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“A Grammar Model and Curriculum Resource for Stereoscopic 3-D Film Production Techniques”

Thesis by

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Statement of the Contribution of Others

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Abstract

This research project is the result of the film industry's lack of a suitable storytelling model in the application of Stereoscopic 3-D in film and cinema storytelling. In working toward such a storytelling model for this under-developed area of the global film industry, a working education resource is formed, that not only helps tertiary film students learn the physics of Stereoscopic 3-D, but also shows how to apply an appropriate film grammar as a part of its language, as Stereoscopic 3-D contributes to film storytelling into the future, in whichever form that takes.

Stereoscopic 3-D in cinema gained significant market share and consumption in mainstream feature film production in the first decade of the 21st century, but its application within filmmaking became limited predominantly to gimmickry and in-your-face effects (literally). The original contribution to knowledge in this study is the formation of a narrative application of Stereoscopic 3-D to cinema storytelling, as a refined education resource with a view to a path for its better application in future film storytelling. In order to do this, an original course of study for undergraduate and postgraduate film scholars was initially developed to teach the physics of Stereoscopic 3-D. Subsequently, this led to a film language model that maps well to contemporary film theories, and emerged through case study research to better apply the use of Stereoscopic 3-D as a tool in cinema storytelling. Through this new grammar model an understanding of how Stereoscopic 3-D best tells the stories within cinema will evolve, despite any seasonal crests and troughs in its commercial interest.

Through this research the addition of Stereoscopic 3-D to the inventory of film grammar tools could well be seen in the same way that the introduction of colour to film from black and white did, or the introduction of sound to otherwise silent films did.

A Case Study methodology was adopted for this research using the mixed method of data collection of qualitative and quantitative processes. As this study was primarily drawing data from volunteer research participants who were undertaking an "Introduction to Stereoscopic 3-D" film course being delivered on three separate occasions, this study was deemed to be a single Case Study, but was run as a series of three 'events' as a part of the one Case Study. Each of these events was delivered to a different set of participant students, and the recognition and refinement of S3D elements as a method to help tell the story was one of the main aims, as well as the aim of using it as a future resource for teaching Stereoscopic 3-D production.

A popular course for the many volunteer research participants (who were undergraduate film students otherwise), meant that data was drawn consistently over the three course's eighteen-

month delivery period. Informed results from these participants of which Stereoscopic 3-D characteristics worked and which didn't, resulted in a clear set of parameters from which Stereoscopic 3-D techniques and models were tested and created. The results drawn were surprisingly similar for each group, despite the course being refined more for each consecutive delivery, and the participants coming from separate time periods of study. The data for this research was sourced for each case study event from surveys, group discussions, and observations made during, and after the course delivery.

The principal conclusion drawn from the analysis of the results of this study is that a model emerged of S3D characteristics to work within for creative storytelling effect in line predominantly with structuralist and formalist film theory. These results after three class iterations of S3D study, revealed a new knowledge by the students in the research study, of the implementation of S3D characteristics for storytelling, in the form of an expansion of vocabulary within the language of film. This new knowledge defines the specific placement of actors, objects, locations, and props within the third dimensional space of the 3-D film frame, not as simply an in-your-face amusement park titillation, but as an addition to the traditional tools of film language (Monaco, 2000). A resulting set of refined guidelines in the form of a graphic representation of S3D characteristics opens the way forward for future testing and additions by filmmakers in the 3-D realm. This emergent S3D grammar model was also progressively incorporated into the S3D learning used in the data gathering as a resource for S3D curriculum development. In effect, the S3D grammar model outcome became an essential ingredient in the teaching of S3D at tertiary level.

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Definitions and Abbreviations (Glossary)

3-D	Stereoscopic 3-D
3D	Often refers to CGI created animations where "3D" stems from the commonly used third dimension in the creation of an animated object rather than any reference to the stereoscopic third dimension
AQF	Australian Qualification Framework
CGI	Computer Generated Imagery again presented as animations or characters created by computer software
CRT	Cathode ray tube
DOF	Depth of field
DOP	Director of photography
F2F	Face-to-face (training)
FOV	Field of view
HE	Higher Education
LCD	Liquid crystal display
LED	Light emitting diode
SAE	SAE Creative Media Institute. The tertiary college venue for this research
S3D	Stereoscopic 3-D
VR	Virtual reality
VR 360-degree	Virtual reality 360-degree immersive vision viewed with head-ware
Z depth	The 3rd dimension is sometimes referred to as the "z" depth in relation to "x", "y", and "z" axes on a graph for instance
Autostereoscopic	References the viewing of Stereoscopic 3-D without the aid of eyewear to see a production in S3D
Depth Budget	The amount of third dimensional space that is utilised in a particular film. For instance, a large depth budget would describe a 3-D film that uses the depth dimension possibly from very close to the viewer (negative parallax) right through to horizon distance (positive parallax). Such a large depth budget uses much 3-D space where a low depth budget might only use a short depth span in the third dimension
Mise-en-scene	Everything "on camera" that contributes to the overall "look" of a scene
Negative Parallax	The S3D depth area used in front of the cinema or television screen. The perceived distance employed between the screen itself to the point closest to the viewer in the audience viewer position
Positive Parallax	The S3D depth area used behind the cinema or television screen. The perceived distance from the screen itself to the furthest horizon point

1 Chapter One: Introduction

Stereoscopic 3-D movies have been around for as long as the earliest motion pictures have been around. In this time period, the cinematic world has come a long way technologically in being able to design, create, and commercialise Stereoscopic 3-D films for the cinema. The director of the 1952 3-D feature film "Bwana Devil" (Oboler, 1952), Arch Oboler, said "The only hope for 3-D is that someone will come along with taste and understanding, and do a good story without regard for the extremes of 3-D, using it in terms of the story itself." (Zone, 2005, p. 47). So, even in the halcyon days of 'B' grade Saturday matinee movies of the 1950s, the realisation that 3-D could be a significant contributor to a film's story was not lost on the pioneers.

The problem is, after all this time, there is still no common model for the cinematic application of Stereoscopic 3-D to a film's *story* in the cinema (Atkinson, 2011, p. 139; Pennington & Giardina, 2013, p. 8).

Two considerations immediately arise from this. First, such a grammatical model for the application of Stereoscopic 3-D to a film's story should be as familiar to filmmakers as the application of a music score is to lift a film, or the application of an appropriate colour grade is to reflect the mood of a film character's journey. The second consideration is that student filmmakers are not exposed to the storytelling possibilities of Stereoscopic 3-D when they should be (i.e. during their film education), unless they are taught these grammatic Stereoscopic 3-D possibilities during their learning, that prescribes an attribution model of Stereoscopic 3-D characteristics for empowering a film's story. Unfortunately, some negative perceptions of Stereoscopic 3-D (S3D) seem to have held it back in the cinematic world - despite significant technological advances in S3D – such as:

- S3D films' popularity began to wane at the cinema (Moorthy & Bovik, 2013, p. 1).
- S3D screenings historically suffered regularly from non-standard projection technologies thus inhibiting the reputation of S3D and its future potential (Zone, 2012b, p. 75).
- Some S3D film productions with below-par S3D were actually high-profile films sometimes made by high-profile directors, and sometimes made with very high budgets. So, a drop in S3D quality was not necessarily due to lack of money, but potentially a lack of S3D knowhow (Lane, 2018, p. 1; Reyes, 2020, p. 1; Middlemiss, 2011, p. 1; Mathieson, 2010, p. 1)
- Viewers of S3D have rarely been properly informed as to what S3D should be delivering in terms of additional storytelling (Pennington & Giardina, 2013, p. 5)

Stereoscopic 3-D is re-addressed in this study and will help answer such 3-D "problems" for its better future implementation in cinema.

1.1 The Research Aims and Question

In producing a research question that included appropriate aims to address such Stereoscopic 3-D "problems", the researcher started with looking at the concept of research design. Robert Yin describes research design as "a logical plan from getting from here to there, where *here* may be defined as the initial set of questions to be answered, and *there* is some set of conclusions (answers) about these questions" (Yin, 2014, p. 28). In contrast to this definition of case study research design, Yin also refers to a definition of experimental research design by Nachmias and Nachmias who define their model of research design as "a logical model of proof that allows the researcher to draw inferences concerning causal relations among the variables under investigation." (Nachmias & Nachmias, 1992, pp. 77-78). The comparison made here by Yin tends to see case study research in contrast to experimental research design, as being a less scientific method of research. He poses that experimental research design looks more at identifying and controlling variables in order to prove a theory. Yin suggests that there are five components to case study research design that are important (Yin, 2014). These five components are:

- a case study's questions
- its propositions
- its units of analysis
- the logic linking the data to the propositions
- the criteria for interpreting the findings

Using this component breakdown as a template for describing the research design for this project, here are the component details specific to this study - starting with the main research question for this project, and its specific research aims:

1.1.1 Question

The specific research question for this research project was distilled down to:

Is there one Stereoscopic 3-D (S3D) grammar that enhances a film's story, by showing more successful results with the viewers tested?

From this, two sub-questions were also produced:

Sub-question 1: What is the model for such a working S3D language that arises from this study?

Sub-question 2: Can a resource for curriculum planning for tertiary film students be synthesised from the research findings?

Subsequently from these two sub-questions, two aims were also drawn:

Aim 1: **Explore and determine a grammar model of S3D that works**

Aim 2: **Synthesise research findings into a resource for curriculum planning for tertiary film students**

So, in order to address the problem of the cinema world not having a common model of S3D to contribute to the telling of a film's story, with this now refined research question and its aims, the problem was being addressed.

1.1.2 Propositions

The premise of whether a working S3D 'language' or 'grammar' could serve as a base for all S3D feature film productions was the main issue explored in this study. In order to clarify the application of S3D within this research, a broad characterisation of the term filmmaking "grammar" as it pertains to the value of cinema is important here. As a definition, filmmaking "grammar" encompasses the attributes of a film's elements in its ability to propel and help tell a story (Manchel, 1990, p. 22). Thompson and Bowen (2009) also define film "grammar" as the reading, writing, and speaking of a film's language, as well as the recognition of images and sounds, and the deciphering of its symbols. Openly put, according to Thompson and Bowen, as a filmmaker, film "grammar" is the ability to communicate a story to a global audience using a common film language (Thompson & Bowen, 2009, p. xi). Film theorist Felicity Colman simply describes film grammar as "ways of 'reading', 'hearing, and 'seeing' film as a cinematic language" (Colman, 2014, p. 9) while seminal film theorist Christian Metz ultimately sees it as a film's underlying meaning above any literal on-screen imagery (Metz, 1991).

Consider here as examples of such ways of 'reading' a film; the use of colour within cinematography, the use of production design as a prescribed set of textures and colours, and the manipulation of sound to alter the perception of a narrative, to illustrate how such a film "grammar" can be applied. Muted or desaturated colours within a film's finished cinematography could be used as an element to help describe a particular character's personality trait or narrative element (such as the yellow/brown colour throughout "Chinatown" (Polanski, 1974) reflecting the story's premise of the lack of water driving the drama). In the realm of costume design, to use another example, carefully selected clothing textures by a Costume Designer or Production Designer for a main character might also reflect the story as it unfolds. An illustration of this particular example might be seen in the feature film "Blue Velvet" (Lynch, 1986), where an insect-like pattern print on the protagonist's shirt informs a change in that character's personality with its reference to garden insect imagery from earlier in the film. One may consider also the artistic application of sound to a film by careful selection of specific sound attributes that ultimately benefit the story. If a sound design choice is made that incorporates extremes of the loudest audio and a maximum number of audio tracks added, this undoubtedly would contrast with a minimalist approach where a "less-is-more" outlook might apply (van der Rohe, 1959, p. 12). Such a stylised and quite selective use of sound in film is also represented well in the film that won the Academy Award for Best Sound in 2013, "Gravity" (Cuarón, 2013).

A film's *story* in the context of this research and in the parlance of theoretical film studies has been defined by Seymour Chatman as one part of a film's narrative, being the chain of events (actions, happenings) including characters and items of setting then expressed by a chosen means (Chatman, 1980, p. 19). A film's story by this definition can be communicated by any number of means and combinations of ideas. Using S3D as one of the means to communicate such ideas opens the doors to this expression of characters, events, and settings and how such expression can be employed creatively.

The future of Stereoscopic 3-D is certainly also linked to pathways outside of 3-D cinema, as evidenced in the proliferation of S3D gaming headwear as gaming becomes embedded in society and households, and its technology races to get ever-closer to total realism and full immersiveness (Oneto, 2019, p. 3). Virtual Reality is also taking giant steps with 360-degree vision simulations, with story-based experiments pushing the bounds of new media. Stereoscopic 3-D has already made significant advances technologically in refining the craft, and so its portage to gaming and Virtual Reality futures is almost a foregone conclusion. The question of whether an S3D grammar model from this research carries forward to the branches of such advanced mediums, must be considered.

1.1.3 Units of Analysis

The units of analysis in this project's research are the individual Stereoscopic 3-D feature films themselves that were screened, studied, and discussed throughout the research process. A cross-section of these films ranges from films made on low-budgets to films made on high-budgets, and also from films made from the 1950s to the present time. Such a timespan has seen changes to the way S3D has been implemented in feature film production - particularly over the last ten years - and lends itself to a path of development that expectantly refines the rougher edges of S3D implementation. The more recently produced S3D feature films have certainly benefited from the results of the previous decades' S3D application to film productions. The S3D films chosen for the three Events in this Case Study's screenings to the course participants, used this possible chronological advancement in S3D to a certain extent to leverage any presumptive evolutionary advances in the S3D application dealt with in this study.

1.1.4 Logic linking data to propositions

The data collected from undergraduate/graduate film students on their observations of S3D feature film examples, directly informs the propositions concerning S3D as a language that applies here across the board. Such observations are benefited by the viewing of multiple examples of S3D productions as a means of contrast and comparison to each other, as well as each participant's perceptions of individual films.

1.1.5 Criteria for interpreting findings

An alternative to statistical analysis in this case study research conceivably is the reasoning behind case study results that might differ from the successful implementation of an S3D grammar model. For instance, if an S3D feature film uses the depth placement of characters, etc. in an obtuse and quite self-evident way this may serve to reinforce the less obtuse implementations of S3D in its use as a successful storytelling tool. In this way an extrapolation of the aims of this research in Stages, will form a pathway for interpreting the findings:

Aim 1: Explore and determine a grammar model of S3D that works

Stage 1: Construct a grammar model of S3D usage by collecting interpretations of depth placement principles. A model primarily based on viewing and analysis of existing S3D films

Stage 2: Mixed method responses from relevant parties to define the most successful grammar model

Aim 2: Synthesise research findings into a resource for curriculum planning for tertiary film students

Stage 1: Determine a grammar template, by repeated delivery and a mixed method of data collection, for production of the most successful S3D grammar model

The research design for this study aims to construct a grammar model of S3D based on interpretations, observations, and discussions on the application of S3D in films by film students. There is no sense of disproving any existing theories with this research design, but more an exploration of the construction of useful theories of S3D, by practitioners who already have a heightened awareness of the use of grammar in film.

1.2 Scope, Strengths, and Limitations

The scope of this research project primarily encompassed two sizeable aspects:

- Three separate S3D coursework events run as five-week delivery courses.

- A cross-section of S3D films studied from independent films, to Hollywood blockbusters, to genre films, and children's films. This important triangulation in the choice of film titles broadened the final application of the analysis.

The size of this research project over an eighteen-month delivery period, has defined the scope of this work to a large extent. Three separate "Intro to S3D" course 'Events' of S3D coursework, each covering a five-week delivery period, with all Events delivered consecutively over the eighteen-month delivery span with breaks in-between, covered significant ground. Each of these three Events saw ten undergraduate film students 'enrolled', creating a total of thirty research participants that contributed to the data gathered.

The cross-section of S3D films that was chosen for the screenings in this research, and therefore for analysis of S3D characteristics, drew from a pool of early generation S3D films, more recent S3D productions, high budget Hollywood S3D feature films, independent S3D productions, and children's S3D films. In this sense there was also a triangulation in the choice of film titles here, on par with that used in the mixed methodology of this research. Such a mix of S3D film titles used in this research is testimony to the fact that, where S3D grammar is employed to any extent, it is not dependent on the "type" or genre of film that it is. It is more that the tool set is what is important, as well as how the tools are used for a particular film. In identifying the depth characteristics of any S3D film, film scholars and practitioners are using the fact that such an application of S3D characteristics is the point, as well as which particular combination of them they may be favouring. This study's outcomes will have an effect on the way that film is traditionally viewed, as far as defining the overall reading of film form. The cross-section of S3D titles in the three Events that were studied, belies the fact that the measure on how to view a film will be revised as a result of this research - at least for how S3D films are grammatically "read".

The strengths of this research study are:

1. The continuous and strong qualitative responses from all participants
2. Strong peaks at similar survey points across a mix of participants and coursework
3. A final rendition of the S3D grammar model being taken up as a formal HE Masters resource in curriculum teaching

Throughout the three separate coursework deliveries over the 2016-2017 period, there was continuous motivated and enthusiastic responses from all of the "enrolled" participants. They offered up observations and strong qualitative data throughout the research, creating a solid capture of data without dips in participation, nor periods of low attendance over the research period. A significant strength of this research was the strong responses at similar times, and over similar S3D film examples. Despite the courses being run some months apart from each other, and with completely different research participants in each course, there were firm responses by each group at similar survey points in regard to feedback from the same survey questions, but significantly, these similar responses were from different S3D film titles. This gathering of broad human responses to these same S3D elements gave vigour to the possibility that a grammar model would result from the research. Finally, a significant strength in the result of the study, is the fact that the most refined version of the final S3D grammar model was incorporated into a Higher Education Masters level module offering at the SAE Creative Media Institute on a national level. The final iteration of this course was ported for a completely online delivery, as well as being made available for on-campus and face-to-face (F2F) delivery. The ultimate compliment and sense of approval for the development of this S3D grammar model, was the invitation and subsequent acceptance of having it included in this coursework.

The following limitations to this study however, grew in concern for the researcher:

1. Seemingly small number of research participants
2. Few negative responses throughout the surveys began to endanger the overall construct validity (some similarity in survey responses felt one-sided)
3. The scope of the final S3D coursework could have been larger than ‘introductory’ in hindsight regarding the final breadth of the S3D course (a common feedback request)
4. There was less usable ‘film industry’ data input than was originally anticipated for use, due to the lack of S3D knowledge for a meaningful contribution
5. Lack of hands-on S3D practical production content in the coursework
6. The researcher’s lack of time to undertake the study due to outside commitments

Limitations to this study start with the seemingly small number of research participants for each of the three Events organised as a part of this single case study. A total of thirty participants took part in the coursework, surveys, after screening group discussions, feedback, and data gathering. Ten were involved with each of the three Events as they ran over an eighteen-month period. An interesting roadblock to the original proposal for this study, was in the plan to include industry practitioners in the study along with undergraduate film students. It quickly became obvious that, very few film industry personnel in Australia had the basic skill base in S3D to be able to take part in the required discussions required in order to appropriately contribute to this research. The undergraduate film students who did contribute to the research, had the foundational background (as they had a minimum requirement of completed studies before they were eligible to participate in the research), and the benefit of having completed the S3D coursework which ended up being the backbone knowledge source that informed these participants for the research. In effect, the lack of knowledge of any film industry personnel that would have otherwise been involved in this research is clear evidence of the need for the coursework and the S3D grammar knowledge being produced by this research project.

Another limitation to the scope of this research was the dearth of significant negative feedback gathered from any of the three Events through either the qualitative or the quantitative sources. As much as the mostly positive data received was indicative of a successful model of both coursework and also S3D depth modelling, it also sounded out the possibility that validity was at risk. Upon further scrutiny it appeared to be that fair and equitable data sourced was indeed indicative of the research topic, and the impartiality of the participants involved. The final limitation recognised early in the Event delivery was the potential for a lack of hands-on actual S3D camera production to dilute the experience of the participants doing the coursework. As per the surveys that dealt with feedback on the course deliveries themselves, a number of parties mentioned the wish for a hands-on S3D camera experience to be a part of the learning. The wish to add this at the "introductory" level was explained as being more appropriate to happen at a later stage. Such a hands-on camera experience would come after the theoretical aspects had been learned, and therefore would be included in an advanced S3D course for a later date.

This research has taken longer than was originally anticipated with two different confirmed end-dates needing to be pushed back for the final thesis submission. The change in estimated finish dates came after the correct estimation of preparation time required for the three Events, the sourcing of participants for the study, and the amount of time required to collate, analyse, and refocus the results from the analysis. However, the amount of time required to do the final assembly of results and converting all final data into graphs, tables, and presentable text was severely impinged by external pressures on the researcher that otherwise had no bearing on the research. The researcher is employed full-time as an academic manager/teacher, and a half day a week was (gratefully) allocated as a regular professional development allocation by the researcher's employer. This half-day each week was valued by the researcher but very often work requirements meant that this time was compromised as far as thesis writing time was concerned. Urgent matters at his place of employment were common, and unfortunately for the thesis writing, was very disruptive. An extra full day per week every week was also allocated by the researcher to work on this thesis assembly, this being one day every weekend from the researcher's personal time. A young family and a non-commutable house extension regularly took this weekly day away from the planned thesis writing schedule also.

1.3 Risk Analysis

There were a number of points of potential risk to this research project from the outset:

- Potential lack of regular commitment from volunteer students for the case study sessions.

- Risk of being diverted away from the original research question, due to the high number of topical areas associated with this field of study (i.e. new technological developments influencing the uptake/success of S3D in the future).
- Possible drop in commercial interest in S3D affecting student interest in learning S3D.

For this research to work, and to have a reliable expectation that motivated participants would continue to volunteer over the extended period of the multiple deliveries of the coursework, the posed risks of their possible desertion were a concern for the researcher. If, over each "Intro to S3D" course delivery of five weeks, the individual research participants who enlisted as students, were unable to attend for all or most of the course sessions, this would greatly hinder the integrity of the data sourcing. Further to this, over the course of the eighteen-month period of all three course 'Events', if overall interest began to drop by the originally enthusiastic participants, again, the integrity of the research would suffer in the eyes of the researcher. It was conceivable that, if such a drop in interest were to occur, then there may be so few volunteers available at the time of commencement of these 'Events' to even complete the research.

Consideration must also be given to the potential influence of the drop in commercial interest in S3D production, that may well infiltrate the student body and easily create a vacuum of enthusiasm for a 'dead' aspect of the film industry. Another potential point of risk was the risk of the research being diverted away from the original research question due to a high number of topical areas associated with S3D study. Arrivals such as Virtual Reality to multi-screens promising quite immersive experiences, S3D gaming advances (at one time), and lucrative S3D entertainment arenas, could derail the concept of S3D cinema storytelling – certainly at research levels. In order to manage this potential risk, the number of students for each 'Event' intake was limited to ten students. In this way, when a call for student volunteers was put out, invariably there were more respondents applying to undertake the S3D course than the limit of ten seats that the researcher stipulated on the volunteer call-out (Appendix F). This had the effect of doing two things, one it created a pool of potential students that sat on a 'waitlist' in case a seat became available (thus ensuring a full class if some were unable to attend at the last minute). The second, it created a sense of popularity and a feeling of good fortune to have scored a seat in this coursework. This added a sense of value to the opportunity to undertake this S3D subject opportunity, again helping to reduce the chances of any attrition of attendees. Any fear of a drop in the commercial interest of S3D in affecting the student's learning was unfounded as the enrolments in the ensuing courses did not decrease. It became clear that, these participants understood the meaning and value of film grammar, and the value of learning the construction of appropriate S3D cinema. It was also a part of the role of the course facilitator (also being the researcher) to make sure that the participants understood the grammatical potential of S3D in cinema as well as its commercial concerns.

1.4 Overview of Chapters

1.4.1 Chapter Two: The Problem with S3D

The 'problem' with S3D lies in the popular perception of the effectiveness of 3-D at the movies. As with many human endeavours when something new presents itself, a consensus opinion is often easier to adopt than it is to weigh up parameters and make a genuine judgment call. Due to the range of variables associated with S3D viewing quality (both technical and creative), and the slow progress in achieving a set S3D standard that employs the highest level of available technologies and processes, popular opinion on the potential of S3D in the cinema is at risk due to this potential loss of momentum.

1.4.2 Chapter Three: Literature Review

Despite the popularity of S3D films during and prior to the period that this research was undertaken, there was little literature that dealt with this research's aspect of S3D storytelling up until the major preparation for this three Event project. In fact, only during the later time period of years since 2018 have academic papers dealing with S3D been appearing in larger numbers. These academic papers however, have predominantly dealt with technical or physiological aspects of Stereoscopic 3-D, and generally not aspects of the artistic application of S3D parameters to cinema storytelling. There has been a rise in academic papers addressing electronic issues with screen dynamics and production of stereoscopic vision systems, but many of these are in relation to virtual reality (VR) forecasts for the future.

In amongst these more recent academic articles on S3D there have been papers that *do* address some of the aspects of how S3D is used for promoting the director's vision. For instance, Delia Enyedi writes about comparisons of Alfred Hitchcock and Jean-Luc Godard S3D films (Enyedi, 2017, p. 649), and does write about the differences between their respective styles when it comes to S3D. She observes that Hitchcock began to manipulate the implementation of S3D at different narrative points in his 3-D film dalliance for more artistic possibilities in the use of 3-D in cinema storytelling. Film theorists like Sergei Eisenstein, and Christian Metz from the early 20th century when writing theories of traditional cinema also included the possibilities of 3-D and its artistic application in cinema (Buckland, 2004, p. 86). Arguably, then as now, there was more written about the lack of 3-D in storytelling than on the actual application of 3-D in storytelling. Still such theorists opened up the possibilities of more intelligent 3-D application in cinema than they were usually given credit for.

Between journal articles "On Aspects of Glasses-Free 3D Cinema" (Blundell, 2015, p. 16), and papers on audience's physiological responses to physically feeling threatened by intruding 3-D images from the movie screen (Adler et al., 2014) a host of related VR, stereoscopic eyewear issues and philosophies, address more industrial/philosophical/physiological aspects than the research topic of this thesis.

1.4.3 Chapter Four: Methodology

Stereoscopic 3-D filmmaking is as much artistic as it is scientific in a number of ways. Being from the already creative field of traditional filmmaking which is over a hundred years old (and notably so are the first attempts at the Stereoscopic 3-D aspects of filmmaking), using a research methodology that embraces qualitative data sourcing, and through triangulation with quantitative data sources, suits this research very well. Case study research according to Robert Yin is defined as "an empirical inquiry that investigates a contemporary phenomenon within its real-life context; when the boundaries between phenomenon and context are not clearly evident; and in which multiple sources of evidence are used" (Yin, 2014, p. 38). This research is a Single Case Study model rather than a Multiple Case Study model because single units of analysis are being used in the S3D films themselves, across all repeats of this study.

To further round off the application of a single case study methodology for this project, Yin describes an exemplary Case Study as having five aspects. These aspects are; be significant, be complete, consider alternative perspectives, have sufficient evidence, and be engaging (Yin, 2014). Applying these aspects to this study, Yin's five elements are aligned as shown in Table 1-1.

Table 1-1

Robert Yin's Five Exemplary Case Study Elements as Applied to this Research

Robert Yin's Five Exemplary Case Study Elements	*This Research Study's Aligned Exemplary Elements*
'Be significant'	The first study in the world to build an S3D curriculum that teaches depth placement theory.
'Be complete'	With clear boundaries in its use in storytelling and multiple evidence sources.
'Consider alternative perspectives'	Broad perspectives from a wide range of participants.
'Have sufficient evidence'	Multiple courses, multiple participants, multiple film titles.
'Be engaging'	S3D has appeal with many people as an interest and/or opinion on its future. The final report by its nature is written with a sense of complementary engagement.

1.4.4 Chapter Five: Case Study-1st Event

Chapter Five is the first of the three chapters that cover the three Case Study Events themselves. Each of these three chapters present evidence on the three research Events, and are structured in a similar way to each other, covering broadly in this order, these four points:

- Depth model observations of each of the specific S3D film titles chosen.
- Survey analyses of each of the S3D Depth characteristic and Likert surveys for these specific Event's film titles.
- Summaries of the S3D depth model learning results for the films screened and discussed.
- Curriculum learning results from surveys completed and discussions about the application of a film grammar model to the coursework and delivery itself.

In this initial Event chapter, the first delivery of the three Case Study Events was organised, described, and delivered as the prototype of the methodological analysis used in this study. Reasoning behind the design of the course, as well as the specifics of what S3D films were screened as units of analysis for this study, are considered and discussed in this chapter. The structure of this first Event design, and why the design was chosen this way, is described and considered here. Being the first of the Events of this research model, a significant amount of explanation and discussion of specific S3D definitions and meanings have understandably appeared here in this first chapter of Events before recursive Event descriptions in subsequent chapters. Participation patterns as well as results of learning are laid out and analysed in this chapter. Also, here the first S3D film titles for screening are presented, and the reasons for their choice by the researcher in this program explained. Results from this first Event as recorded in Chapter Five, showed that initial evidence of some common ground in observations of S3D characteristics had begun to surface. The results of the participants' learning began to inform their discussions during and after screenings in this first Event. The beginnings of the formation of a set of S3D characteristics that work with the story, also started to influence the student's learning itself within this first five-week coursework Event.

1.4.5 Chapter Six: Case Study-2nd Event

Chapter Six covered the second Event setup, progression, analyses and results of the course delivery as well as any advances in the learning of S3D grammar characteristics. The coverage is similar to the first Event chapter in Chapter Five where it also used the same chapter breakdown of: depth model observations of the specific S3D films, survey analyses of each of the S3D depth model characteristics and Likert surveys for these film titles, and summaries of the S3D depth model learning results for each film.

The S3D film choices in this second Event chapter included films produced more recently than the average age of the first Event's combined S3D screening titles. Even as a modest change, such a change in era of S3D film titles opened up the triangulation of this research study by introducing potential evolutionary changes to the S3D processes and characteristics. Results from this second Event delivery found that group discussion work after the weekly screenings started to bread confidence in the student's ability to critique some of the more recent S3D films used for analysis.

A tighter form of a model of S3D grammar began to emerge in discussions and surveys, with regular reappearances of a set of S3D characteristics occurring from film discussion to film discussion within this Event, as well as from Event to Event. This added awareness that was appearing in the group, filtered into the weekly coursework. It became clear that the weekly screenings, and the resultant learning by the participants from the discussions around the broad range of S3D films, was now a significant aspect of the S3D Curriculum learning model in itself.

1.4.6 Chapter Seven: Case Study-3rd Event

The structure of the final delivery of the 3rd Event was purposely kept similar to the previous two Events' chapters using the same structural form again. However, in this final Event chapter, are also significant comparisons to film title analyses stretching across two and sometimes three of these Events. Some S3D film titles traversed two of these Events, and two titles covered all three Events. Of particular interest in these comparisons was the finding that some similar properties were evident across these three Events between the same film, and other properties drew quite different observations. Intriguingly, there were few clues uncovered to explain some of these observational differences. Despite such observational anomalies, there were significant commonalities appearing within this third Event group, as well as between Event groups over the course of the research. Through the broadening of the numbers and style of films viewed and discussed by the participants, and also by the subsequent repetition of demonstrated positive S3D characteristics, a grammar model had been built through the sheer number of reappearances in the screenings of positive S3D attributes as the five-week courses progressed. This significantly accelerated the following week's understandings of the S3D coursework, and so the merging of both aspects of this research of an S3D grammar model, with it being an informed S3D Curriculum resource became a double-edged sword.

1.4.7 Chapter Eight: Conclusions

The research for this study used a mixed method of qualitative and quantitative studies to further the perception and application of Stereoscopic 3-D to cinema storytelling. By teaching undergraduate and post-graduate film students how Stereoscopic 3-D is enabled technically, through individual exemplary cases, their perception of S3D's benefits to the storytelling was tested. By defining the attributes of positive S3D techniques, and then applying these to film grammar principles within theoretical film models, a refined set of characteristics of S3D emerged. The application of this new S3D grammar model to older S3D films as well as to newer S3D films, proved its worth to the course participants in these five-week Events. A model of significant S3D characteristics had forged itself from the evolving data, and its simple interpolation with traditional film grammar principles, saw these research groups apply these "new" characteristics to the telling of the film's story. A clear second benefit of this learned set of S3D grammar principles, was its ensuing application as a part of the refined S3D curriculum coursework itself, from which the student participants themselves learned S3D.

2 Chapter Two: The Problem with S3D

Notwithstanding the risk of any reduced public interest in S3D being seen as detrimental to the long-term feasibility of continued S3D production, the research in this particular study on the better integration of S3D into contemporary filmmaking, has less to do with a decrease in consumer S3D popularity, and more to do with the establishment of its integral storytelling potential within film language. Such prospect improvements are more within reach of filmmakers since the technical roadblocks in the S3D production process have mostly been conquered in recent years, with the digital evolution of the S3D form.

Just as popular cinema incorporates effective cinematography, sound, editing, and production design into the telling of the story, even in the most commercial of cinema releases (albeit sometimes at a basic level), arguably such film grammar techniques (as sub-conscious as it may be for many cinema-goers) still successfully contribute to the story within the sub-conscious perception of a large percentage of the filmgoing public. The most successful films (Figure 2-1) despite even the most basic premises of story in some cases, rely upon implementation of well-honed film grammar techniques (Monaco, 2000). In this light, any lack of implementation of S3D in regard to film grammar would also affect the storytelling in the same way, and therefore could conceivably contribute to any sense of loss in popularity of S3D with the cinema audience into the future.

Hollywood film producer and director, James Cameron, has been a staunch supporter of Stereoscopic 3-D's place in formal filmmaking. He has a simple but convincing edict on the importance of Stereoscopic 3-D:

> "[W]hy is 3-D better [than 2D]? Well, because we're not a race of Cyclops. We have two eyes. We see the world in 3-D. It's the way we perceive reality. Why wouldn't our entertainment be in 3-D? It's absolutely not a gimmick, it's an alignment. It's a calibration of our entertainment industry to the way in which we actually sensorially perceive the world. It's absolutely inevitable that eventually, all or at least most of our entertainment will be in 3-D" (Ho, 2012, p. 1).

Cameron's staunchness is balanced by some with a perception that Stereoscopic 3-D (S3D) has lost some shine and will slowly retreat from view (Frommer, 2011, p. 1).

Figure 2-1

Top Ten Movie Grosses of All Time

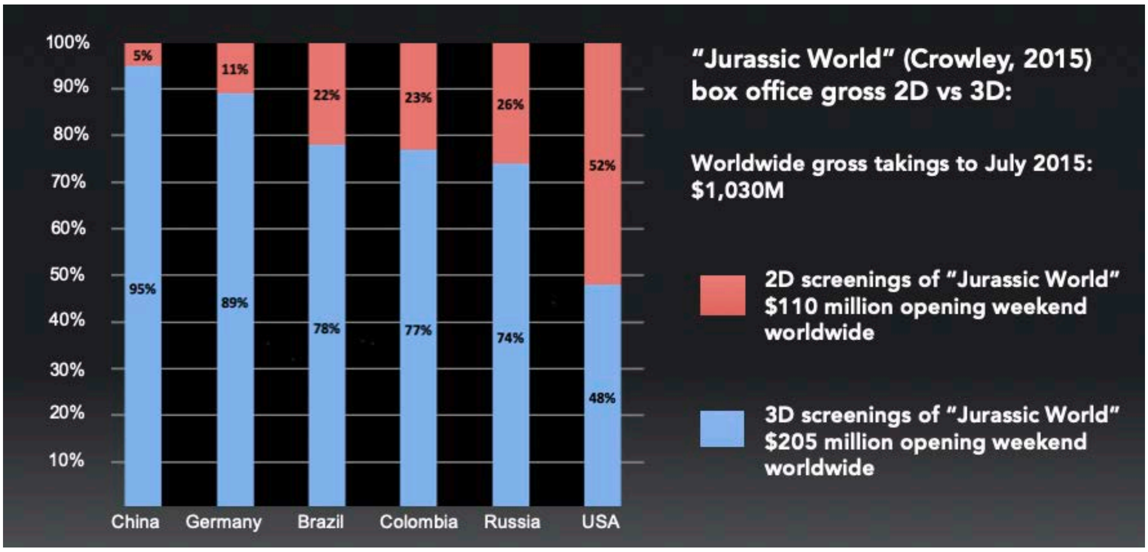
Top ten movies *of all time* for box office takings:

Rank	Title	Lifetime Worldwide Gross	Year
1	Avengers: Endgame	$2,797M	2019
2	Avatar	$2,788M	2009
3	Titanic	$2,208M	1997
4	Star Wars Ep.VII: Force Awakens	$2,068M	2015
5	Avengers: Infinity War	$2,048M	2018
6	Jurassic World	$1,670M	2015
7	The Lion King	$1,670M	2019
8	The Avengers	$1,518M	2012
9	Furious 7	$1,518M	2015
10	Frozen II	$1,450M	2019

Note. The top ten grossing movies of all time were all released in 3-D (Gray, 2020)

Figure 2-2

2D Versus 3D Worldwide Box Office Takings 2015



Note. Figures showing that in 2015, 3-D movie box office takings worldwide were higher by a ratio of 2:1 over traditional 2D releases of the same movie (Elzer, 2015, p. 1; Gray, 2020, p. 1)

It conceivably becomes a point of contention that just when the technology has finally developed enough to make high quality Stereoscopic 3-D cinema financially and technically attainable, the movie-going public doesn't get to see the fully evolved cinematic value in having S3D help tell the cinematic story before it recedes from the mainstream view (Frommer, 2011). The fact is, that many Stereoscopic 3-D (S3D) films have received a poor reception at the cinema by cinema-goers, not only in recent years, but on and off throughout its cinematic life in various forms (Moorthy & Bovik, 2013, p. 1). Reasons for this almost seasonal change in reception of S3D screenings, has been regularly attributed to the fact that, very often there were poorly setup physical technologies used to shoot and exhibit these S3D films, thus inhibiting the S3D potential for a much wider acceptance and better experience (Zone, 2012b, p. 75). Interestingly, many of these poorly created S3D films over the years had very high budgets for production. So, arguably a drop in S3D quality could only be about the S3D knowledge of the film's producers (or lack of it) - not about money (or lack of it).

Despite a dissident sense of doubt and lack of confidence in the form, it is astounding to note that in the list of the most profitable films in the world's history (as shown in Figure 1-1), every one of the top ten films in this list were released in 3-D! There did not appear to be such fear in investing in 3-D film production when making these films, and so there was clearly a lot of money to be made in films that included S3D (Statista, 2016). However, even with their financial successes, such blockbuster S3D films did not all have necessarily productive *applications* of S3D, despite their overall fiscal windfalls. This is evidenced in reviews of "Jurassic World" (Crowley, 2015) for instance, where such sometimes less than optimal applications of S3D are described as:

> "the [3-D] illusion isn't…effective, such as when the two nephews roam the visitor center where we see more of a layered, pop-up book effect, as if some of the kids were paper cut-outs. [A] couple other [3-D] moments…fall a bit on the flat side" (Duarte, 2015, p. 1).

Another "Jurassic World" (Crowley, 2015) review in regards to the implementation of 3-D stated "If only…the 3-D had been more immersive, I could have recommended [this film]" (Ek, 2015, p. 1). Despite such economically successful films being released in 3-D, there was still a noted subsidence in the popularity of 3-D as the years went on, in the face of these significant box-office successes.

Another point that leans on the rationale of this study, is the fact that cinema-going viewers are generally not informed about what S3D could be delivering (Vishwanath & Hibbard, 2013, p. 12). There is no standard by which the movie-going public can use as a benchmark for what it actually was that they had paid to come and see - apart from of course, spears coming out of the screen for instance to remind the audience that this was indeed a 3-D movie (Kermode, 2010, p. 1).

The rationale that the 3-D movie industry would have a much better chance at prolonged longevity (and therefore more profits from future film releases, see Figure 1-2) if the movie-going public were more aware of the language possibilities of S3D, with higher expectations of 3-D movies than just a 'spears out of the screen' experience, rides on this research. Traditional cinematography and film storytelling have for most of its 120-year life been viewed as a two-dimensional experience. There have been multiple standards of screen ratios, resolutions, sharpness, and levels of quality over this time, which for the most part have been gradually improving the overall production values of cinema (Dodd, 2014, p. 1). Throughout this trajectory and over the course of film history, much of what has evolved into celebrated heights of "good cinematography", manifests itself as photographic eloquence in the form of story-driven moving cameras, selective fields of view, and purposeful mise-en-scene (Mascelli, 1998, p. 15; Gleicher & Liu, 2007, p. 1). The camera work exemplars of many films through the last hundred years in their two-dimensional (2D) form created the *illusion* of the third dimension, being depth.

Historically this has been attributed to fine artists in the Renaissance (Kubovy, 1988) but has also been found more recently in Palaeolithic cave paintings from as early as 35,000 BC in the form of depth representations of animal imagery (Brooks, 2017, p. 3). It is clear after many years of cinema (and centuries of fine art) that the limitations of a two-dimensional image, be it a photograph, painting, or moving image, do not inhibit clear representations of this depth (Pepperell, 2011, p. 8). When Masolino in the 15th century utilised perspective and vanishing points in early works such as "The Healing of the Cripple and the Raising of Tabitha" (da Panicale), the move from a two-dimensional viewpoint to what appeared to be a three-dimensional perspective was implicitly understood by contemporary viewers of these Renaissance artworks (Pepperell, 2011, p. 9).

In the ensuing centuries of fine art and then photography, there seemed to emerge collectively a set of attributes recognised in two-dimensional imagery that appeared to succinctly describe the third dimension of depth. With a basis arguably within Max Wertheimer's Gestalt psychology theory specifically in relation to visual perception, where the depth dimension is portrayed through a 2D medium, then perceived by the viewer just as 3-D might be in real life (Wagemans et al., 2012), such identifications of two dimensional "depth cues" also easily apply to modern filmmaking. Nine of the primary 2D depth attributions used to imply the third dimension regularly in the moving image are: perspective, occlusion, shadow, focus, texture gradients, atmospheric perspectives, movement produced cues, relative sizes, and familiar sizes (Goldstein, 2010). Modern cinematography engages some of these illusions of depth within the innate characteristics of cinematography for instance, by selectively controlling focus particularly by using a shallow depth of field. Here backgrounds and foregrounds in some shots are shifted out of focus forcing the viewer to "see" a specific depth point that is in focus somewhere between the background and foreground. Another example specific to the moving image is the “tracking” camera. A “tracking” camera is a moving camera on a dolly or vehicle travelling laterally from either left to right or right to left. When a camera is tracking, the differing perceived rates of movement between background and foreground is often interpreted in terms of their vicinity to the camera (this is also known as motion parallax).

In consideration of such a visual understanding of depth and depth cues within the traditional 2D environment, the relatively new adaptation of Stereoscopic 3-D processes to the traditional film industry’s 2D world is somehow surprisingly *not* a significant change for viewers already using active brain functions to interpret 2D cinematographic imagery. With this understanding of the capacity of viewers to interpret the use of Stereoscopic 3-D within film, the roll-out of the technical ability to produce good 3-D motion pictures may appear to be the only reasonable roadblock to the continued evolution and implementation of 3-D within cinema (Block & McNally, 2013, p. 33).

However, this surely cannot be the case as the technical advances of Stereoscopic 3-D film production seems to have reached monumental heights within the design, implementation, and understanding of complete Stereoscopic 3-D filmmaking pipelines (Rogers, 2013, p. 7). Benchmark films that illustrate such levels of achievement like Ridley Scott’s “The Martian” (2015), and computer-generated animated movies such as Spielberg’s “The Adventures of Tintin” (2011) show a refinement in these processes with fewer of the traditionally more common S3D issues of awkward, painful, or poorly created S3D shots. Consideration therefore must be given to the premise that the public’s ability to be able to interpret a deeper subtextual application of Stereoscopic 3-D within these movies has not evolved at the same rate as the capabilities of technologists to create and control S3D in this modern age.

Film historian Scott Higgins noticed the immaturity of the acceptance of S3D in 2012 when he wrote;

> “[b]ecause 3-D has not become a ‘fact of mise-en-scène’, tamed by familiarity and diegesis, at this moment it can be a spur to experiment with, explore, and develop cinematic space… Digital 3-D presents a rare opportunity to study the aesthetic impact of a new technology. In the face of its ever-diminishing novelty, filmmakers are seeking a sustainable formal response to 3-D. Some are moving away from protrusion effects, which are associated with disruptive gimmickry, and exploring depth as a means of extending the technology’s narrative reach” (Higgins, 2012, p. 197).

Stereoscopic 3-D in cinema has progressed significantly from its inception to its most recent high-scale implementation in feature film production. The technical issues that plagued the 1950s phase of 3-D cinema releases such as projection sync issues, and eyewear discomfort etc. have seen monumental improvements to modern day presentations of S3D cinema (Read, et al., 2015). Such improvements are due mostly to the finer tolerances afforded by digital technology advances in 3-D production. However, despite these improvements in technology, and a significant subsequent reduction in projection sync-errors, there have been quite a large percentage of S3D films released that still have significant technical errors in the S3D side of things (Vatolin et al., 2017). Technical errors that seem to abound in many S3D film releases, become both a limitation to this research study, by the fact that efforts to create a storytelling model and film grammar are thwarted, but also a positive aspect to this research in that such technically error-ridden films help refine the S3D elements that ‘aren’t working’ in building an S3D film grammar model.

Such errors include vertical mismatches between the left image and the right image (where S3D basically consists of two images that work alongside each other, using a left eye/right eye scenario). Such vertical mismatching between the two images quickly breaks the stereoscopic effect, which is in significant contrast to a horizontal shift between the two images that actually is required to create the stereoscopic effect. As a result, any vertical mismatch between the left and right images works against comfortable S3D viewing, and surprisingly is common in a number of recent high budget cinema releases for some reason (Spöhrer, 2016, p. 15). Such technical issues that appear in even quite recent S3D productions, is not an aspect that specifically affects the research undertaken here. The research for this project is concerned with the design and placement of characters, objects, and locations in the 3-D space as far as their use in the storytelling. Any issues that may be associated with technical errors and flaws in the physical production of S3D cinema is not necessarily relevant to this study at any important level, and will be precluded from data results wherever possible.

The increase in use of Stereoscopic 3-D (S3D) in commercial filmmaking in recent years has opened a Pandora’s Box (Benson, 1940, p. 47) in the public’s expectations (and varied successes) of this added third dimension in cinema. More specifically, a significant increase in the public’s interest in S3D seemed to have occurred around the time the much-heralded movie “Avatar” (Cameron, 2009) brought the full effect of digital Stereoscopic 3-D to the wider public (Brown, 2012, p. 1) with a film that held the record of being the highest grossing film of all time until 2019 with a gross intake by 2016 of $2.778 billion (until overtaken by another S3D film, “Avengers: Endgame” (Russo & Russo, 2019) with a gross intake of $2,797 billion (Schrodt, 2016)) (Figure 1-1). “Avatar” and other high profile early 21st century S3D films such as “Life of

Pi" (Lee, 2012) and "Gravity" (Cuarón, 2013) kept the S3D spectacle popular amongst other somewhat less successfully produced S3D film releases like "Clash of the Titans (Leterrier, 2010). "Clash of the Titans" unfortunately did damage to the growing reputation of Stereoscopic 3-D in cinema and garnered less than favourable reviews for its poor application of S3D. "[The S3D is] tacked on at the last moment and barely registering as a true 3D experience, *Clash of the Titans* is sure to disappoint fans of the technology while turning off others whose first experience might have come at the hands of this dumbed-down, last-minute effort" (Liebman, 2010, p. 1). In its defence "Clash of the Titans" had an inferior quality S3D process added late in production and against the wishes of the film's director who has since stated that the movie "...was famously rushed and famously horrible. It was absolutely horrible, the 3D. Nothing was working, it was just a gimmick to steal money from the audience..."Clash of the Titans" is not my movie" (Ryan, 2013, p. 1; Abramovitch, 2013, p. 1).

In the twelve years prior to 2017 a number of films had contributed to an S3D renaissance in film production, particularly by major studios such as Dreamworks SKG. As a result, such studio films have influenced S3D production techniques, storytelling, editing, profits, and even viewing platform formats. The ability to view S3D in the home increased significantly with major television manufacturers including S3D capabilities as a standard feature in almost every television set sold between 2012 and 2016. After 2016, S3D in new television sales became mostly either an added option, or was not a feature available at all. Despite a seeming downturn in S3D home viewing futures, and the fact that S3D film releases counting on average for only around 6% of all film production releases in the USA and Canada (as a global indicator), the considerably higher priced tickets commanded by 3-D films has seen patronage generally remain steady since 2010 (Statista, 2016).

A significant problem for S3D comes from the most basic of drivers, being any waning interest by the moviegoer to want to pursue the wearing of eyewear in order to view S3D movies along with the inherent issues that may be associated with this viewing process (Zone, 2012b, pp. 76-77). Such issues may include headaches, eye strain (Read & Bohr, 2014, p. 1140), the awareness of a more limited view of the screen, an overall physically darker view of a film's projection due to the darker tint built in to many 3-D glasses, and a resultant less bright projected image (depending upon the setup of particular S3D screening facilities) (Siegel, 2000, p. 390).

Most works published so far on depth usage in 3-D storytelling do not extend past theories of 3-D usage in its most basic deployment of depth (Grabiner, 2012, p. 15). Often this means utilisation of 3-D simply by the placement of objects anywhere in the third dimension other than on the screen plane. In this way, many 3-D films have engaged Stereoscopic 3-D simply by having objects at any given position either in front of and/or behind the screen plane without much thought as to how far in front of/behind the screen plane, or importantly why. This study will extend the few theories on S3D usage by showing that intelligent deployment of 3-D in the frame can add significantly to the storytelling aspect of filmmaking by highlighting how the possibilities of smart placement of 3-D objects can add another level of mise-en-scene to the film frame.

2.1 The Introduction of S3D to Filmmaking

Arguably, discussing personal opinions on whether S3D should be incorporated into every film ever made, or be made available at every cinema screening, is not as relevant to its intrinsic value as its *choice* of inclusion as a tool for added film grammar by filmmakers. Discarding S3D as a viewing format because it may be perceived as being 'out of favour' has little to do with this research study. Another analogy can be made, for example, with a claim that Dolby 9.1 surround sound film soundtrack technology (which plays back audio for a film in ten discrete positions spaced proportionally around a viewing space of 360 degrees) negates any relevance of early films that may have used single channel, one microphone soundtracks. A perception that inferior technological levels of production by modern standards cannot match artistic values achieved with current technologies is the parallel being drawn by such assertions.

Even though Fritz Lang's "M" (1931) was made only four years after sound was first used in a cinema film with "The Jazz Singer" (Crosland, 1927), the use of sound in Lang's epic is still voted commonly by film critics as the best in film history (Harte, 2015, p. 1) despite its 1931 vintage. Similarly, Orson Welles' "Citizen Kane" (1941) is not considered diminished as a result of it not being shot in widescreen nor in full colour. Welles' epic used a black and white process over the increasing-in-popularity colour process that was gradually being introduced by the studios at the time. The more technologically advanced option of colour did not override the artistic option, as a black and white cinematographic outlook suited Welles' story. "Anyone foolishly wondering how black-and-white images could be superior to color needs only to watch the first few frames of *Citizen Kane* to understand" (Berardinelli, 2017, p. 1). Rouben Mamoulian, the director of the first feature length colour film "Becky Sharpe" (Mamoulian, 1935a), felt that when sound first came to the movies it was used without restraint and artistic value. He was wary of this same problem happening with the advent of colour in film when he described some sound movies as "too much talk and too much noise coming from the screen. The cinema must not fall into such another trap, and must not go about color as a newly-rich. Color should not mean gaudiness. Restraint and selectiveness are the essence of art" (Mamoulian, 1935b, p. 123). When discussing this same film

"Becky Sharpe", film critic Scott Higgins stated that "[c]olor has been so cautiously deployed that it appears stylized. This method of design is obviously intended to use color to steer viewer's attention" (Higgins, 2007, p. 53).

So too can the advanced technological state of S3D be analogous to these examples. Using such comparisons, the advances in S3D technological capabilities should not be considered a direct link to any advances in the application of S3D techniques artistically.

2.2 The Introduction of Virtual Reality & the Rebirth of S3D

Stereoscopic 3-D has been considered by some as a novelty at the cinema, as reflected in Business Insider magazine, "[The S3D] novelty will likely wear off...leaving 3D tech companies and Hollywood execs scratching their heads" (Frommer, 2011). As S3D hovers near becoming a more entrenched grammatical tool within modern cinema, so too has a new visual form, Virtual Reality (VR), stepped up as a new innovative medium to occupy a similar place in the consumer spotlight (Hargrave, 2016, p. 1). The same stirring that excites consumers who can now own a "Dick Tracy" (Gould, 1931) cartoon-influenced two-way radio wristwatch, in the form of a smartwatch, has got the VR future firmly anchored as the next big thing (Lancheres, 2017, p. 1). Even though Stereoscopic 3-D plays an integral part in VR as it develops, S3D seems to have taken a side-step in the zeitgeist while VR hits its stride and creates significant commercial interest and development (Pogue, 2016). S3D remains a fundamental element in the best that VR offers, and as we have seen over the last ten or so years, S3D's contribution to cinema has been established technically, but is yet to see its optimal systematic application to story.

The application of S3D in filmmaking has taken an interesting route since its second rebirth in circa 2005. The first rebirth of S3D was in the early 1950s when popular Stereoscopic 3-D cinema screenings around the United States burgeoned with box office film successes like "Bwana Devil" (Oboler, 1952), "Kiss Me Kate" (Sidney, 1953), and "It Came from Outer Space" (Arnold, 1953). Unfortunately, this wave of S3D popularity soon became a victim of the technology available at the time in keeping everything in alignment for shooting and for screening (Loew, 2013, p. 15). The inaccuracies associated with the line-up of the twin-cameras and projectors during production and screening (respectively), often resulted in significant viewer discomfort. Not only was this the cause of sub-standard viewing experiences, but some blame was also attributed to the poor overall quality of the actual S3D stories themselves, i.e. "Creature from the Black Lagoon" (Arnold, 1954). As a result, this wave of initially popular S3D cinema subsequently conceded commercially to high budget 2D Cinemascope blockbuster studio releases like "The Robe" (Koster, 1953). Around the end of the 1990s saw the reintroduction of the S3D process back into film production, but this time utilising modern digital precision in the technologies required (Mendiburu, 2009, p. 7). Arguably this may be referred to as the 3rd rebirth of S3D, where such digital refinements brought with it much closer tolerances for S3D production and viewing equipment – this also included quite high-quality domestic television screens available for the home viewer. No longer was viewing S3D a shaky experience, visually it actually became fun, and at the same time allowed the possibility of S3D to be regarded as a more serious experience, now that the technical inaccuracies of the past had receded and made way for filmmakers to consider it now a genuine tool in the toolset.

2.3 Issues with Modern S3D Film Production

Since around 2005 the film industry has invested a great deal of money and economic risk in adding the feature of Stereoscopic 3-D to its major motion picture releases (Hartvig, 2009, p. 1). The extra costs involved with S3D production and distribution have placed a huge responsibility on the filmmakers to create stories that use the technology successfully (Voorhees- Harmon, 2010). Unfortunately, with the large number of S3D films that were initially released with this renewed stereoscopic fervour, a number of films were released that damaged the reputation of the quality of S3D as a potential value-add to a film production. Films such as “Clash of the Titans” (Letterier, 2010) for instance, were released having a poor quality S3D effect and thus began to influence audiences’ desire to attend future S3D releases (Tyler, 2010). Not surprisingly, after a short succession of such poor quality S3D movie releases, media began to suggest that S3D might not be as popular with the movie-going public as had originally being heralded, with newspaper headlines such as “3D Films are Overpriced and Over-Hyped” (Hall, 2012, p. 1).

In this burst of S3D film releases since around 2005, it began to be clear that the S3D technology itself was not well understood by the filmmakers and resulted in S3D looking less than impressive. Such poor technical manifestations occasionally presented themselves on-screen as looking like paper cut-out, and pop-up book styles of S3D. In some cases, this also resulted in physical pain on the part of the audience through eye strain due to technical inaccuracies in the S3D production process. In highlighting this less than pleasing ‘dimensional’ look in the final releases of such films it subsequently posed the question, how could it be that the filmmakers themselves don’t really seem to understand what “works” and what “doesn’t work”? Even when it was successfully implemented into a production from a technical point of view, the S3D itself seemed to be limited to an endemic appeal of the “wow factor” of S3D rather than any potential it had as an important storytelling tool (DeSouza, 2010, p. 1).

In contrast to this, there have been some renowned directors who see the storytelling potential in S3D. Director Martin Scorcese has employed S3D in feature films such as "Hugo" (2012) and has said, "Every shot [in S3D] is rethinking cinema, rethinking narrative – how to tell a story with a picture. Now, I'm not saying we have to keep throwing javelins at the camera, I'm not saying we use it as a gimmick...but it has a beauty to it also. People look like…like moving statues. They move like sculpture, as if sculpture is moving in a way. Like dancers…" (Kermode, 2010, p. 1).

As S3D-based productions steadily become more commonplace on viewing platforms such as gaming, social video viewing sites like YouTube, and 3-D feature films and animations, the zero-to-infinity use of the third dimension is becoming more wearing. In recent times the application of S3D appears to be approached inelegantly by the major studios simply because 'it is there', without any form of purpose in its deployment. It is envisaged that with more education there will be additional care taken in its utility and will only be used where necessary, if its use is more subtle, just as editing, production design, and cinematography in movies are not always blasted at the viewer in every circumstance. There will be times when it *may* be appropriate to "overuse" the third-dimension just as music videos historically used fast edits, over-the-top cinematography, and out of this world production design when it was appropriate. In films where the production design for instance, is apt for the story, characters, or locations, so too will S3D be used appropriately for reflection of the same. If an S3D production model were to evolve that saw S3D used only when it worked grammatically, with minimal usage as a starting point, this would go a long way toward refining the implementation of S3D in film viewing. Another way to look at this is, if a film were predominantly seen in its traditional two dimensions, with only a widening of the "z" depth (3-D) every now and again where appropriate, then the use of S3D would become a refined technique within film grammar rather than its sometimes crude usage for the sake of it.

The evolution of S3D has begun to show a smarter application of the use of S3D in telling the story in some more recent commercial Hollywood releases such as Scorsese's *Hugo* (2011). Bringing an increased expectation of this storytelling element of S3D to the education of new filmmakers will bridge the gap between its serious recognition as a filmmaking tool, and its use as a sideshow-style gimmick. As this is the core of this study proposal, a dissection of the films produced in S3D so far, was then followed by a plotting of the projected evolution of the advanced use of S3D as a storytelling tool. The incorporation of such learned S3D storytelling techniques by the students in the S3D courses delivered in this study, then fed the improved application of such S3D film grammar modelling within future undergraduate film studies. As a result, the 'lack' of grammatical implementation of S3D into film storytelling will close and an improved standard of S3D production will result.

3 Chapter Three: Literature Review

In regard to Stereoscopic 3-D theories of narrative progression, it soon became clear to 3-D pundits that as its popularity began to be affected after the mid 2010s, the opportunity to develop better ways of harnessing S3D to help tell the story was unrivalled (Atkinson, 2016, p. 149). A number of sides began to emerge within discussions of S3D in industry, from the strong belief in wow-factor 3-D inclusion, to high-profile industry leaders claiming that 3-D is dead. The fact is that amongst these theories of S3D, few theories were in circulation up to and including this renaissance period of the early 21st century that were concerned with any use of film grammar. Specific models that *were* used in 3-D production however, are discussed in this chapter. As any such model of film grammar is likely to come from either industry and/or from experimentation, it is likely that film schools that had developed any teaching of 3-D would have an interest in film theory as it pertains to 3-D, and so these are drawn upon in this literature review also.

A literature review as described by Senior Lecturer and academic Helen Aveyard is "the comprehensive study and interpretation of literature that relates to a particular topic" (Aveyard, 2010, p. 5). However, the aim of the literature review for this study is defined more by the gaps in the literature on the grammar usage of S3D in cinema. Without such a model of S3D grammar usage in this "new" realm of cinema, the potential for the hitching of film theory to the reading of an S3D film will not be recognised, and S3D will be relegated to thrill-factor usage only. Such a gap is the central premise of the research problem in this project.

The following compendium of previous S3D literature is made up of elements that include some story application of S3D, but more deal predominantly with technical issues in the S3D academic research to date. If categories were to be formed of such mainly technical and non-grammatical S3D research, they might include: 3-D camera design, 3-D post-production (i.e. 3-D editing concepts that may include a whole new paradigm of shot length within editing standards (Koppal et al., 2011)), stereoscopic viewing processes (including glasses-free autostereoscopic screens in the future (Blundell, 2015), visual discomfort in 3-D displays, (Mehrabi et al., 2013), and 3-D television perceptual quality (De Silva, 2011)). The research gaps in the context of this literature review still lie outside of these common categories, and specifically lie within the area of S3D's application to storytelling.

Little research had been published on the effect of 3-D on story in cinema up until the beginning of this research study, with German film researcher, Markus Spöhrer, observing that "[a]lthough…[S3D film] studies are increasing, research on the aesthetic and narrative possibilities of the stereoscopic film is still limited in comparison to other fields of film and media studies" (2016, p. 22). Since the beginning of this research study, a number of academic papers have been published that have begun to deal with topics of Stereoscopic 3-D in regard to its effect on cinema as a whole. Within this pool of works however, Spöhrer reaffirms that in regard to the amount of "literature about the aesthetic and narrative dimensions of 3D films…the argument can be made that this research is underrepresented in contrast to other research topics of film and media studies, especially narratological examinations of 2D films" (2016, p. 22). Such research gaps are illuminated here and addressed in this research.

Mike Wallace and Alison Wray in their 2016 book "Critical Reading and Writing for Postgraduates", have proposed that literature reviews in general be categorised into four groups (Wallace & Wray, 2016). Briefly, these categories are described by them in this way:

- Theoretical literature: commonly seen as less evidence-based and often developed on a core of empirical observations only.
- Research literature: based on the collection of data via systematic investigation and addressing specific research criteria.
- Practice literature: text written by practitioners within their field of expertise, in the form of published observations and ideas about practice-related aspects.
- Policy literature: text as a set of guidelines based upon research, theory, or practice. It is possible that policy literature is made up of variations of the above that may not subsequently be as strong as research-based literature alone.

Further to the application of Wallace and Wray's four literature categories in helping sieve through the available literature on S3D, a set of inclusion and exclusion criteria has been specified by the researcher for this literature review due to the high level of just purely technical literature that exists. Another important aspect to this inclusion/exclusion criteria set is the year of publication/production. As most of the 'storytelling' discussions associated with S3D have only begun to be considered in relatively recent years (post-1950s), so more emphasis on books, journals, and film productions created from around the turn of the 21st century will be placed on its inclusion as such criteria. Another exclusion criteria likelihood is, S3D film productions that are specifically made to entertain in a carnival sense with over-the-top S3D elements. There are now a number of well-made S3D films available that do not rely upon this carnival aspect, that make them better prospects for study for the application of S3D to story. Films such as "Rogue One: A Star Wars Story" (Edwards, 2016), "Hugo" (Scorsese, 2011), and "Pina" (Wenders, 2011) began to discard the need for out-of-the-screen 3-D effects and showed that subtle and purposeful use of S3D could be beneficial in more thoughtful ways (Higgins, 2012).

In recent years there have been a small number of published works on Stereoscopic 3-D that make more specific reference to the S3D issues identified in these more informed times. Celine Tricart's 2017 book "3D Filmmaking: Techniques and Best Practices for Stereoscopic Filmmakers", like many such S3D publications spends time on technical 3-D how-tos, problems, and stereographers' experiences. From a technician's point of view this is a valuable text for 3-D production particularly, but for the most part is less inclined to follow up on film grammar techniques as they apply to 3-D. If Tricart's 3-D publication were to be categorised into one of Wallace and Wray's set of literature categories then Tricart's text would best be listed in the practice literature group of these categories. However, in Tricart's chapters 3 and 5 respectively "Stereoscopy: A New Art?" and "3D as a Storytelling Tool", a rarer discussion on how 3-D might be adopted by filmmakers to help tell the story is addressed. It deals with the potential for 3-D to be used more creatively for story but does not venture into any detailed grammar model, but rather a suggestion that there is room for 3-D storytelling in the future. Therefore, there is arguably a more theoretical and research-based element to this work when categorised by Wallace and Wray's literature group descriptions.

In Pennington and Giardina's book "Exploring 3D" (2013), S3D outside of the purely technical processes begins to be addressed more than many other publications. In this case, the authors' application of S3D to the film from a narrative perspective is concerned in the first instance, with governing via 3-D where the eye of the viewer can be directed within the frame (Pennington & Giardina, 2013, p. 6). Such manipulation of where the viewer 'looks' inside a frame is doing more than just intrusive 3-D and is leaning toward being more in line with story enhancement. Another aspect that is stated in this same text is the application of S3D for simply immersing the viewer in the story "for a sense of presence and being there" (Pennington & Giardina, 2013, p. 6). This incorporation of S3D for other than the wow-factor begins to harness 3-D for something more useful in the storytelling stakes, but is not drawing as much as one might with 2D film language elements. Suggesting the use of 3-D for a "sense of presence and being there" (Pennington & Giardina, 2013, p. 6) is not fully utilising the role of 3-D in storytelling to any notable degree. Pennington and Giardina's book does however suggest in an early chapter that a 3-D grammar as researched in this study is not far away. The authors use the example of music in film with its peaks and troughs as analogous to the potential use of 3-D's peaks and troughs to build a film's story (Pennington & Giardina, 2013, p. 15). Such a view of the likely form of a 3-D film grammar is broadly described with few specific examples, although the reasoning for this could likely be because "people's interpretation of conventional film grammar can vary", and a film grammar model for 3-D "…is not an exact science and there is no creative industry bible you can refer to" (Beard, as cited in Pennington & Giardina, 2013, p. 15). This statement succinctly informs the impetus behind this research project.

Block and McNally's "3D Storytelling" (2013) is another publication that comes close to this research project's aims as of the date of its publication. Despite much of this book being concerned with 3-D physics, and 3-D viewing physiology, the authors touch on "3D Aesthetics" as a chapter where they utilise some of the concepts proposed in this research study. For instance, there is a suggested possible visual correlation in Block and McNally's text for showing changes in emotions, moods, ideas, or locations (Block & McNally, 2013, p. 179). In this context it suggests such changes by adding more 3-D for a happy demeanour versus using less 3-D for a sad demeanour, and adding more 3-D for a lonely demeanour versus using less 3-D for a united scenario (Block & McNally, 2013, p. 179). Although Block and McNally start to consider 3-D for its more aesthetic qualities in this chapter, and also continue to build a theoretical structure for potentially affecting story, such examples ultimately outline simple stages of possible film language applications. Still, this narrow section of their broader publication begins to qualify advanced storytelling uses of 3-D that few other publications seem to consider. Despite the absence of many forays into such published models of S3D grammar, concepts presented by these and other 3-D practitioners did indeed start to assimilate with the formation of concepts of this research. For instance, Block & McNally (2013) go on to describe another possible application of visual film theory to 3-D storytelling in the following way. They propose that 3-D can be applied in one or more of three ways, being; the use of a constant 3-D application, the use of a progressively changing 3-D application, and the application of a contrasting usage of 3-D or a similar usage of 3-D (Block & McNally, 2013, p. 159). Such a visual theorist's view of applying 3-D to story steps closer to the results of this research by suggesting that by applying variations in the characteristics of 3-D to change the look of a shot, a change in visual structure varies the story in some way. Such publications tend to stop short of any detailed descriptors in the application of variable characteristics of 3-D. Some basic concept examples are floated in Block and McNally (2013) but in the form of imaginary suggestions to existing 2D films as if they were created as 3-D films.

Clyde Dsouza's book "Think in 3D: Food for Thought for Directors, Cinematographers and Stereographers" (2012) is another relevant text that looks outside of the purely technical 3-D aspects. Dsouza generally concentrates on a range of techniques such as camera techniques, depth continuity, etc. that might traditionally be used in 2D film production, and considers the benefits or otherwise in their application in 3-D. Dsouza touches on these techniques in light of how they need to be manipulated for 3-D storytelling but short of a specific application for specific storytelling requirements. For this reason, it is a good handbook for 3-D filmmakers in covering frontier filmmaking procedures and techniques, however it is less concerned with film grammar techniques specifically as this research study is pursuing.

Delia Enyedi published an academic paper on the differences between S3D films directed by Alfred Hitchcock, and those directed by Jean-Luc Godard (Enyedi, 2017) where she discusses differences between their respective styles when it comes to S3D. In this article Enyedi recognises that most of Hitchcock's use of 3-D to promote the story was alternating from broad depth placement to shallow depth placement as the main technique in applying a 3-D characteristic to tell the story. Envedi notes that this basic 3-D grammar usage changes part-way through the film to utilising aggressive reaching into the audience's space for dramatic effect (i.e. during the actual murder scene). This primary usage of 3-D for story was broad stroked in its infancy but just effective enough to show the future of 3-D being more than just wow factor (Envedi, 2017). A journal article by Hélio de Souza appeared in 2015 called "The Visual Representation of the Physical Space through Stereoscopic S3D Documentary" where he dealt with the issue of using the characteristics of S3D in a documentary setting, where there is unlikely to be time to plan such S3D manipulation for story. In this paper his understanding of the potential of S3D to help his documentary stories is centred on the capabilities of S3D documentary-style camera technologies, and also the use of S3D's immersive function in the documentary form (Souza, 2015, p. 22). However, between journal articles such as "On Aspects of Glasses-Free 3D Cinema" (Blundell, 2013), and dissertations on cinema audience's physiological responses to feeling physically threatened by S3D intrusion on personal space (Adler et al., 2014, pp. 5-40), a host of Stereoscopic 3-D articles have addressed more industrial/philosophical/ physiological aspects than the research topic of this thesis.

In contemplating the evolution of S3D from its humble beginnings, through the 1950's renaissance, then onto the digital progression of the early 21st century S3D extravaganzas, there has been a relatively small cross-sectional sampling of these films possessing S3D variations within a film's narrative that experimented with the enhancement of the film's story. Films such as "Coraline" (Selick, 2009), a stop-motion animated film, utilised a more purposeful stereoscopic 3-D effect in terms of the central character changing 'worlds' within the story. As the story progressed into the central character's alternative world the 3-D depth increased as Coraline's 'other' world became more prominent. A similar effect was used in "Butch Cassidy and the Sundance Kid" (Hill, 1969) but with the use of colour. The film's initially black and white world of the Wild West in the beginning morphed into widescreen colour for the remainder of the movie at the appropriate time in the narrative. A broad acknowledgment of the potential of what S3D can bring to a film's narrative had begun to filter through in the first twenty years or so of the 21st century. As some of these story-led applications of 3-D began to find a small amount of traction in some 3-D cinema releases, University film lecturer Dr Sarah Atkinson observed that in some of these maverick S3D movies, sound played an interesting part in the attribution of S3D (Atkinson, 2016, pp. 150-151). In some of these independent but progressive S3D film releases, Atkinson observed that these films utilised little dialogue and therefore relied psychologically on the visuals to tell the story, thereby increasing the sense of S3D's contribution to the story by default. Other attributes of some of these initial forays into S3D's use in narrative were also recognised in films such as dance homage film "Pina" (Wenders, 2016). Here the 3-D space behind the screen was used more as an emphasis on the breadth and relationship of the locations with the dancers - more than any of these early 3-D storytelling tools such as progressive, intermittent, or changing S3D techniques used to help emphasise narrative (BBC, 2011).

In more recent years however, a growing number of sceptics within the film industry recognised little potential of S3D or any such intelligent application of S3D to storytelling. Such notable luminaries include esteemed Academy Award winning film editor and sound designer Walter Murch who had stated that; the physiological requirement of cinema-goers to focus on one point (the cinema screen), whilst still converging on many different 'distances' in front of and behind the screen, is counter intuitive to human evolution, and therefore destroys the immersive concept (Murch, 2010). Murch's physiological theory is technically plausible but evidence shows that a large proportion of 3-D cinema goers have little trouble with viewing 3-D despite this aspect (Owen, 2010). Such opinions of well-informed high-profile industry personnel potentially influence many who are yet to make up their own minds, and the risk is that an unnecessarily negative public opinion may be formed on, in this case, 3-D in cinema. High-profile film critic Roger Egbert, whose multi-syndicated film critique programs had a huge influence on movie sales due to his enormous public reach, in 2010 wrote a Newsweek opinion piece titled simply "Roger Ebert: Why I Hate 3D Movies" (Ebert, 2010). His reasoning for "hating" 3-D movies centred primarily on the premise that 3-D "adds nothing essential to the movie-going experience" (Ebert, 2010, p. 1). He broadly stated in this article the following reasons for his negative outlook; the extra ticket cost of viewing S3D, the darker image on the S3D cinema screen, the distractive quality of 3-D, the limitations placed on S3D production choices by directors, and the sense that S3D films were deemed to be suitable mostly for children and not adults (Ebert, 2010, p. 1). Although many of these points were in fact true at the time of this Newsweek article's publication as far as extra ticket cost, dimness of cinema screen, etc., little of his reasoning seemed to involve observations concerning S3D's application to story directly.

There appears to be a consensus amongst the broad range of S3D publications sourced at the time of this research, of technical setup and basic procedural systems being the predominant point of textual dissemination. The few alliterations that touch upon S3D's potential within film grammar and narrative progression that do reflect the interest proposed in this research, have the foundations for a clearer model but tend to stay non-specific.

As far as technical research into the characteristics of Stereoscopic 3-D in S3D, commercial film production Russian researchers at the Graphics & Media Lab at Moscow State University (Voronov, 2013) completed a study on Stereoscopic 3-D film quality across many 3-D films released between 1994 and 2012. Although this Voronov study did not analyse or attribute any findings to the influence of 3-D in these films to the 'story', it instead identified each film's allocation of 3-D space employed from a technical point of view. As a result, their data relates specifically to where in relation to the projection screen the S3D usage is employed, (i.e. how much S3D is utilised between the screen and the viewer, and how much behind the screen). Voronov's research does not put forward any views on the use of 3-D in the films it has analysed, only describing to what technical extent many 3-D cinema releases have utilised the 3-D space.

Literature from early days of Stereoscopic 3-D film production, right through to more recent publications from the 1990s up until the present, have predominantly portrayed technical descriptions of how and where 3-D has been used in film production. Ray Zone's book "3-DIY: Stereoscopic Moviemaking on an Indie Budget" (Zone, 2012a) covers historical production of 3-D cinema, as well as how 3-D is created technically in order to make 3-D films. The same author also in 2012, wrote another book on Stereoscopic 3-D called "3-D Revolution: The History of Modern Stereoscopic Cinema" (Zone, 2012b), and this too describes technical and historical aspects of 3-D film production. As said, in 2016 film stereographer Celine Tricart published "3-D Filmmaking: Techniques and Best Practices for Stereoscopic Filmmaking" (Tricart, 2016), with more of an overview outlook on the state of S3D than many publications have done. Tricart's background as an on-set stereographer (3-D camera rig technician) informs her ideas in one or two chapters of how using 3-D can help tell the story rather than how to make it only reach out and touch the viewer.

It is relevant here to cite examples of coursework delivery of S3D around the world, and to what level of S3D storytelling they delve into. In these examples the implementation of an S3D grammar model would be seen to lift the value of S3D instruction from a technical how-to, to a curriculum that is helping to further the language of film itself. Such specific S3D coursework since the new emergence of S3D in the high-street cinema (from around 2005), does appear to film industry professionals to have predominantly been S3D technological instruction rather than any incorporation of film theory-based concepts within such delivery (J. O'Loughlin, personal communication, January 29, 2011). A number of workshops, master classes, and short courses appeared from this time with the basic premise of such courses being centred on explanations of “how 3-D works” technically. For example, in 2011, UK based company Stereografix Ltd. offered a three to five-day course that covered technical training in S3D, but little coverage of S3D as a storytelling tool ("Stereografix and Teesside University offer ‘An Introduction to Directing 3D TV’ course/3Droundabout", 2011, p. 1). An Australian film school that is considered one of the country’s premiere film schools, the Australian Film, Television and Radio School (AFTRS) ran a ‘3-D Master Class’ in October 2010 with cinematographer Peter James ACS for four days that introduced basic 3-D camera processes to experienced cinematographers (Hughes, 2010). Curtin University in Western Australia ran a one-day course in 2017 on stereoscopic basics for medical imaging, remote vehicles, and molecular modelling (OzViz 2017: Stereoscopic Technologies Short Course - Curtin Institute for Computation, 2017). Such short programs and master classes exemplify the predominance of basic sessions that touch on S3D physics only and do not necessarily progress to more advanced levels nor deliver more formal Higher Education level coursework.

In recent years it has come to light that the University of Central Lancashire in the UK delivered a degree in Stereoscopic 3-D Film Production from 2012 to 2017 entitled Bachelor of Science (Hons) 3D Film Production (UCLAN, 2016). This is an unusual qualification in that a full degree in 3-D related film production has not been seen elsewhere, although this qualification had ceased being delivered by 2019. As the degree title implies (Bachelor of Science), this course was based on a more scientific approach to Stereoscopic 3-D than the specific storytelling aspect of the research of this project. Models of film grammar didn’t appear to be a part of the course topics on 2016 documentation, but more technical requirements (such as avoiding ‘broken’ S3D shots within the student S3D film productions) along with transferrable 2D film production skills were. The same degree was also offered by SSR (School of Sound Recording) in Manchester, being administered by the University of Central Lancashire for a short period. The School for Cinematic Arts at the University of Southern California (USC) has had strong academic interest in the application of S3D in cinema with classes in S3D delivered from 2009 (Child, 2009, p. 1). However, from 2010 at USC, more emphasis had been placed on the utilisation of S3D within interactive projects using real-time game design concepts than film grammar inspired S3D storytelling concepts (Willis, 2020, p. 1). The procurement of an S3D Grammar model as proposed in this thesis would add to the physics-only nature of such S3D film course offerings. Such an addition would mean that the minimum technical requirements of being able to reproduce S3D film vision is not bounded by hardware and software knowledge alone. Such S3D coursework would benefit from the creative and artistic side of S3D by utilising such an S3D Grammar model to heighten the application of S3D to film learning.

Creation of interest in utilising 3-D as a storytelling tool might conceivably be a foundation of a 3-D filmmaker's learning journey. Student filmmakers at the many traditional (2D) film schools around the world, would expect to get a grounding in image creation, editing, storytelling, and media production, etc. in order to have the base-set of skills needed to create a video product, such as a short film for instance. Such skills would be refined along the way on the student filmmaker's journey, both in film school, and also upon leaving film school into industry (Hughes, 2010). If ever a career path involved the concept of lifelong learning it is film. History seems to show that as technologies mould, form, and re-form the standard methods and techniques used in film production, some of these technologies alter the work practice structure more significantly than others. By adding to this group, the added skill set requirements of Stereoscopic 3-D, specifically in its application to telling the story, student filmmakers have the best chance of including S3D as a grammatical tool along with the traditional 2D elements already considered standard. To this point, all of the academic papers that deal with Stereoscopic 3-D, whether they be purely technical, purely economic, or as with this research, concerned with creative storytelling aspects, presumably are striving to provide a pathway to future S3D perfection, that regardless of its specific area or topic, elevates the potential for better S3D application artistically in the cinema.

Despite relatively few academic papers being openly discussed in S3D circles in the film industry prior to the beginning of this research study, more academic papers dealing with the S3D area have surfaced since around 2018. As stated, many of these academic papers have predominantly dealt more with technical or physiological aspects of Stereoscopic 3-D than aspects of the artistic application of S3D parameters to cinema storytelling. There has also been a rise in such publications addressing electronic issues with screen dynamics and production of stereoscopic vision systems, but many of these are in relation to virtual reality (VR) forecasts for the future. Many such topics on technical S3D production and highlights of electronic fixes to technical issues, have a bearing on the viewability of S3D when it comes to this research study, but these studies have little to do with the concepts of the application of S3D characteristics to a film's story. Even though this research topic would be impossible to study without the high technical standards and workarounds provided by these researchers and scientists, the technical achievements – even though important in *applying* S3D to the screen story – is not pertinent to the underlying success of S3D in cinema that this research is concerned with.

Summarily, the advances in technological tolerances of modern 3-D production apparatus significantly eliminates issues in the worldwide viewing of 3-D cinema. As positive as this is, such reductions in 3-D technical issues are of little obvious consequence to a 3-D viewer looking for a 3-D grammar - *except* that the purity of what 3-D can contribute to storytelling finally becomes conspicuous by the absence of 3-D as a storytelling tool within this technical sphere. By the fact that such technical white paper research for the most part sits outside the framework of this research problem, these works spotlight the lack of an S3D grammar in the current 3-D cinema experience, and so emphasises the lack of contribution generally by such research to this researcher's question. The contributions mentioned here that do begin to deal with 3-D as a tool for storytelling, as a group tend to suggest broad stroke basics as a generalised concept of this potential rather than any specific grammatic details.

The formation of institutionalised film theory since the invention of film in the 19th century has governed the acceptance of film into the creative and commercial world. How Stereoscopic 3-D fits within formal film theory is key to the legitimacy of 3-D being used to tell stories and will be examined in its historical as well as current context here.

In the past nearly one hundred and fifty years of film history there have been various incarnations of theories of film that have evolved. The Routledge Encyclopedia of Film Theory, defines film theory as "…a set of scholarly approaches within the academic discipline of cinema studies that question the essentialism of cinema and provides conceptual frameworks for understanding film's relationship to reality…" (Branigan & Buckland, 2014).

With no formal framework to define film theory in its beginnings, a number of common beliefs were assumed by academics and filmmakers. Not the least being that film was a legitimate art form (at a time when in the mid to late 19th century stills photography was also a new medium battling to find a place in the legitimate world of art (Baudelaire, 1859)). Early film theorists argued that the film medium and its manipulation were akin to other accepted forms of art and so its aesthetic attributes both visually and technically, were to be gradually accepted, especially as it applied to its reflection of modern life. Early filmmaking technology was still evolving and so quality of presentation and slowly evolving film language techniques hindered the progress of film to become a "dignified" art form (McDonald, 2016, p. 14).

Film Classicism was soon to evolve from the centre of film theory argument between it being a mechanical reproduction of reality, and an artistic interpretation of reality. Classicist film theory used traditional cinema techniques with some artistic flare, but without particularly drawing attention to itself. By using a set of combined filmmaking techniques such as use of frame composition, shot transitions, editing, etc. (McDonald, 2016, p. 21) the theory of film classicism started to define film to be included as a legitimate artform as a result.

Early film Realist Hugo Münsterberg observed in his early writings that even though it appears as "realistic", film combines the flatness of two-dimensionality with the depth and dynamism of three-dimensionality (Münsterberg, 2011). Film theorist Rudolf Arnheim in the 1930s also espoused the "creative intervention of developing a poetic language that belonged to film" (McDonald, 2016, p. 21). A view that applies as easily to S3D films as it does to 2D films. From the growing movement of surrealism in the art world, there emerged a more experimental cinematic view of film theory termed Formalism where a more abstract approach began to be included, and thus the 'formalist' view within film language became gradually more accepted. In contrast to this, film theorist André Bazin saw film as inextricably linked to realism and that artistic creation would always be a part of an inescapable reality inherent in film practice. In this light, Bazin came to view film as being a form of "semi-realism" by the nature of its process. With this concept, the application of 3-D as a forced perception of "real world" binocular vision, can easily be seen to be a form of Bazin's reality of film. Bazin in fact described S3D as "abstract painting in motion…" and that 3-D would make a great leap forward in years to come (Bazin, 1952, p. 5). Prior to Bazin, in the 1930s film scholar Rudolf Arnheim (as described in his book "Film as Art" (1957)), presented his view that film was more than simply "a mechanical reproduction of reality". Arnheim certainly saw the film image as a representation of reality, but in its effort to capture reality it would inevitably alter it. Arnheim was well-known for lamenting the introduction of sound and colour at the time of their introduction, because he saw these elements as dragging film back to a much more real-word and imitative form, and so moving it further away from it being considered "art". Many critics however, saw Arnheim's views as being overly broad with his sweeping statements that discarded the creative potential of the elements of sound and colour, including 3-D production. Arnheim saw the inclusion of such elements in filmmaking as a move back toward dry imitation and away from the storytelling aspect of film that is often associated with classicist film theory (Arnheim, 1957; Gianetti, 2010).

Noted film theorist and pioneering filmmaker, Sergei Eisenstein, spearheaded Soviet montage theory with his highly influential work on the effectiveness of editing and montage. This then influenced formalist film theory from the 1920s with the employment of more artistic 'licence' in filmmaking creating much more on film than was 'seen' in reality (Gianetti, 2010). Formalist film theory became more associated with artistic expression and less to do with reality than cinema usually presented, and Eisenstein's creative influence using the power of editing changed the way film was considered in this light. Eisenstein also happened to view 3-D as a process that exemplified what was already happening in 2D film, being the placement of objects near to the camera to accentuate depth. Luminary filmmakers such as Orson Welles, William Wylder, and Erich von Stroheim were all known for using such frame design and Eisenstein viewed 3-D as this same favouring of foreground composition (Christie, 2014, p. 120). Eisenstein was so optimistic about the uptake of 3-D in the future of filmmaking that he said "it is as naïve to doubt that stereoscopic film is the tomorrow of the cinema, as it is to doubt that tomorrow will come" (Eisenstein, 1970, p. 129).

French film theorist Christian Metz took these film theorists' works from the early 20th century and presented a refined view of film theory by writing a series of papers including the seminal 1964 article "Cinema: Language or Language System?" (Buckland, 2004, p. 89; Metz, 1991). Metz presented a broad principle of semiotics where cinema storytelling is more than just the image that is shown, it is what the image represents. Metz used structural linguistics to form a film theory showing a hierarchy between the underlying realities represented on a film screen, and the surface observable reality of what is seen on the screen (Buckland, 2004, p. 88). This is one of the purest descriptions of what defines a cinema language or the basis of what is termed film grammar, where a film's story is presented by a number of techniques showing subtextual meaning other than that from any manifest image directly shown to the viewer (Monaco, 2000).

Amongst these theories structuralist film theory gathered broader acceptance, where the underlying structure of a film may be seen as common to a number of films, and therefore such commonalities became a part of a given film's themes. For instance, a film's genre may have an influence on how a story is told by way of the expectations of how other films in the same genre may be told (Metz, 1991). In the early days of S3D cinema basic visual techniques of reaching into the audience was common and widespread. Forming expectations of what S3D movies would 'give' the S3D viewer for their money was ultimately needed to keep the commerciality of the S3D enterprise going. Such a 3-D model fit well with structuralist film theory as it traditionally applied to 2D film, because after a while, it created then leveraged the audience's 3-D expectations, so that the audience might continue to return to the 3-D cinema. The fact that S3D in cinema is created as an *illusion* of depth rather than actually reproducing depth, places the potential of S3D firmly at the feet of creative storytelling. The argument that the appearance of depth is diffused in the S3D cinema viewer by the simple fact that the viewer *knows* that they are not likely to be in a zone of danger, elicits Arnheim's views of drawing the film image away from reality (Arnheim, 1957). To a certain extent however, this illusion of depth can also *imitate* depth reality where it needs to, thus bringing S3D within the realm of multiple film theory frameworks.

Within all of the permutations of film theory over the decades and through the evolution of traditional cinema, each of the arguments and characteristics cited for film within these accepted film theory bounds, fit the application of stereoscopic 3-D within this framework as it does for traditional 2D cinema. Realist, classicist, formalist, and structuralist film theories all accommodate S3D within their defined bounds just as the concepts of 2D filmmaking work within their defined bounds. From this, there is little basis that S3D falls outside of the principle contemporary film theories that have been summarised above, and therefore no reason presents itself for S3D to be excluded from film theory applications of storytelling techniques.

The currency of Stereoscopic 3-D within modern film production processes, has been regularly updated technologically throughout its 'lifetime', but published milestones of S3D and significant events within cinema history as it affects 3-D in terms of a literary review, may best be represented in terms of a technological timeline:

In the early years of the film industry "the progress of motion picture technique was brought to an abrupt halt by the invention and adoption of sound" (Acland, 2007, p. 142). The introduction of sound was seen on the one hand as revolutionary, but on the other as an unnecessary gimmick that threatened to derail the evolution of film (Jacobs, 1968, p. 29). In many ways it *did* slow down this evolution, evidenced for example by the hugely increased size of film cameras in order to keep them soundproofed for the implementation of on-set microphones. "Microphones were insensitive and hard to move; it was difficult to mix soundtracks; and scenes frequently had to be shot by multiple cameras in soundproof booths" (Thompson & Bordwell, p. 179).

The significant increase in camera size and subsequent decrease in camera mobility, just as camera mobility was beginning to find its own legs, meant that creatively active cameras (being placed in horse drawn wagons and swinging on pendulums) in films like Abel Gance's "Napoleon" (1927), and D.W. Griffith's "Birth of a Nation" (1927) would be promptly anchored again while sound found its feet (Limbacher, 1968, p. 141). The addition of sound to the familiar Saturday matinee movie took a little getting used to by the moviegoer, but quite a lot of getting used to by the industry. Happily, sound stayed in the movies despite some erroneous movies that were produced at the time that appeared to include sound just for the sake of it (Glassman et al., 1992). Highly talented actors/filmmakers such as Buster Keaton unfortunately were quickly dispatched from the Hollywood lot as they didn't appear to integrate well with the new "talkie" movies (Neibaur, 2010, p. 34). Such relegation to the Hollywood scrapheap was not a rare occurrence and did not accurately reflect the talent or usefulness of some of the people and/or processes that were obviously under-recognised and/or mismanaged at the time (Juddery, 2010, p. 1).

In another example of technological breakthroughs that shook the film industry's standards, the 2007 introduction to the world of Red Digital Cinema's "Red One" camera was in reality, a redesign from the ground up of the complete video camera concept. The electronic video camera had traditionally been thought of as a lower quality approximation of what celluloid film could do in relation to the superiority of the image captured (THR, 2012, p. 1). Despite regularly paced improvements in video recording quality over the decades there was a quantum leap in quality gain (for its price) with the introduction of new-age cameras such as the Red camera and the German built Arri Alexa. For the first time, the previously perceived as inferior "video" camera, appeared to be providing the artistic results that up until that time only film cameras could achieve (having over a hundred-years-in-development of the final film form). The often-cited claims that video would never replace film started to quieten, and the technological evolution of video with its electronic image acquisition, (in contrast to the optical and chemical processing image acquisition of celluloid film), began to take the place of film cameras on some of the larger film production sets around the world. If we use this 'video camera versus film camera' example we can see a comparison with the impending acceptance and usage issues of Stereoscopic 3-D within future film storytelling. Just as the evolution of camera technology from film to video seems to have finally tilted the scale toward a cheaper and visually at least equal form of image acquisition, so too can the analogy be drawn to the evolution of Stereoscopic 3-D. From its low-quality results initially, to brilliant technological results in more recent times, S3D has become clear and convincing when smartly produced. Within the 'film camera versus video camera' example the adaption to the newer electronic acquisition technology is not just a significant improvement in the technical process of image acquisition, but it improves this process *without any change in the expectation by the viewer of the final film result*. It is more about being a cheaper, more efficient way of getting the same end product. For this reason, the move to the newer technology of video image acquisition is a foregone conclusion from the psychological point of view of the moviegoer, and also from the fiscal point of view of the moviemaker. In the change to high-resolution video camera technology over the celluloid optical/chemical process, there come some important associated added benefits:

- reduced physical weight and size of cameras themselves
- instant viewing of vision at full resolution on set
- no risky chemical processing of negative film rolls at a dedicated processing
- laboratory (that was sometimes not located in the same state - let alone the same city) no delays in reshooting if required
- less ancillary equipment and crew required

In the case of Stereoscopic 3-D techniques and technologies, and despite excellent tolerances within the new S3D hardware (with S3D having a high dependence on technical accuracy for successful results), an *additional* aspect to a film viewer's experience is introduced, which asks the viewer to re-evaluate their expectations at the movies. There is now an added third dimension in movies, that in real life most people with natural human binocular vision take for granted. 3-D in movies requires the learning of - or the getting used to at least - a completely new grammar in 'reading' a film (Woodcock, 2011). In contrast to this is the previous analogy, where the expectation of the film viewer is *unchanged* when watching a film that may have had a technological revolutionary item or process included (i.e. an advanced video camera system) . The existence of a 3-D grammar is conspicuous by its absence, and therefore presents here as a research gap that frames this research problem, whereas the above analogy of a new camera technology has no conspicuous gaps because a previous camera technology 'looks pretty much the same as a new camera technology' to the average punter. The new camera technology example contrasted here, has no conspicuous gaps and so sails past the cinema viewer more easily by comparison.

There is yet another distinctive aspect to the introduction of S3D to traditional film viewing expectations that was not very obvious in the beginnings of this new era of S3D. The fact that the technical knowledge required to create S3D has been sharpened and honed, not surprisingly, at broadly the same pace that serious viewers of S3D cinema have engaged in regard to seeing what works and what doesn't. We have begun to see an evolution in the refinement in broad terms, of the rules that define good S3D technique. For the most part this reduces the number of S3D shots in filmmaking that plainly have technical issues when it comes to just 'working'. However, a further step in the evolution of refining S3D has become slowly evident. After the wearing off of the "new" aspect where the cinema-goer expects to "see" some S3D because they have paid for an S3D cinema ticket, or they have been forced to wear a sometimes-additional pair of eyewear to see the benefit of this "S3D", there becomes a space where S3D can just be a part of the toolbox. To get to this point, where the cinema-goer is not waiting for the S3D when viewing a film, but is just watching the film, there has been an evolutionary aspect that is unlikely to sit very well with the S3D money-making aspect of the business (Kim, 2013, p. 391). To just be able to watch the movie and to not be waiting for the audio to make itself known to us, or to watch the movie and not be waiting for the colour to hit us with a spectacle that we may have been waiting for, will serve to highlight the story, not the spectacle (Failes, 2019, p. 1). In this way S3D can be just waiting for when it is needed, and not have to draw attention to itself. It is moving to become a part of the evolutionary process that is not understandably a media-friendly aspect. Being just a grammatical element that lurks in the darkness until it is quietly (or loudly) called upon to help tell the story, has not been a media aspect that tends to entice viewers to purchase more expensive S3D cinema tickets, or purchase Blu-ray players that play S3D Blu-ray movies, or entices viewers to purchase S3D Blu-ray discs, or the television screens that have the technical ability to play these films in high resolution.

Along the literary timeline of the development of S3D over the years, one of the more established requirements for watching S3D movies has been the necessity for viewers to wear specialised eyeglasses of one type or another in order to view the depth aspect of an S3D film. Such technical requirements have had a bearing on the quality of the S3D image, which in turn has a bearing on the perception of story in as much as a reduction of any distractions from the story. S3D eyewear types generally fall into three categories: anaglyph (red/blue) glasses, shutter glasses (battery operated and synced to an S3D screen), and passive polarised glasses (common in many S3D movie theatres). Such a requirement of having to wear a physical piece of eyewear means first, that such eyewear needs to be supplied, and second, the use of such eyewear brings varying levels of discomfort experienced by many S3D moviegoers when using them. Along with this eyewear problem, there are some other common reactions in regard to negative impacts from the S3D experience. These include:

" • Viewing 3D movies causes some moviegoers headaches, eye strain or dizziness
- The 3D effect doesn't improve most movies
- It's just a Hollywood gimmick. 3D reissues of movies prove that Hollywood isn't creative
- The movies often fail to look three-dimensional
- The movies are more expensive to attend than 2D movies
- Moviegoers dislike wearing the glasses" (Henning, 2013, p. 1)

As a result of the mixed set of S3D skills held by some filmmakers in S3D movie production, any loss of the potentially large audiences for S3D due to poor production skills, may have had an impact before any of the benefits that S3D can bring to film grammar has had a real chance to be implemented. Another difficult aspect to this problem is noted when trying to attribute the cause of poorly performing films at the box office to the specific fact that it was created in S3D. If a commercial film is a poor film outside of the fact that it was created in S3D, this becomes problematic when trying to garner positive feedback on the future of S3D in films. In the 2012 box office mid-year report according to The Hollywood Reporter, producers were suffering box office losses that may or may not have been due to the higher ticket prices of S3D films (McClintock, 2012, p. 1). If a film was just fiscally unpopular for its story, or acting, etc. its attributable cause is not easily distinguished from the S3D elements included in its production. Separating out the attributes of well-implemented S3D from the other distinguishing marks of a quality film is one of the elements that needs to be identified and taught to future filmmakers who might use S3D as a production tool.

On the horizon is a potential rescuer of S3D before it has been discarded by industry and film viewers alike. S3D could easily be cast aside before it proves its worth through; negative and unfounded word-of-mouth (that may not necessarily be based on first-hand experience), inaccurate technical skills in production, and the above already cited examples. Such a rescue may come in the form of the release of *autostereoscopic* television screens into the marketplace. Autostereoscopic screens are screens that require no additional eyewear in order to view S3D. Not only is this technologically a significant breakthrough, but also from a marketing perspective this opens the floodgates to widespread acceptance of S3D. Such acceptance is made simply by the fact that viewers do not have to put any effort into viewing S3D. S3D can conceivably be used on advertising billboards, car dashboards, personal tablet screens, etc. without 'permission' of the viewer (just as current 2D billboards/advertising images don't require anything of the viewer other than to just look). Director James Cameron has invested much time and money into increasing the longevity and the viewing experience of S3D (Doring, 2016, p. 1), including the development of a glasses-free S3D process ('James Cameron wants Avatar sequels to be 3D without glasses', n.d., p. 1). Autostereoscopic screen construction in one form is similar to the physics of commonly available still-image postcards available in 3-D, or children's twin-image cards on what is known as a lenticular surface. Such a surface is characterised as a ribbed clear plastic overlay, often bonded to an appealing picture that usually manifests as fine grooves over a photographic image. Each of these ribs act as a convex lens that in effect, splits the vision of the underlying image to the viewer's two eyes without the need for eyewear (Blundell, 2010, p. 272). It is expected that upon the broad introduction of such autostereoscopic screens the resulting acceptance of S3D imagery into 21st century lifestyles will create a much greater need for a general ability to be able to *read* S3D. If/when this happens, a significant need will emerge for filmmakers, technicians, graphic designers, and CGI artists, etc. to be able to produce large quantities of S3D for immediate consumption. For this reason, an advanced and intelligent grammar for S3D will need to begin its evolution ahead of this requirement. Providing film school graduates with a knowledge of stereoscopic physics, technical knowhow, and advanced storytelling skills in S3D is the education model that will be relied upon by industry to use.

The research gaps in this literature review of listed academic S3D studies to date, leave a clear space for Stereoscopic 3-D to be furthered in its engagement with storytelling. Predominantly existing literature deals with technical operations and advances in S3D processes, with a few but significant publications lamenting the lack of an S3D storytelling grammar standard. In some cases, there are publications touching on the beginnings of discussions about the need for such a standard rather than the application of film studies concepts to create one. In pursuing this research project's question of the existence of a Stereoscopic 3-D grammar to enhance a film's story, the existing literature as shown highlights the gap in this specific area of S3D, and therefore bolsters the importance of this research study in using a case study methodology to find one.

4 Chapter Four: Methodology

4.1 Introduction

This chapter will look at the strengths and viability of the methodology used, as well as the reasons why a single case study approach was appropriate for this research. Issues of generalisation, reliability, and validity are discussed here, as well as how the specific course design, participant selection, and how the collection and analysis of data was considered in relation to this research.

The choice of methodological approach for theoretical study is determined by a number of aspects. Such aspects include determinations of best processes of data collection and analysis, best models of engagement as applied to the subject matter itself, and also via specific theoretical proposals as may be put forward by the researcher. The resultant choice of subsequent research methodology then informs the methods by which the research ensues. Robert Yin (2014, p. 28) suggests that having theoretical proposals developed prior to any data collected is important for case study research in contrast to other qualitative methodologies such as ethnography (Lincoln & Guba, 1985; Van Maanen, 1988) and grounded theory (Corbin & Strauss, 2007, p. 85). The preliminary theoretical proposition for this research, being the creation and implementation of a grammatical model of Stereoscopic 3-D, lends itself to case study research using a mixed method approach because this involves the gathering of empirical data through a broad range of data collection processes (Mills, Durepos & Wiebe, 2010). Such a mixed method approach to this case study research has enabled for instance, the conversion of interviewee opinions and impressions, into data that displays common and uncommon attributes (Coffey et al., 1996, p. 83). An example of this mixed method case study approach, is the porting of interpreted interview data gathered on ‘how significant to the telling of the story are object placement choices in 3-D space’, into a graphical display showing whether certain factors do or do not contribute to better 3-D results.

“The ultimate goal of the case study is to uncover patterns, determine meanings, construct conclusions and build theory” (Patton & Appelbaum, 2003, p. 67), so in defining “case study” we should consider the aspects of the case study that are appropriate methodologically to this specific research project (Stake, 1978). According to Robert Yin, case study acknowledges the importance of context when analysing data. Another example of this as it applies to this research is the context of 3-D within cinema, where the expectation and inclusion of differing modes of cinema storytelling is considered along with the introduction of these newly added 3-D cinema aspects.

Yin also considers the fact that case study research accommodates many combinations of data collection and analysis techniques (Yin, 2014). In this particular research the variations in data collection are characterised by individual interviews, group interviews, group discussions, surveys, and lecturer observations of students during 3-D film screenings. The variations in such data sources allows triangulation of the collected results revealing a broader set of findings. Case study research can be characterised as single case study or multiple case study research (Maxim, 1999, p. 26). Such case study naming conventions are not defined by everyday English interpretations of these titles, but by a more specific definition as it pertains to research. A single case study uses the same research questions or propositions across a study of similar groups using a single unit of analysis. Robert Yin states that a single case study is appropriate where a case meets all of the necessary conditions for testing a theory, where it is an extreme or unique case, or where it is a revelatory case (Yin, 2014, pp. 38-40). Yin also states in the International Encyclopaedia of the Social & Behavioural Sciences (2nd ed.) that "the supposed difficulty in generalising from a single-case study...has long been considered a major shortcoming of case study research." (Wright, 2014, p. 196). An example of single case study in this particular research project would be, the sourcing of data from enrolled 3-D students that pertains to a specific perception of 3-D, and collected from similarly enrolled 3-D students in different instances of the same "Intro to S3D" courses. A multiple case study might divide the iterative coursework into separate cases and thus treat the delivered "Intro to S3D" coursework and its subsequent research results quite independently. It would then deem each delivered iteration as a completely different scenario from each of the others, which is not the case in this study.

Multiple units of analysis that use multiple data collection techniques, arguably have an advantage over single case studies by way of its built-in replication (Kumar, 1996, p. 34). Here, common conclusions are drawn from more than one case, and more specific and direct data is gathered from the repetition of the same coursework, and same analysis of 3-D films over a given period of time. Multiple case studies might also be seen to have the benefit over single case studies, of dispersing the chances of any perceived unique influences affecting the outcomes (Pickering, 2008, p. 12-13). In the case of this study, a single case study methodology fits this research where the sourcing of data from individuals (undergraduate students in most instances here) in the evolving iterations of the same "Intro to S3D" course, with similar 3-D movies being viewed under the same conditions. A mixed method research approach in this single case study for example, combines the usefulness of empirical data collection via surveys with more opinion-based data from interviews and group discussions. It is important to remember though that such empirical survey data is empirical after its collection as qualitative survey data in the first place. Specifically, by taking survey-based findings of observed qualitative depth placement data and use quantitatively, then combine this with depth placement opinions as qualitative data from interviews, a fuller picture is drawn.

4.2 Methodological Approach: Case Studies

Case study as a research tool has seen an increase in its adoption as a methodological approach amongst qualitative researchers (Hyett, Kenny & Dickson-Swift, 2014). This study supports the increase in case study popularity, with case studies having high levels of flexibility and subsequently there being a high appropriation by prominent researchers in the field. Case study's flexibility comes from its methodological design capacity to suit the research question, and its subsequent capacity to construct a design paradigm around the selection of methods and models of data collection. The result is a demonstration of broad diversity in potential research study designs.

In line with Yin's proposal of the importance of having theories developed prior to any data collection, one such theory developed prior to this particular research project is one in which;

- the implementation of a set of pre-configured and differing S3D grammar models is used for comparison of individual characteristics and attributes.

Such pre-configured S3D models would be used in contrast to an otherwise infinite palette of S3D possibilities put up for consideration, where the variables are so broad that it will prove very difficult to define any specific S3D grammatical aspects. For example, one instance of pre-configured S3D grammar models for consideration is one that employs minimal depth placement using only fleeting aspects of the S3D space. In this model very little S3D usage is employed throughout the "3-D" production except for subtle forays into the S3D space on rare occasions. Such a model will certainly subdue any expectations of overt 3-D usage so that the subtle use of 3-D might not even be specifically noticeable as such. A second S3D grammar model proposed for study is one in which the S3D space usage is quite inconsistent throughout a production. So, for this model some scenes will use almost no S3D space (looking much like a traditional 2D production), and in other scenes in the same production the S3D space utilisation is relatively pronounced, and so by contrast to the earlier scenes the S3D becomes marked in its application. Such a model means that fluctuations in the use of S3D based on the particular aspect of the story being told defines the S3D application and so will sometimes be non-existent, and sometimes be quite obvious.

Due to the contemporary nature of Stereoscopic 3-D and its application in modern filmmaking, there is little research to date on the application of S3D theory to storytelling beyond research into the physical construction of a 3-D image, and some research into viewing discomfort of extended S3D viewing (Wöpking, 1995, pp. 101-103). Although this particular research project requires analysis and implementation of the technical aspect of S3D creation - particularly in its form as a model for education - it is the application of such 3-D construction to cinema, as far as its effect on the telling of the story, that has seen little research to this point. Russian researchers at the Graphics & Media Lab at Moscow State University (Voronov, 2013) did complete a study on Stereoscopic 3-D film quality across many 3-D films released between 1994 and 2012. The Voronov study however did not analyse or attribute any findings to the influence of these films' 3-D to the story, but instead identified each film's unique allocation of 3-D space employed from a technical point of view. Such data concerning usage of the third-dimensional space in these films, specifically where in relation to the screen this usage is employed (i.e. how much in front of the screen between the screen and the viewer, and how much behind the screen), has proven to be a valuable tool in the pursuit of this research study. The Voronov study was utilised in this particular research as a guide to each of the case studies when specific films were considered in relation to the application of 3-D to story. Such indicators for each film in the Voronov study proved to not only save a lot of time in gathering such useful data, but importantly also gave the case study constituents perspective and a clearer roadmap from which their perception of story, as influenced by the 3-D elements, has been applied.

A structural plan was implemented in order to pursue the aims of this research. Here these aims are restated, starting with Aim number 1:

> Explore and determine a grammar model of S3D that is recognised as successful.
>
> Stage 1:
>
> Construct a grammar model of S3D primarily based on viewing and analysis of existing S3D films.
>
> Stage 2:
>
> Survey responses from relevant parties to define the most successful grammar model.

In order to pursue Aim number 1, the following structural plan was implemented:

1. Delivery of "Introduction to Stereoscopic 3-D" coursework as a basis for undergraduate student's understanding of how S3D works, and how it can be applied to film storytelling.
2. Screening of film excerpts from a cross section of 3-D feature films to these students during but particularly after completion of this introductory course.
3. Group discussions, and individual interviews to open up different points of view of the application of S3D to the storytelling.

This structural plan fed the construct of a 3-D depth model to be presented to the students for this case study research in Stage 1. Stage 2 used examples from existing 3-D films in lieu of the creation of a short 3-D film using a 3-D depth model, and Stage 3 included the resultant case study responses. Variables that influence the outcome of this case study research include, numbers of qualified participants, availability of resources in order to collect the data such as S3D viewing apparatus, screening/teaching facilities, and availability of course facilitator for the separate instances of the course delivery.

4.2.1 Generalisability

According to Yin (2014), one case study's conclusions are not necessarily transferable to another case study's conclusions no matter how similar they may appear in the detail. Case studies have been shown to benefit theories however, and as a result are "particularly well-suited for naturalistic generalisations that are based on experiential transformation of tacit knowledge into explicit knowledge (Baškarada, 2014, p. 4). Yin's concept of triangulation (Yin, 2011) in relation to this particular case study's results, where three different course group deliveries were replicated, means that if there is evidence of any established general conclusions then a model can be constructed and analysed as a result.

For this study where a general model of S3D and curriculum design is being researched, a single case study focus therefore suits the data collection choices made.

4.2.2 Validity

Validity is a broad term that consolidates the level of success that a chosen set of data collection tools has achieved in measuring a given study's goals. Succinctly "validity determines whether the research truly measures that which it was intended to measure or how truthful the research results are" (Joppe, 2011, p. 1). Validity has also been described widely as the "appropriateness, meaningfulness, and usefulness of the inferences a researcher makes" (Fraenkel & Wallen, 1996, p. 152). Concepts for establishing validity are not necessarily viewed as particularly scientific according to Yin (2014), so he has proposed the following methods of describing validity in an effort to qualify the term. Construct validity, internal validity, and external validity, each attempting to describe the success of data collection measures consistently (Yin, 2014).

4.2.2.1 Construct Validity

Construct validity describes the amount of inferences that can be drawn from chosen data collection processes, particularly in relation to the research question proposed (Trochim, 2020). Construct validity establishes "correct operational measures" (Yin, 2014) for the research and hopefully verifies that the data collection methods are well matched to the proposal being studied. For case study research, Yin (2014) suggests three ways for developing better construct validity in pursuit of improved data measurement. First, to collect data from multiple sources, second, to allow informants to review and comment on the findings, and third, to develop a chain of evidence.

For this research the triangulation of multiple surveys (completed both during and after the coursework and screenings), interviews, and group discussions (also held both during and after the coursework and screenings) established a broad cross-referenced data source to draw upon. Being a single case study, yet delivered as three separate events being 1st, 2nd, and 3rd 'Events', there were similar films screened and similar coursework was delivered, but to three separate groups of student constituents as sources of evidence.

In each 'Event' the students had the opportunity to revisit their opinions on their surveys, and thus were subsequently able to express any changes to their first observations and consolidate the evidence they provided. In the case of the 3rd Event this same group of students were able to review and comment on their original evidence by viewing a second set of S3D films three months after their initial course, and first set of S3D film screenings. The subsequent data informed their own thoughts and beliefs from the coursework via the passage of time in the form of surveys, interviews, and group discussions. The chain of evidence from all three of the course deliveries and sets of film screenings provided data that built upon each subsequent 'Event'.

The survey questions from each event were the same for all events thus increasing the validity of the findings through use of multiple sources (Yin, 2014). Discussions during each of the multiple events of S3D film screenings were corroborated with each participant individually and also in a group environment, plus additionally being added to again, by each participant at the end of the films' screenings if they wished (see Table 4-1). The sourced data centred predominantly around multiple points of collection (Richards, 2005) around the intelligent implementation of Stereoscopic 3-D within the filmmaking process. Mechanical and technical issues of the S3D process were of course germane to the sourced data concepts, but most of the survey questions and group discussions contributed data from a broader observational perspective, that not only informed a less problematic film storytelling process, but advanced the possibility of a viable S3D model for the future.

When all data was combined and analysed for each of the three events, a triangulated model of qualitative and quantitative content regarding S3D storytelling attributes, and a potential S3D model template, established the chain of evidence that suitably informed the research question.

Table 4-1

Data Collection Methods and Data Analysis Convergence

Method	*Analysis Convergence*
Researcher/participant observations during F2F training sessions and S3D screening sessions	The researcher was also the "Intro to S3D" course facilitator from which much of the research data was drawn. Due to this course facilitation the researcher was able to observe participants directly during the face-to-face training. The researcher was also able to observe participants' reactions to the S3D screenings via facilitating discussions that were instigated both during and after these S3D screenings. The student participants in each of the three "Intro to S3D" courses were independently also undergraduate students at the college that the researcher was employed at. In this way regular 'running into' participants during their regular undergraduate campus presence provided more informal discussions throughout the period of the Case Study events.
Likert scale survey after S3D screenings (Figure 5-4)	The Likert scale surveys asked student participants their observations of S3D implementation. These were filled out one or two days after the film screenings in order to allow some participant contemplation of recently acquired knowledge from the S3D coursework in their responses. Questions were posed in such a way that analysis of the direct effect of the S3D on the film's presentation was tested rather than more technical analyses of how the S3D results might be achieved.
Group discussions after S3D screenings	After each "Intro to S3D" session over 5 weeks at least one S3D film per week was viewed by the participants in order to apply their newly learned skills. The discussions that were facilitated after the screenings garnered observations that cross-referenced the same students' feedback via the S3D Depth Budget Graphic surveys. By having student participants consider their S3D Depth Budget Graphic surveys whilst speaking in the group discussions there was an increase in the analysis convergence in line with Yin's construct validity recommendations (Yin, 2014).
S3D Depth Budget Graphic survey of perceived use of S3D screen space (Figure 5-3)	This survey was filled out by student participants in a simple form indicating their perceived use of depth in each screening. This survey was completed during or directly after the S3D film screenings in order to capture the participant's immediate sense of the S3D in the excerpts screened. On this same survey sheet was a number-coded question relating to the student participant's overall perception of that film's S3D integration into the story. This S3D Depth Budget Graphic Survey (and included S3D & Integration of Story survey) triangulates well with the convergence of the Likert scale surveys and the more detailed S3D analysis from the interviews and group discussions.

In order to solidify 'construct validity', any sources of perceived bias needed to be addressed. It may be seen by the nature of this research that because the questions in the surveys and the topics of discussion were asked of the course participants by the researcher, who was also the author of the coursework being surveyed, then the results may be biased. The potential of such an issue was addressed by W. Edwards-Deming in his 1944 journal article in American Sociological Review titled, “On Errors in Surveys” (Edwards-Deming, 1944). In this article he suggests that there are thirteen different factors that can affect the usefulness of surveys. He noted factors such as variability in response, and differences between different kinds and degrees of canvass; (a) mail, telephone, direct interview, (b) intensive versus extensive interviews, and also amongst these is “Bias and variation arising from the interviewer” (Edwards-Deming, 1944, p. 362). On this point he states that “Some interviewers unconsciously cause respondents to take sides with them” (Edwards-Deming, 1944, p. 363). This point might conceivably be seen to apply to the surveys and discussion questions in this research, due to the fact that the survey and discussion respondents are all students at the educational institution that the researcher is otherwise lecturing at. The usual teacher/student relationship of their otherwise daily formal studies, may be seen to conflict with this research situation where students may feel pressured to deliver survey feedback that the researcher wants to hear, or that the students think the researcher believes is the “right” answer.

However, in this case, the data collected from the S3D delivery in order to assess the validity of the S3D grammar aspect to this study, was seen as unbiased by the fact that all students/participants were informed before “enrolling” into any of the three “Introduction to S3D" courses, that the S3D coursework that they were about to embark upon was not assessed or graded. The students were also told that the results of their learning from this “Introduction to S3D” coursework was in no way connected to any of their formal studies that they may be enrolled in at the college from where they were enlisted (in most cases these students were undergraduate Bachelor of Film students). Their performance in all aspects of this “Introduction to S3D” coursework had no bearing at all on the assessable work that they did outside of this “Introduction to S3D” coursework, and so this fact relieved them of the burden of having to perform, or having to say what they thought they might be ‘expected’ to think. All students were made aware of this fact before they signed up for the course, as well as in the first session of the “Introduction to S3D” coursework. It also happened to be the case, that the researcher was not in fact scheduled to deliver any formal undergraduate Bachelor of Film subjects to these “Introduction to S3D” students during the time they were undertaking these “Introduction to S3D” courses. Subsequently, any potential sense of conflict was additionally mitigated for all attendees of the S3D program from which this research was based.

Another point in countering issues of potential result bias from the participants in this research, is the fact that all coursework surveys were filled in and then submitted anonymously. Upon completion of each of the three “Introduction to S3D” courses, each student was invited to complete an anonymous survey about the coursework itself, and then submit to the researcher as either a paper document or an electronic pdf in order to ensure anonymity. It was not of any interest to the researcher to know who of the participants wrote which survey. It was also of no value to the researcher nor the students, to have or give this knowledge of authorship. In regard to the observations made by the researcher during class delivery, and the subsequent data gained from these student discussions, they too would not be seen by the students as being anything but their own observations of the course content. Critical analysis questions were left more for the surveys predominantly, whereas the discussion content supplied data more about general student's observations and experiences during the course. The discussions specifically about the coursework itself, between the researcher and the student participants, served only the researcher's evaluation of the content of each "Introduction to S3D" course in the PIMRI (Southern Cross University, 2018) continuous improvement sense being plan, implement, monitor, review, and improve (Figure 4-1). The student participants would only be describing their individual experience in that particular course, whereas the researcher would ultimately be drawing conclusions based on the comparisons of these same results, from each of these course instances. For this reason, the researcher's observational data and results from class discussions are not deemed to be open to the bias as described by Edwards Deming, where "Some interviewers unconsciously cause respondents to take sides with them" (Edwards-Deming, 1944, p. 363).

4.2.2.2 Internal Validity

The measure of the results of research to the reality of the findings, is termed internal validity (Yin, 2014). Internal validity broadens the risk of research being biased by incorporating research methods that may otherwise be susceptible to the drawing from too few a number of sources, or drawing incorrect conclusions from not having a suitably broad enough pool of research sources. Internal validity of research methods is improved by the implementation of research methods such as triangulation, participant checks, and long-term observation of subjects (Zohrabi, 2013, p. 258). By employing triangulation of research methods in this study, a specific sense of independence to the results was enabled. Any found commonalities in results through the various methods therefore strengthened their validity.

Participant checks as described by Yin (2014) are an extra check of the results drawn from the various events that produced data supporting the proposed research aims. This data is taken back to a cross-section of the participants for confirmation and validation of their submitted views as a part of the research. Long-term observation gives a better average of data collected. In this case the data gathered from three different S3D course offerings over an eighteen-month period where the surveys taken and group discussions recorded were similar and therefore produced a longer-view comparison of the three courses over an eighteen-month period.

4.2.2.3 External Validity

The definition of external validity in this context refers to the portability of a study's findings beyond a specific case studied (Yin, 2014). If results from research are not sufficiently viewed as independent of the process, then a danger of poor data collection exists. The external validity of this research may be used to describe not only the portability of the research process, but also of specifically the S3D characteristics results being the centre of the study. This broader validity needs to be carefully considered in regard to data drawn from observations of S3D film to S3D film, and also the portability of the research results from research candidate to research candidate. The mix of participants in each of the three case study Events, as a demographic representing different cohorts of study, different ages, and varied cultural backgrounds, could potentially find commonality disparities within their individual and group observations. Another potential risk to the external validity of this study, is the choice of S3D film titles used in each of the researched Events. As there was a mix of S3D film titles for each of the three Events the triangulation aspect of the data gathering was less likely to be affected by an undermining of results, despite the fact that this research study was a single case study project and not a multiple case study. Robert Yin (2014) points out that multiple case studies are more likely to produce independent conclusions than single case studies where they are more likely to be susceptible to replication. However, with these separate Events within the one case study being delivered individually over a long period of time, the mix of demographics and also mix of S3D film titles reduces this risk of dilution.

There is also the risk of researcher bias within the results of this study. As the researcher of this project was delivering all three of the coursework Events, as well as hosting the screenings and discussion groups for each, there was a risk that the data collected from each of the three Events was not sufficiently analysed in an independent manner. The same leaning toward a preferred outcome may be inadvertently injected into all three sources of data.

At the beginning of this research project, one of the elements expected by the researcher to be included in the research results of the application of any found S3D characteristics and principles, was the high potential of being able to apply the results of the findings to other contemporary forms of S3D new media. Forms of such S3D new media include virtual reality in numerous guises, whether it be gaming, experimental applications, simulator training, presentations, or new film forms. It also includes 360-degree vision as the technology quickly develops to cater for prospective commercial opportunities into the future. The research results for the application of better S3D techniques to cinema and cinema storytelling, are more specific to film grammar and the cinematic application of S3D than is likely to be applicable to new media forms of S3D.

4.3 Context: Participants and Course Design

In order to successfully come up with a relevant model of 3-D depth usage, a PIMRI model of quality assurance (Southern Cross University, 2018) was employed in teaching undergraduate students the principles of S3D. Once these students completed a short course on S3D, their newfound knowledge then fed the case studies undertaken for compiling the best readings of the application of Stereoscopic 3-D to film. The results of this then fed the optimum 3-D depth models as proposed in Aim number 1, before going on to refine the same short course on S3D as shown in best practice using this PIMRI cycle (Southern Cross University, 2018). Such a cycle shows how the Aims of this research followed on and fed each other in a symbiotic relationship.

Figure 4-1

PIMRI Model of Quality Assurance (Southern Cross University, 2018)

Plan - Design “Intro to S3D” course

Implement - Deliver “Intro to S3D” course

Monitor - Gauge result of S3D learning

Review - Gather resulting evidence/ideas

Improve - Feed results back into “Intro to S3D” course

This model also reflects John Biggs’ teaching model of constructive alignment for outcomes-based curriculum of learning outcomes, student participation, and assessment (Biggs, 2003). The initial course design for this “Introduction to Stereoscopic 3-D” module borrows from Biggs’ constructive alignment model by corralling skills in film storytelling, editing, and cinematography then subsequently adding appropriate camera physics to successfully control Stereoscopic 3-D implementation. Importantly, once the physics of this control was understood, its application in Stereoscopic 3-D cinema production was then to be analysed by students as well as industry professionals, in order to define how well S3D is being applied by ardent filmmakers. The resulting mixed method analysis intended to conclude with models that added to the film grammar, versus film grammar models that possibly did not.

The second aim of this study was to develop a framework of Stereoscopic 3-D theory and practices for the teaching of filmmaking at tertiary education level. Group class offerings of "Introduction to Stereoscopic 3-D" sessions resulted in undergraduate film students undertaking the coursework. The resultant surveys and interviews provided a benchmark for S3D by comparing a number of commercially released S3D feature films, and analysing the benefit of the S3D to the story. In order to minimise technical aberrations in the physical viewing of these films for the study, a high bar was set in the viewing process by mandating an elevated technological standard of viewing. At least Full High Definition screens (minimum 1920 x 1080 pixel resolution), employing either polarised or shutter glass processes were used for the research gathering screenings. These S3D technologies were amongst the highest quality S3D viewing experiences available at the time of this study, and not only maximised the S3D experience, but enabled an even playing field when comparing a number of S3D film titles for this research.

Testing the resultant model highlighted the success of the research, and subsequently provided the opportunity to write an accepted industry grammar for S3D. The results of the research were to integrate learning outcomes that incorporated the continual evolution of the S3D area of filmmaking, by eliminating any risk of redundancy if the field develops at pronounced rates. In assessing the learning outcomes of students in the three S3D courses, and the surveyed results of their S3D film 'readings' themselves, a refined curriculum was to be produced for direct rollout to higher education as well as vocational learning institutions.

4.3.1 The Researcher

David Crowe's research experience comes formally from a Masters of Creative Media Practice degree by research, studied through Middlesex University in 2011, and attaining a First-Class honours result. David has fifteen years of experience working in the Australian film industry on commercial feature film and television crews, as well as having significant independent film production experience prior to this study. Since 2003 David has been writing curriculum for and teaching Diploma of Film, Bachelor of Film, and Masters of Creative Industries film students, and so by combining this with his significant industry experience in the field, his broad capabilities are unusually high in relation to others in the space as a result.

David is also a Senior Fellow in the Higher Education Academy through his academic experience (HEA, 2019), and he has supervised five Master of Arts students in their pursuit of post-graduate qualifications in the last three years. David's teaching experience since 2003 backs his ability to put together a "new" module of study, and shows that it is within his skill level to orchestrate the undergraduate students as they traverse this new coursework.

4.3.2 Case Study Selection Process

Students who had enrolled in an undergraduate course of filmmaking in the form of a Bachelor of Film degree, were asked if they were interested in learning an extracurricular topic of film being "Introduction to Stereoscopic 3-D" (abbreviated here as "Intro to S3D"). In the first instance it was unknown by the researcher as to how much interest there would be in undertaking an extra module in these undergraduate students' busy study schedule, but happily there turned out to be much interest from them, and on an ongoing and regular basis. The fact that this "Intro to S3D" coursework did not have any extra financial implications for these undergraduate students, nor any implications in regard to grades and assessments for their formally enrolled subjects, no doubt made for an easier decision by students as to whether to partake or not.

The only prerequisite when a call-out was made to ascertain the level of interest of these Bachelor of Film students, was the need for a prior knowledge of introductory level cinematography and basic film production techniques. In this way, the theory that was covered in the "Intro to S3D" content did not require significant extra time to go over basics such as camera framing, depth of field, and exposure basics that would otherwise hold up the sessions if these concepts needed higher levels of revision. It also condensed the numbers of individual students in this cohort to those who expressed strong interest in enrolling in this extra-curricular topic, from those who may have had only a cursory interest in watching 3-D movies. The number of students who were possibly interested in 3-D movie 'watching', but may have had difficulty in applying the photographic and technological aspects to the storytelling aspects of 3-D, were therefore reduced in the overall selection process.

4.3.3 Course Design

4.3.3.1 Undergraduate Course Delivery Process

Classes were delivered in a tertiary education lecture theatrette with raked seating that was purpose built for cinematic representations within classroom teaching (see Appendix C). Two methods of S3D screening were used in the set sessions; shutter glasses viewing of S3D film sequences via a 3-D projector on a large (150-inch) screen, and also at other times with polarised S3D viewing on a 65-inch LED television monitor. Both S3D viewing methods are amongst the highest quality S3D viewing processes available at the time of the course delivery, and served to minimise distractions to students caused by any issues associated with less than exemplary S3D viewing practices. Some S3D processes were at early stages of the course delivery, presented in class using a less advanced method of S3D viewing in the form of anaglyph (red/blue) glasses. Such use of anaglyph S3D viewing allowed simple S3D processes to be presented (despite generally poorer colour rendition) without the requirement of specialised projection/viewing apparatus. Anaglyph S3D viewing in this way added instantaneous depth demonstrations during on-screen slide-deck presentations where depth only needed to be illustrated, and colour resolution was not necessarily needed to make a point. Using this anaglyph S3D method in some sections of the coursework delivery also provided the added benefit of reinforcing the variations in S3D quality available for S3D viewing, if more advanced and more accurate possibilities are not available.

Three stages of the training sessions' delivery were planned and implemented for each Event;

1. A core knowledge was imparted on how S3D works both theoretically, and also technically, using current best practices.
2. Viewing of S3D cinema examples to broaden the knowledge of industry usage of S3D over time, as well as to illustrate best practices and poor practices.
3. Comparison, discussion, and suggestion of variable attributes in S3D depth placement, and the resultant effect on the storytelling aspect of an S3D film.

4.3.3.1.1 Face-to-face Course Delivery

The first "S3D Course Delivery-1st Event" coursework in April of 2016, created by the researcher for teaching Stereoscopic 3-D to undergraduate and postgraduate level students, was built using the PIMRI model of development (see Figure 4-1) over a number of years. It was fed by personal experience of the researcher, as well as attendance at S3D conferences and masterclasses over time. Refinement of the content was also informed by student feedback on the initial prototypes of the S3D coursework and content, just as the student participants in this research study supplied data for this more refined offering as a part of this dissertation. Course content consisted of core technical attributes of how Stereoscopic 3-D is perceived by the human brain, as well as creation of S3D content via camera arrangement and physical processes.

After combining these two arenas, a study of existing S3D cinematic productions created by maverick filmmakers (who had themselves to some degree interpreted these parameters), enabled the students to apply their new knowledge of how these processes best work to the cinematic storytelling that has been produced each year for the last ten or more years. The coursework was designed initially to be delivered in a face-to-face environment in a lecture room styled facility, with one three-hour session per week delivered over five weeks. Resources were created for this face-to-face delivery in the form of slide deck presentations and S3D screenings. The slide deck presentations reflected the core curriculum and relied greatly upon student participation in the form of image recognition and resultant direct in-class feedback. There was subsequently a 2nd Event S3D course delivered in July 2016, and a 3rd Event in April 2017. Each had ten undergraduate film students enrolled for the five three-hour weekly sessions.

4.3.3.1.2 Technology Requirements for F2F S3D Delivery

In the first instances of the S3D course deliveries, the obvious requirement for successful student understanding of S3D course content was high quality Stereoscopic 3-D playback. After a number of years spent by the researcher refining the best available Stereoscopic 3-D viewing system, two technological systems were settled upon. One, for larger class lecture delivery and screenings, was an S3D capable video projector throwing to a four-metre wide projector screen from a Full High Definition Blu-ray player. It produced surprisingly high quality S3D results considering the throw and screen size required to be illuminated, especially in a setting that usually hosts contiguously large class sizes. The resulting quality of the S3D images proved quite high, with the only possible concerns potentially being lower brightness of images by the nature of S3D in large viewing/teaching rooms, and also the technological need for viewers to wear self-powered shutter glasses-styled eyewear. Such eyewear by their design, slightly reduces the brightness of S3D images, and when coupled with the generally lower brightness of the projectors used, had the overall effect of lowering luminances for S3D film screenings.

The second supplementary source of S3D viewing in these earlier classes, was a 47-inch LED television monitor playing S3D films from a Full High Definition Blu-ray player. The very high quality of the S3D playback on this monitor is astounding, and is attributable to the significantly increased brightness of the image. It is also greatly enhanced by the fact that polarised eyewear is required for this viewing rather than the shutter glasses in the lecture theatre screening room. Polarised glasses are passive glasses and as such do not have the inherently darker view that the (active) shutter glasses exhibit. Overall, the experience of viewing S3D on a (3840 x 2160 pixel resolution) 4K LED monitor using passive polarised glasses, is a significantly better experience than most when it comes to watching S3D films. Having a brighter image coming from the screen, combined with the usage of the lightest shade of the polarised lenses available, gave an enhanced S3D viewing experience that is as close to state-of-the-art available at that time period.

4.3.3.2 Post-graduate Course Delivery Process

As a result of these three face-to-face courses delivered in April 2016, July 2016, and a third in April 2017, an S3D course was formed for an online environment for delivery in July 2017 for a Master of Arts program (SAE Creative Media Institute's Master of Creative Industries degree). As this Masters level delivery was for students who were at an Australian Qualification Framework (AQF) Level of 9, there was more self-driven learning required of the students enrolled in this module. The content of the "Intro to S3D" coursework for the Masters module is essentially the same as the resultant undergraduate "Intro to S3D" coursework from the research, however much of the knowledge required was sourced by the students themselves rather than being supplied directly in a face-to-face model to the undergraduate students of this module. As S3D is still considered quite a new field of filmmaking much of this content needs to be taken on by all students as new knowledge given the nature of this modern area of filmmaking. As a result of this, an online method of delivery was created for the Masters students so that geographic barriers did not prevent the learning of this “Intro to S3D" module. It also continued the PIMRI refinement of content as it progressed just as it did from the repetition of the three previous undergraduate deliveries.

4.3.3.2.1 Blended Course Delivery

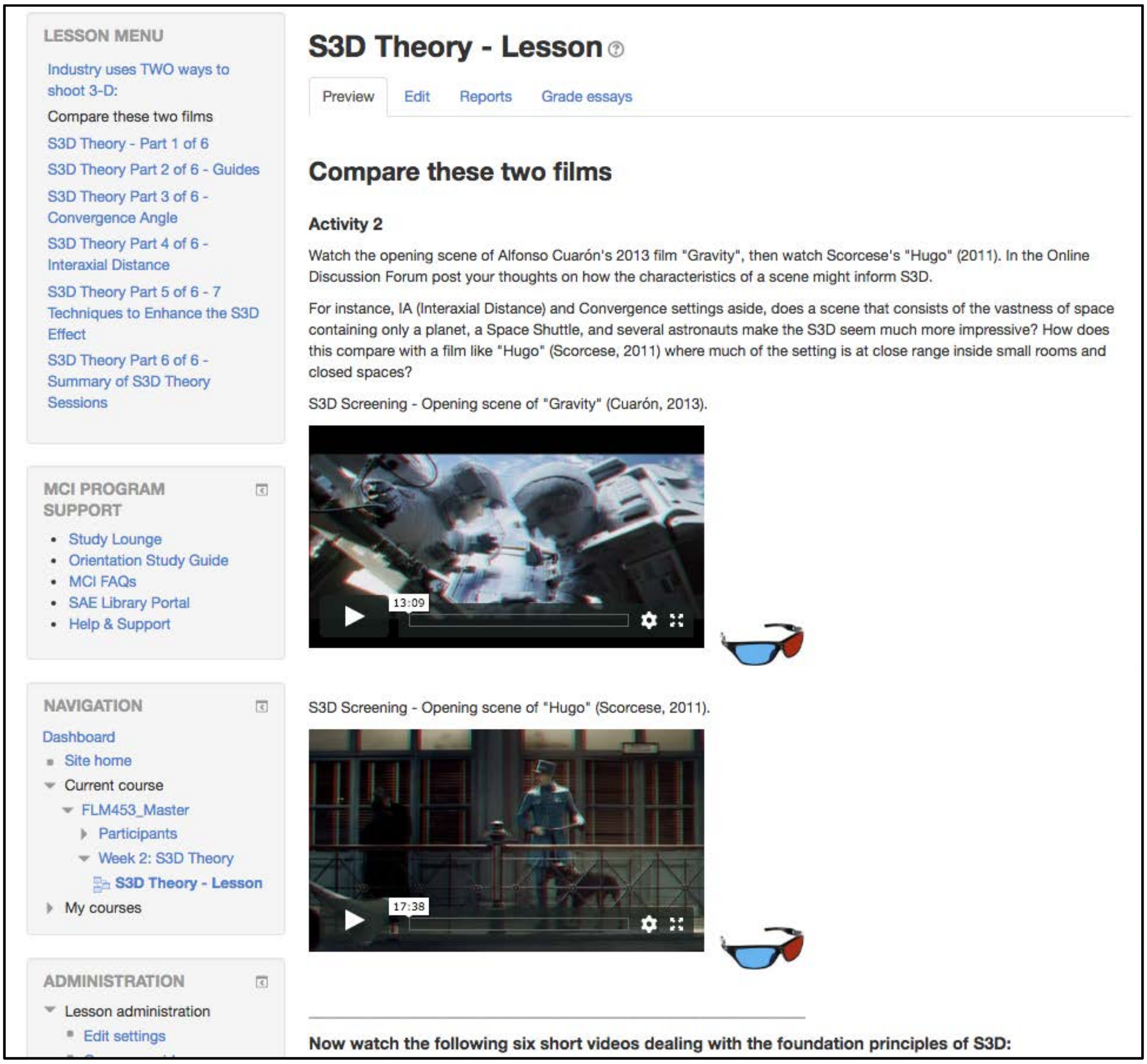
In creating the content for delivering the “Intro to S3D” module in a blended mode, a number of milestones were required to be reached by the researcher in the learning of techniques for online course creation. Once initiated, a number of limitations to the building of an online S3D subject delivery model were discovered when applying standard resources for such a course delivery. Such limitations were primarily based around technological roadblocks but this soon affected the delivery of required points of understanding by students, who were learning an area that they ostensibly had very little prior knowledge of otherwise.

Blended delivery by definition has a mix of online delivery as well as face-to-face delivery elements (Graham, 2013b). The face-to-face delivery elements of the “Intro to S3D” course is discussed in proceeding pages, and certainly has challenges in providing the required albeit introductory knowledge in regard to Stereoscopic 3-D understandings. However, in translating such S3D challenges (that are already taxing enough in its infancy) to a face-to-face environment, the design and creation of Learning Management System (LMS)-based content required a breakthrough for remote delivery in regard to teaching Stereoscopic 3-D content. Coursework had to be translated into a readable and smooth-flowing path for its online LMS construction.

In having to introduce Stereoscopic 3-D elements into an otherwise 2-D world of traditional LMS delivery, a model of viewing of at least some “3-D viewable” content had to be implemented. A breakthrough in this online delivery was created by the researcher in finding a method to illustrate 3-D content online without the requirement of sometimes expensive hardware to view. For instance, a 3-D capable high-definition Blu-ray player and a 3-D capable television/monitor is the optimal method for viewing 3-D content in such a 3-D course, but if the tyranny of distance learning did not ensure that every student could access such technology, then an online method of some sort needed to be created. By constructing example clips of 3-D movies and posting them within the online LMS (Learning Management System) using social media video playback sources such as Vimeo or YouTube (Garrett, 2016), then these clips could be viewed anywhere, as long as a pair of inexpensive red/blue 3-D glasses were supplied to each student.

Figure 4-2

LMS Playback Screenshot



Note. Learning Management System (LMS) content copyright the author. "Gravity" (Cuarón, 2013) image and "Hugo" (Scorsese, 2011) image used under fair use for purposes of research, criticism, and review.

Research shows that the combination of audio and video in teaching can be an effective learning tool (Jung & Lee, 2013, pp. 243-253), and so by utilising embedded YouTube and/or Vimeo within the researcher's S3D blended learning model, this would become an effective delivery resource by the added fact that it increases the recall by students of new information learned (Kozma, 1994). After including online S3D videos in the first instance of this module of "Introduction to S3D", a more successful and inclusive method of teaching/delivery was ensured. Of course, the higher technological requirements of such 3-D viewing would be beneficial for motivated students, but there now was a more democratic method of viewing S3D, and also for illustrating some of the more salient points of S3D concepts (Figure 4-2 & Appendix H).

4.3.3.2.2 Technology Requirements for Blended S3D Delivery

In order to create a benchmark that allowed a fair and high-standard approach to the S3D viewings in this research study, the highest attainable standard was sourced as much as possible for S3D screenings to minimise those same physical issues of S3D that had not helped the popularity of the form. Such a minimum standard was based on polarised S3D viewing using the available 4K 3-D monitor (Sony KD-65X9000C), and Polaroid branded S3D 'Real D' (licenced) glasses, (the eyewear product with the least darkened lenses of all found polarised lenses). These Polaroid glasses were also large-lensed and very light in weight, creating minimal impact on the wearer whilst viewing. The combined effect of the high-end 4K 3-D monitor, with the light weight and lightly tinted glasses, and high-quality Blu-ray S3D discs for playback, created a high-level experience for the viewers from which to make judgements on story quality, as well as technical attributes of this S3D study.

Regardless of S3D viewing capabilities, and whether the coursework was delivered face-to-face or online, most of the deliverables remained common in essence, and also similar in overall structure. Presentation-based slideshows of each session's content were used from a technological standpoint mainly in the face-to-face sessions, but also in a more refined form when eventually delivered online. This relied upon at least two-dimensional (i.e. traditional non-S3D) standard classroom projection of these presentation slide decks. Having the ability to screen full (or segments from) 3-D cinema-released movies in the classroom from which the coursework was being delivered, was greatly advantageous. Students then had a choice of using one of the three most common technological forms of S3D viewing, being polarised, shutter glasses, or anaglyph. As a result, these students were able to then apply the skills learned in-class through the content visuals, with a minimum loss of quality, and thus by their own experience were able to get the best from the important 3-D clips viewed in-class.

4.3.4 Ethics

The James Cook University Human Ethics Sub-Committee has approved each Ethics report submitted over the time the researcher was engaged in this research and has been allocated Ethics Approval Number H6422 (Appendix I). The basic premise for this approval has been the fact that each "Introduction to S3D" course delivered to undergraduate film students was delivered outside of any formal coursework that these students were undertaking to attain their Bachelor of Film degree. The only requirement of each student undertaking the "Introduction to S3D" five-week course was to have a prerequisite base cinematography, basic film theory, and film production understanding as is delivered in the foundation stages of the SAE Bachelor of Film degree from where the students were sourced. These students had no formal academic progression opportunities available to them by doing the "Introduction to S3D" course, yet the full classes of ten students for each course indicated there was much personal appeal and keenness to learn a very new aspect to film, that had not yet made it to mainstream formal academic coursework yet. As these S3D courses also had no monetary costs to the students undertaking them, the involvement of these students was therefore on a completely voluntary basis with no formal 'Pass' or 'Fail' risk to affect their otherwise formal academic work in their Bachelor of Film degrees.

The students in each of the three "Intro to S3D" courses used as a basis of this study, were for the most part, cohort classmates from their daily studies in their Bachelor of Film degree coursework. Even though these students were likely to have known each other from their everyday campus study experience, and also to some extent by the study's researcher (who was delivering the "Intro to S3D" coursework to them), these students did not use their real names in surveys or online work related to this study. Their anonymity was assured throughout the data gathering with the survey work done in group discussions/interviews naming them as "Student #1", "Student #2", etc. In the surveys filled out by participants the identifier codes of "041601", "041602" etc. for instance identified which of the Events the surveys belonged to if needed. It also separated each participant's survey identity from others in the same Event by a single number from 1 to 10. So, for instance, participant "071603" was the third participant of ten, in the Event delivered in July of 2016. This delineation however, was not required, nor did it come into the data analysis.

4.4 Research Schedule

The schedule for this study had been set over quite a long six-year period. This was done so that the course design, implementation, subsequent data collection, analysis, and reporting could happen around the researcher's high employment and family commitments. The three courses delivered over the 2016 and 2017 period required significant time between each delivery to:

- gather data from the students
- refine the curriculum of the "Intro to S3D" coursework from the resulting data
- allow time for new volunteer film "recruits" to come up through the Bachelor of Film degree ranks for the next course

As a result of this, and the heavy workload of the researcher, the longer time periods required to just deliver and refine the actual courses, had an added benefit. With time, higher quality S3D films came onto the cinema market, and as the inclusion of the most up-to-date S3D films obviously benefits the coursework (by the sheer evolution of S3D film improvements), the length of the study itself enabled a broader scope of S3D films used in the study.

4.5 Data Collection

Case study methodology is recognised as a methodology that can assimilate both qualitative and quantitative processes of data collection, and is colloquially termed a mixed method of analysis. “A key feature of mixed methods research is its methodological pluralism or eclecticism, which frequently results in superior research” (Johnson & Onwuegbuzie, 2004, p. 14). A broader base of data collection as described for this study, was sought through this mixed method of evaluation through both qualitative and quantitative processes. Despite a broad choice of data collection methods identified for use in case study methodology (Yin, 2011), the best and most appropriate sources available for this study were primarily surveys, documented focus group discussions, and one-on-one interviews.

Quantitative methodology used in this study included surveys filled out by all focus group constituents of depth usage characteristics of each S3D film viewed (which in itself serves as excellent qualitative sources of data before being quantified for this mixed process). This also encompassed Likert scale survey sheets that recorded observations of similar S3D depth characteristics, which were then collated and compared with graphically drawn recorded observations of the use of screen depth (see Figure 5-3 as an example depth usage survey document). In defining this qualitative and quantitative data collection for this research, it is important to note, that the quantitative data gathered through surveys for instance, is empirical by the nature of its collection, but is intrinsically qualitative in the nature of its evidentiary use in this research (Cresswell, 2012, p. 12).

Significant qualitative data for this study came from the running of discussion groups with subsequent transcriptions of the results after each S3D film screening. These discussion groups involved each participant where possible, and was run after each S3D film excerpt screening over the five-week course, and then for each of the three courses. The structure of this data collection process became rhythmic as a weekly discussion session during and after the coursework delivery, detailing specific characteristics of the 3-D in each S3D example.

The first S3D Depth Budget Graphic Survey (Figure 5-3) was completed by each participant during or immediately after the individual film’s screening. In this way, each participant’s immediate perception of the 3-D in the just viewed 3-D film is recorded prior to the second qualitative survey. The second survey being a Likert scale survey, asked for more detailed aspects of the participants perceptions and observations after the individual film screenings. However, these second surveys were completed by the participants a day or two after the film screenings, in order for the participants to be able to gather their thoughts and to be able to consider their findings with the benefit of their recent “Intro to S3D” coursework experience. At the end of each course instance, another important qualitative data gathering process was executed through individual participant surveys regarding the course content and delivery specifically (see Appendix B for an example of this survey submission, and Figure 5-6 for a combined summary example of these results). These “S3D Coursework Surveys” were completed by each student after the end of each five-week course. These surveys were designed to recover participant expectations of the coursework, any problems with the content and delivery, and any suggested improvements for consideration. Industry professionals were also involved in this data collection process after the three course delivery instances, with 3-D film sequence screenings and subsequent interviews of these participants feeding the research analysis. Such multiple data sources for triangulation of this single case study benefits the final result, as “any finding or conclusion in a case study is likely to be much more convincing and accurate if it is based on several different sources of information” (Yin, 2014)

In each of the focus group discussions, the students’ responses were recorded by the researcher in the form of reflective field notes, and then converted to full notes within twenty-four hours of the group discussions. As suggested by Robert Yin as best practice for such data collection (Yin, 2011), a systematic approach to this field note-taking was formed by the researcher prior to the three main periods of data collection. This process was trialled in informal student screening sessions prior to the first official course delivery, in order to refine a data collection process for use. A proposal was initially made to potential students of the first event of the course delivery, to record the focus group’s responses by means of digital audio. These first event student’s responses indicated concerns with an audio recorded method of data collection, with a clear majority stating that they did not want their opinions to necessarily be personally identifiable.

An alternative method was then offered, being tablet note taking by the researcher, where no personal identification or attribution would be made other than a coded number (i.e. “Student #4”). It was subsequently agreed to by these potential participants that this was a preferable method of data collection in their view. It was also suggested that this alternative anonymously attributed note taking method, would also possibly elicit more forthcoming opinions from individual participants, without fear of any insecure participants appearing sophomoric in any formal setting.

The subsequent refinement of this process by the researcher found a rhythmic model that enabled a high level of attention to participant’s responses. The qualitative data collected from the first focus group discussions combined group observation, choice of direction of discussion, and question ‘posing and response’ recording for later interpretation. Reflective data is more subjective by nature than responses recorded as factual data (i.e. more prescriptive information such as amount of 3-D depth observed, duration of movies, cost of movie production, etc.). The data collected in these focus group discussions as a result, were much more reflective than factual, with discussion, interpretation, and group-unanimity all being a part of the final data set. Despite such reflective information being loosely defined by Yin as being the researcher’s reflections of the noted observations (2011), there is a risk with this method of data collection of potential problems. For instance, such a problem may lie with distinguishing between participant observations, and possible inadvertent inclusion of the researcher’s own interpretations.

In order to subvert this possibility, the subsequent recording of field notes by the researcher using bullet points and shorthand during the actual focus group discussions, would then minimise the possibility of the researcher “adding” direction that was not intended by participants. Later elaboration by the researcher from the field notes to full notes within the self-nominated twenty-four-hour window would then be more mechanical in nature, with less chance of directional embellishment of the data. There is however the risk that there might have been some natural input from the researcher when the focus group discussions were conducted, as the researcher was also the course facilitator responsible for the delivery of S3D knowledge to these students.

So, in eliciting responses from the focus groups, some specific knowledge may have become a part of the question and answer process that was still guiding the students in their learning (Wenger, 1998). Each of the individual focus group discussion sessions considered at least one specific film’s S3D characteristics, and at the end of the five-week course of this first focus group, all responses to each of these selected films were compared for commonalities. All similar question and response comments were collated for each S3D film viewed. All main ideas that arose were reviewed for commonality between each discussion, and identified as possibly thematic for refined S3D modelling.

The Bachelor of Film undergraduate students who had completed the “Intro to S3D” courses had the advantage of having a freshly delivered and current understanding of the physical concepts of how S3D worked, what S3D worked, and how S3D didn’t work, and what S3D didn’t work. In contrast to this, the film industry personnel interviewed for this study, did not necessarily have the most current knowledge of the physics of S3D, but instead had industry knowledge by way of daily immersion in film production concepts. It was decided soon after the first film industry personnel interviews that the undergraduate students who had much better S3D knowledge, would serve the research more appropriately from then on.

4.6 Data Analysis

In reviewing the collected research data from each of the Events for this study, the results were analysed for use in the construction of a working model of S3D in education, for a usable language in relation to cinema storytelling. The cross-referencing of the group discussions with the surveys and interviews provided a triangulation that broadened the analysis. The data was of a standard that remained relatively high throughout the research period, despite some of the long gaps in delivering each course instance, and the lack of control over the demographic of the volunteer participants over this extended time period. The representation of the data gathered for this study was manifested in enhanced graphs, that not only displayed the range of observations from each Event group, but also displayed graphically the depiction of the three-dimensional impressions from each S3D film presented. This enabled not only traditional data analysis by mixed method means, but also provided a visual display of the results creating a simple but effective "picture" of the 3-D representations for each screening, by each participant.

4.7 Summary

A clear advantage in choosing the case study method for this research was highlighted in the accommodation of the mixes of the qualitative and quantitative means of gathering data, in the area of 3-D cinema, that is generally not well understood even by film industry professionals. By delivering coursework that utilised frontline technology in enabling the best possible quality and experience for research participants (particularly in the high quality of the 3-D screenings provided to the participants), the results were easier for these participants to learn from, and to be motivated in contributing to. By undertaking blended learning strategies, including between-class viewings, between-class readings, then face-to-face classes, face-to-face screenings, and face-to face discussions, a broader drawing upon Yin's mixed methods of cross-referencing data (2014) was facilitated.

In weighing up the potential risks of biased data gathering and analysis *before* the study commenced, a greater balance and awareness of such risks was achieved by the researcher. The course design facilitated the research, and also proved to be popular with the research participants (evidenced by full attendance figures, and student feedback). This created a significant amount of data (even with what may be deemed by some as a potentially small group of ten 'students' in each Event group), and also created an impetus to replicate the same structure of coursework for all three Events, whilst still leaving room for improvement in each subsequent Event iteration.

5 Chapter Five: Case Study – 1st Event

5.1 Introduction

In initiating this study, the main aim was to create a prospective model of what could be a future standard of depth usage in Stereoscopic 3-D (S3D) production. A second aim was to apply such a depth usage model to create a resource for 3-D learning for student filmmakers in the area of Stereoscopic 3-D cinema production.

The case study used in this research consisted of three bespoke five-week courses of "Introduction to Stereoscopic 3-D" content delivery (named as 1st, 2nd, and 3rd Events), where volunteer undergraduate film students participated in the learning and teaching in this area of Stereoscopic 3-D film. The results from these groups of students' learning were collated via interviews, surveys, and class discussions to elicit any emerging depth placement characteristics in the S3D cinema-space in front of, and behind the screen, colloquially termed "depth budget". Such depth budget characteristics may crystallise future S3D productions, and subsequently would also help refine the use of S3D to become a resource for film learning along the way.

All of the S3D film titles that were screened, studied, and discussed by the differing participant groups in the following chapters for this research, have each had subsequent S3D characteristics noted from the data results. Each of these S3D films are tabled in their own sub-headed section in the following pages, with each section consistently using the following structure for each film's analysis:

- Depth model observations of the specific S3D film title in question, including poignant points that may have come out of group discussions.
- Survey analysis of each of the S3D depth characteristic and Likert surveys.
- A summary of the S3D depth model learning results for that film.

This repeating structure of reportage within this project, creates a simpler method of following the results from film to film, and from Event to Event. It also makes referring to different parts of this research structurally easier to navigate to, and to draw comparisons from.

The first Event in the case study research reflected the first delivery of the "Intro to S3D" film course run in April of 2016, and was delivered on the premises of SAE Creative Media Institute in Sydney, NSW (see Appendix C). The research was designed to refine the resulting grammar model characteristic observations before the next subsequent course run in later consecutive deliveries, as well as to establish if such S3D grammar models could emerge as a beneficial learning resource for widespread use and acceptance. The 3-D course design was put together by the researcher in the first instance, by combining past studies in the area, S3D conference and masterclass attendances, his own analyses in the viewing of many S3D films, and by using his experience in designing curriculum for undergraduate film courses. The first model of course delivery included film screenings, in-class slide deck presentations, and practical demonstrations. Even though this first Event course delivery was run outside of formal accredited degree coursework, and was delivered to volunteer film students with this understanding, preliminary assessments in the form of regular quizzes were conducted over the five weeks of weekly classes in order to establish student learning outcomes.

The delivery of these "Intro to S3D" courses in three intervals over a period of approximately eighteen-months gave the students from each course new knowledge enabling their understanding of S3D and how it is used within cinema. The level of their new understanding of S3D was measured by the observations of these students, and so informs the aims of this research in refining a 3-D depth standard as a model for all future S3D production. This subsequent data was drawn from feedback from these students (as well as initially from film industry professionals) via surveys, discussions, and interviews. Any such resulting 3-D depth standard would conceivably be a mix of a number of 'depth budget' characteristics. A 'depth budget' is a film industry term that refers to the amount of 3-D space used in any given scene or shot (Holliman, 2004, p. 1). For instance, a large depth budget might use the dimension of depth in a cinematic shot, ranging from very close to the viewer's face, right through to a distant horizon object that seems well 'behind' the cinema screen. A small depth budget may describe the use of only a very limited amount of depth space behind the screen and some or even none in front of the screen. In broad terms, a film's depth budget reflects the *amount* of implementation of 3-D in a film. It describes a viewer's experience, where it may be that a huge amount of 3-D is 'seen' coming out of the screen, as well as a huge amount of 3-D reaching far behind the screen and off into the perceived distance. Depth budget by the same token will also describe a very small amount of 3-D either in front of the screen or behind the screen.

Depth budgets by definition then, can vary greatly from extreme usage of this 3-D depth, an average usage of this 3-D depth, to a minor usage of this 3-D depth, with the possibility of many points in between. These differing levels of depth budget usage come with inherent characteristics that include being intrinsically difficult to achieve technically, and can also be very difficult to watch. The case study data gathered in this research manifestly informs a distinct depth budget model that a majority of students identify as being beneficial to the delivery of S3D. Conceivably as a result, a standard of depth modelling for S3D film production worldwide may present itself as a new standard from which future S3D films might be based.

Such a standard model for instance, would define S3D production with possibly an expected depth space from which most of a film's "action" might generally fall within. Subsequently, any use of depth space that steps outside of this "zone" (whether it be negative parallax being the 3-D space used in front of the screen, or positive parallax being the 3-D space used behind the screen) for example, using classicist film theory may denote an expression of a character's extremes based on stepping outside of a standard safe area (Buckland, 2004).

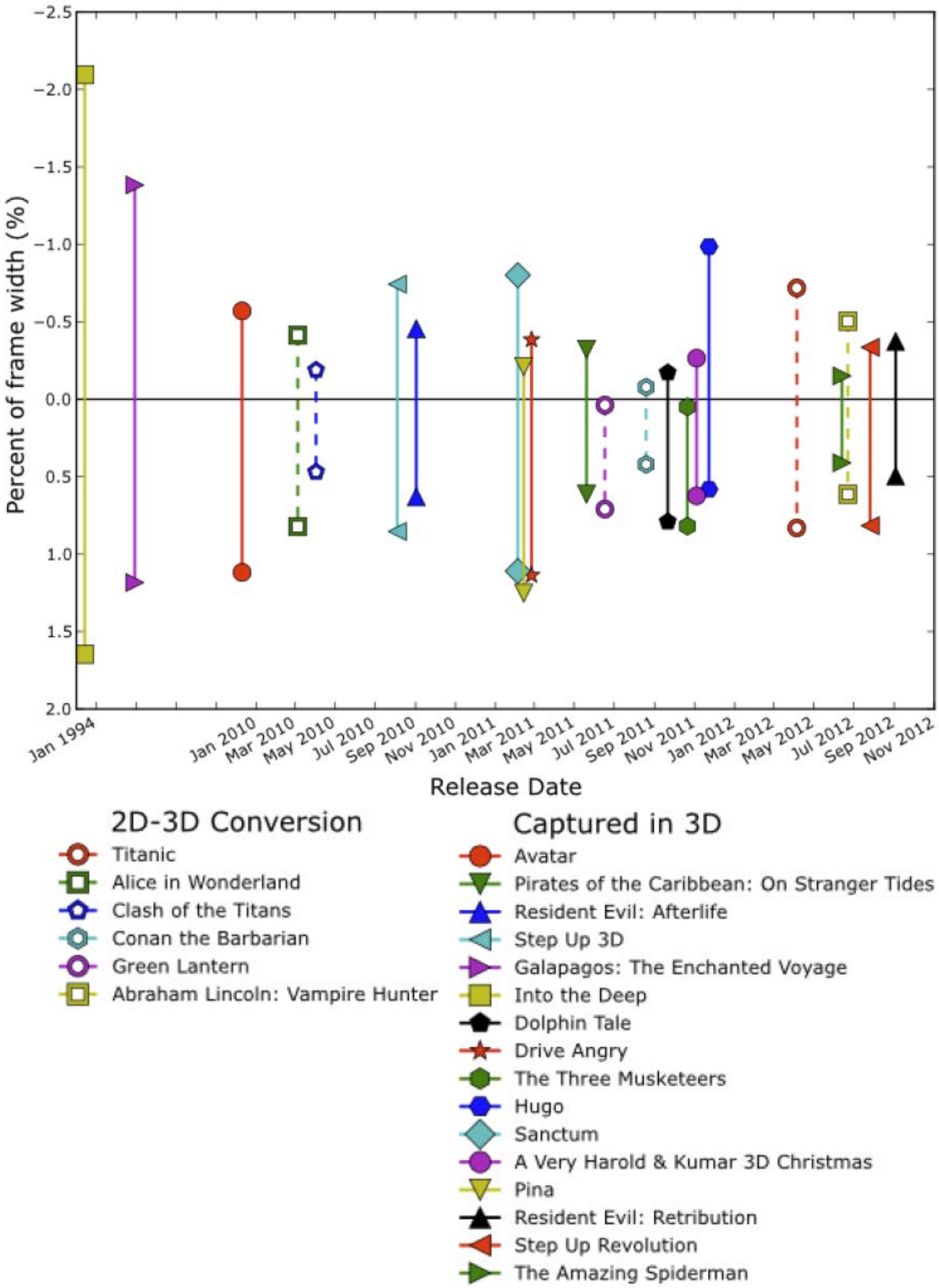
S3D film screenings for students in this research accomplished a number of things. First, the students became accustomed to the viewing of S3D films in a controlled environment (i.e. a closed theatrette designed for class teaching as well as cinema screenings, see Appendix C for an image of this location). Second, they had a standardised base from which to compare each of the S3D productions viewed for the study, although there were three different screens of differing sizes from which the students were able to view the films for this study.

From the screenings that were a part of each of the five sessions of "Intro to S3D" classes, students were asked to try to identify how much of the depth space was utilised for each of the films. As these students were somewhat novices when it came to understanding S3D in movies (understandably, a number of the student participants had informed the researcher at the beginning of each course that they enrolled in this module because they did not know how S3D worked and wished to learn), their interpretation of the use of depth in these films started without any formal understanding of any standard set of S3D depth attributes. However, these students did come with an understanding of cinematographic principles at a basic undergraduate level, giving a more even playing field for these students when it came to applying and interpreting S3D in association with their filmmaking foundation skills. As a result, when these students were asked after each screening to describe the application of depth placement, they had no preconceived notions as to what this would be as far as being a comparable characteristic between films.

Russian researchers at the Graphics & Media Lab at Moscow State University did analyses on Stereoscopic 3-D film quality and amongst their findings was a comparison of depth usage in a selection of S3D feature film releases (Voronov, 2013). Using this depth usage data in addition to the student's observations of the same after their S3D film screenings created a basis for a depth model that would conceivably work as a "standard".

Figure 5-1

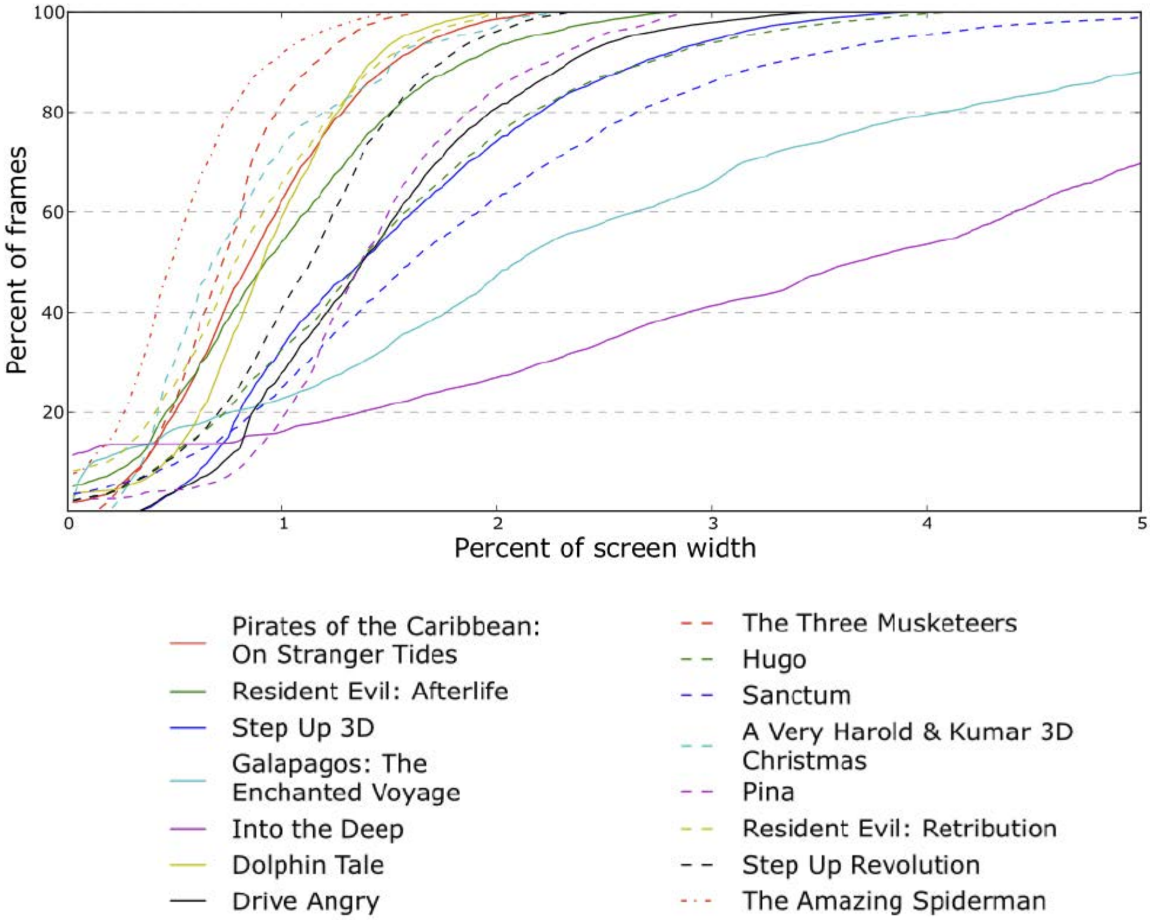
Depth Budget Versus Release Date Figures



Note. Depth budget versus release date figures of selected S3D film releases Voronov, A., Vatolin, D., Sumin, D., Napadovsky, V., Borisov, A. (March 2013). Methodology for stereoscopic motion-picture quality assessment. *Proc. SPIE 8648, Stereoscopic Displays and Applications XXIV*, 8648, 864810-1-864810-14, doi:10.1117/12.2008485. Graph reproduced under fair use for purposes of research.

Figure 5-2

Depth Budget Distribution of Selected S3D Film Releases



Note. From Graphics & Media Lab at Moscow State University. Voronov, A., Vatolin, D., Sumin, D., Napadovsky, V., Borisov, A. (March 2013). Methodology for stereoscopic motion-picture quality assessment. *Proc. SPIE 8648, Stereoscopic Displays and Applications XXIV*, 8648, 864810-1-864810-14, doi:10.1117/12.2008485. Graph reproduced under fair use for purposes of research.

Figure 5-1 and Figure 5-2 indicate graphically the use of depth budget in a number of studied films that were released in Stereoscopic 3-D. These figures can be viewed in a graphical top-down view of what is commensurate with a cinema viewing environment. With this view looking down on a cinema environment, the zero-percentile marker on the Y axis can be seen to represent the cinema (or television) screen. The space above this zero is the usable 3-D space between the viewer and the screen, with the space below the zero-percentile representing the 3-D space utilised behind the screen. In this manner, a visual representation of which films use more or less depth budget is clear and easily distinguishable from one another. The graphs (Figure 5-1 and Figure 5-2) created by the Graphics Media Lab in Moscow (Voronov et al., 2013) were assembled for these Russian researcher's purposes of comparing depth budgets of

S3D films specifically to their year of production. However, for this current research study, the Voronov data is being used to compare the amount of depth being utilised in front of the screen, behind the screen, or both, for these films with the new research data. Comparisons between each film's use of depth space become significant here, rather than specifically when these films were created (although such storytelling characteristics that reflect a particular time in the evolution of S3D storytelling practice is important to the progression of S3D implementation).

5.2 Student Participation

Students in the April 2016 "Intro to S3D" 1st Event, did five three-hour sessions of introductory knowledge of 'how Stereoscopic 3-D is created'. It was designed to give the students enough technical knowledge to understand the constraints of the medium but more importantly, to understand the processes when it came time to decide when and where to implement S3D eventually for best storytelling. The weekly three-hour sessions added to their existing traditional 2D knowledge, which is imperative to the application of S3D, and this built an *additional* skill base to the traditional model rather than an *alternative* one to 2D.

After applying their new skills and also reinterpreting their 2D skills, the students quickly became engaged in applying these new ideas to the S3D film productions they viewed for the coursework. As a result, the expectation was then set that where possible, the students would also watch S3D film excerpts/productions between classes, to gather the extra knowledge that comes from experience.

Focus group discussions were employed along with surveys for qualitative data retrieval, and these focus group discussion meetings were subsequently transcribed and tabled for thematic analysis. After each weekly session, the students were screened sections of a number of S3D films after the coursework. Each film excerpt screened (being either a complete S3D film or at least thirty minutes of an S3D film), was followed by a discussion between the students in the group regarding the perceived use of the 3-D space in each film, and whether it accomplished three things. First, in regard to the depth usage, each student for the first time substantiated for themselves just how much of the 3-D space was used, and whether it benefited the story or not. Second, each discussion highlighted any differences between individual students' perceptions of the use of the application of depth in these S3D productions. Third, for the researcher, a chance to understand how well the course itself worked in delivering the 3-D grammar understanding hoped for by the researcher in this new arena of film production.

5.2.1 Participation in Viewing Sessions

Students undertaking the "Intro to S3D" course indicated to the researcher that they were inspired by the coursework, and as a result they were keen to view the S3D films as a part of this 'new media' coursework. Having the chance to apply the theories learned, in not only how S3D is created, but how some notable filmmakers applied these theories to help tell the film's story (or not help tell the film's story as the case may be), became a form of summary test of what these student participants had learned. Some students in the April 2016 1st Event group sessions described their insecurity in relating their views of the use of S3D in these film screening sessions. "I'm not sure that I know enough about what good S3D looks like yet to comment much on these films" (Case Study-1st Event, student #8).

These students were subsequently told that their views of this new field of S3D were valid as they progressed in their knowledge, and as a result were very useful in the researcher's discussions with them.

> "You students know more about 3-D than most cinema-going people because most people don't look past the fact that there is some kind of 3-D on the screen. Your input is also valuable because I am looking for whatever your level is as a part of this research" (Case Study-1st Event, Researcher).

5.2.2 Participation in the Learning Environment

The five-session coursework of this initial "Intro to S3D" delivery used a mostly face-to-face (F2F) approach with a small amount of a blended learning model (Graham, 2013a) included (where the students were asked to read and view some S3D content before coming to the face-to-face session). A significant aspect to the learning and teaching of this "Intro to S3D" module was the original content created by the researcher for the five face-to-face classroom sessions. The five sessions involved students undertaking in-class exercises in viewing images and video clips with standard (non-S3D) viewing techniques, in order to build a catalogue of understanding of stereoscopic concepts before applying these to viewed S3D movies.

The first iteration of this "Intro to S3D" coursework saw all ten enrolled undergraduate students participate with 100% attendance over the five weekly sessions. These student retention figures indicated to the researcher that these students were more driven to attend each class for three reasons. One was the fact that the course was not grade assessable in regards to affecting any of their formal undergraduate studies that they may be enrolled in, and so took the pressure off their academic performance in this "Intro to S3D" course. Second, there was no monetary cost to them to do the course, with the only prerequisite of their acceptance into the course being a prior understanding of the principles of cinematography and basic filmmaking procedures. This prerequisite knowledge not only ensured the best chance for each student of understanding the area of S3D as it related to traditional filmmaking, but it also saved much time in this five-session course in not having to re-cover many traditional filmmaking basics that are often common to S3D production techniques. Third, the students undertaking these "Intro to S3D" courses being undergraduate film students, were aware of the rare nature of the opportunity to learn a "new" area of filmmaking in the form of Stereoscopic 3-D that was not delivered in any film schools in Australia at that time. For all these reasons, the motivation to learn appeared well above the average of the accredited Bachelor of Film coursework these students otherwise attended.

5.3 Results of Learning

As S3D is perceived by many (including traditional filmmakers and film students) as a "new" form of film, the average cinema-goer's perception of depth whilst viewing an S3D film is conceptually a breaking of new ground for the common viewers of Stereoscopic 3-D films due to its unfamiliarity. After consideration has been given to any physical problems being out of the equation (eye strain issues for instance), the viewer has no choice but to compare their own perception of the use of 3-D space in S3D film production with the first thing that they can compare it to, being real life. The result in the viewer's mind as to what works, and what doesn't work for successful 3-D viewing, is learned by the viewer in the form of a simple question of whether it looks "right", or whether it doesn't. It is a knowledge gained by the viewer in a constructionist form (Piaget, 1978) where the knowledge is actively gained by the viewer and their perception, rather than the knowledge being delivered to the viewer by someone else as to what looks good in S3D, and what doesn't (Fosnot, 1996).

An important second tier view of the perception of S3D, is when structuralist and formalist film theory is viewed within the application of S3D, just as the combination of all technical elements of film (editing, music, lighting, and design) bring much more to the screen than just the image in front of the viewer. As discussed in the literature review chapter, the structuralist and particularly the formalist view of film sees "spiritual and psychological truths that can best be represented by distorting and exaggerating the image" (Gianetti, 2010, p. 3) and so distances itself from the realism of filmmaking in a documentary style. To a lesser extent classicist film theory also suits S3D usage where the standard film techniques aren't as obtuse as those used in formalist theory, but still present a colourful slant to a story without drawing too much attention to itself (Gianetti, 2010, p. 4)

By combining the results from all research events in this S3D study such structuralist, classicist, and formalist film theory modelling can easily be applied and shows that S3D can be manipulated to work within these topical theories of film grammar.

The initial results in this Case Study-1st Event after the April 2016 "Intro to S3D" delivery, was through analysis of screenings of the 3-D feature films, "Dial M for Murder" (Hitchcock, 1952), "Journey to the Centre of the Earth" (Brevig, 2008), "Gravity" (Cuarón, 2013), "Sanctum" (Grierson, 2011), "Legend of the Guardians: The Owls of Ga'Hoole" (Snider, 2010), "Mad Max: Fury Road" (Miller, 2015), and "The Martian" (Scott, 2015). Each film was screened in 3-D, either as the complete film or a major portion of it, so that the Case Study participants could make direct comparisons between all the films' use of 3-D.

From the data supplied in the "S3D Depth Budget Graphic Surveys" (Figure 5-3) which showed overall impressions of the S3D's application to storytelling, it stands to reason, that if the research participants indicate that the 'S3D and Story Integration' codes and descriptor ratings (Table 5-1) reflect beneficial characteristics in seamless use of S3D in storytelling, then other associated S3D characteristics for these same movies will describe best practice in future S3D production. This is where the results from this project, as drawn from the combined surveys, group discussions, and interviews, will triangulate to an S3D model that address this study's research questions and aims.

The "Dial M for Murder" (Hitchcock, 1952) example was chosen as a 3-D screening production for this study due to its historic value, as it was generally acknowledged by film critics as one of the better films of the mid-20th Century early wave of 3-D films released (Parkinson, 2006). The "Journey to the Centre of the Earth" (Brevig, 2008) excerpt was chosen by the researcher as an example of the 3-D films released relatively early in the 21st century resurgence of 3-D in cinemas. The "Journey to the Centre of the Earth" release was timed not long after the enormous spectacle that James Cameron's "Avatar" (Cameron, 2005) made, and so represents one of many similar 3-D films that hit the market at around that time. Alfonso Cuarón's "Gravity" (Cuarón, 2013) is one of the more recent examples of single-camera post-converted Stereoscopic 3-D processes, and so represented such post-converted S3D films that are appearing more often in cinemas. By definition, a "true" 3-D production is optically created by shooting then combining two separate camera views similar to human eye binocular vision (where two cameras are used each for left and right eye views), in contrast to a post-converted 3-D production. Such a post-produced 3-D production is a film shot with just one camera but then digitally converted in a film's post-production stage to two separate image streams for eventual 3-D reconstruction. The optical "true" method of S3D production has been seen as a purist's method of Stereoscopic 3-D production and is relatively expensive to make, whereas the post-converted method despite being a much cheaper method of S3D creation, until recent years, made up the vast majority of poorly received S3D feature films.

Australian productions "Sanctum" (Grierson, 2011), and "Legend of the Guardians: The Owls of Ga'Hoole" (Snider, 2010) were both made at a similar time as far as S3D evolution. They display a high-level representation of animated S3D ("Legend of the Guardians: The Owls of Ga'Hoole"), along with an example of live action S3D ("Sanctum"), in this case shot in particularly close-quartered locations (i.e. underground cave systems). Such close-quartered locations mean that many common technical stereoscopic issues in trying to accommodate distant horizon locations are averted. Miller's "Mad Max: Fury Road" (Miller, 2015), on the other hand combines both distant horizon locations along with close-quartered locations. "Mad Max: Fury Road" (Miller, 2015) was shot in desert locations in Namibia with vast expanses of desert and mountainous vistas coupled with close-quartered truck cabin interior dialogue scenes and is an example of a 2015 era post-converted S3D process. Ridley Scott's "The Martian" (Scott, 2015), also shot with one camera and post-converted, is another example of high-level production values that belies the fact that it was created using the post-converted S3D process.

This cross-section was indicative of the films released in the relatively early stages of the new wave of S3D up until 2015, excluding Hitchcock's 1952 "Dial M for Murder" (Hitchcock, 1952) which arguably represents the better received of the first wave of 3-D films from the mid 20th century.

5.3.1 Case Study-1st Event - Depth Model Learning Results

The first class of ten students of the April 2016 instance of the "Intro to S3D" course completed surveys, interviews, and group discussions during and after completion of this course. The results from these methods of analysis were triangulated, and so created data on S3D depth placement models of each of the above listed S3D films whose characteristics would define better pathways for future S3D production.

The combination of qualitative and quantitative methods of data gathering meant that a combination of two different survey sheets, with similar observation requests, were different enough to enable objective cognisance of the more successful attributes of S3D usage. The results from these surveys were then combined with the results of the group discussions held during and after the screenings that also covered similar areas within the group environment.

The resulting depth model readings by each student and also as a group, were based on each student's application of newly learned principles of Stereoscopic 3-D, through the study and completion of the "Intro to S3D" coursework. It also required of these students the viewing of a number of S3D feature films (or large excerpts from these) in order to apply their newfound knowledge, along with their prerequisite knowledge of basic cinematography, editing, and film studies, to discern what depth model(s) can be gleaned for future betterment of S3D film production.

All students participated in group discussions about the S3D screenings with these discussions annotated by the researcher to then be used as a primary qualitative data source for this study. The students filled out a series of data gathering forms also, that formed the basis of the survey data source collected for this research.

The following indicates the survey forms and transcriptions used for this study:

- An "S3D Depth Budget Graphic Survey" sheet completed by each participant indicating their perceived reading of the depth characteristics for each S3D film viewed.
- 'S3D and Story Integration' data gathered on each student's reading of the effect of S3D on that film's storytelling.
- A Likert Survey with eight questions relating to S3D usage in each film.
- Transcriptions of each Event's focus group's discussions after each S3D film screening.
- "Intro to Stereoscopic 3-D" Course Survey for feedback and data on the delivery of the actual coursework.

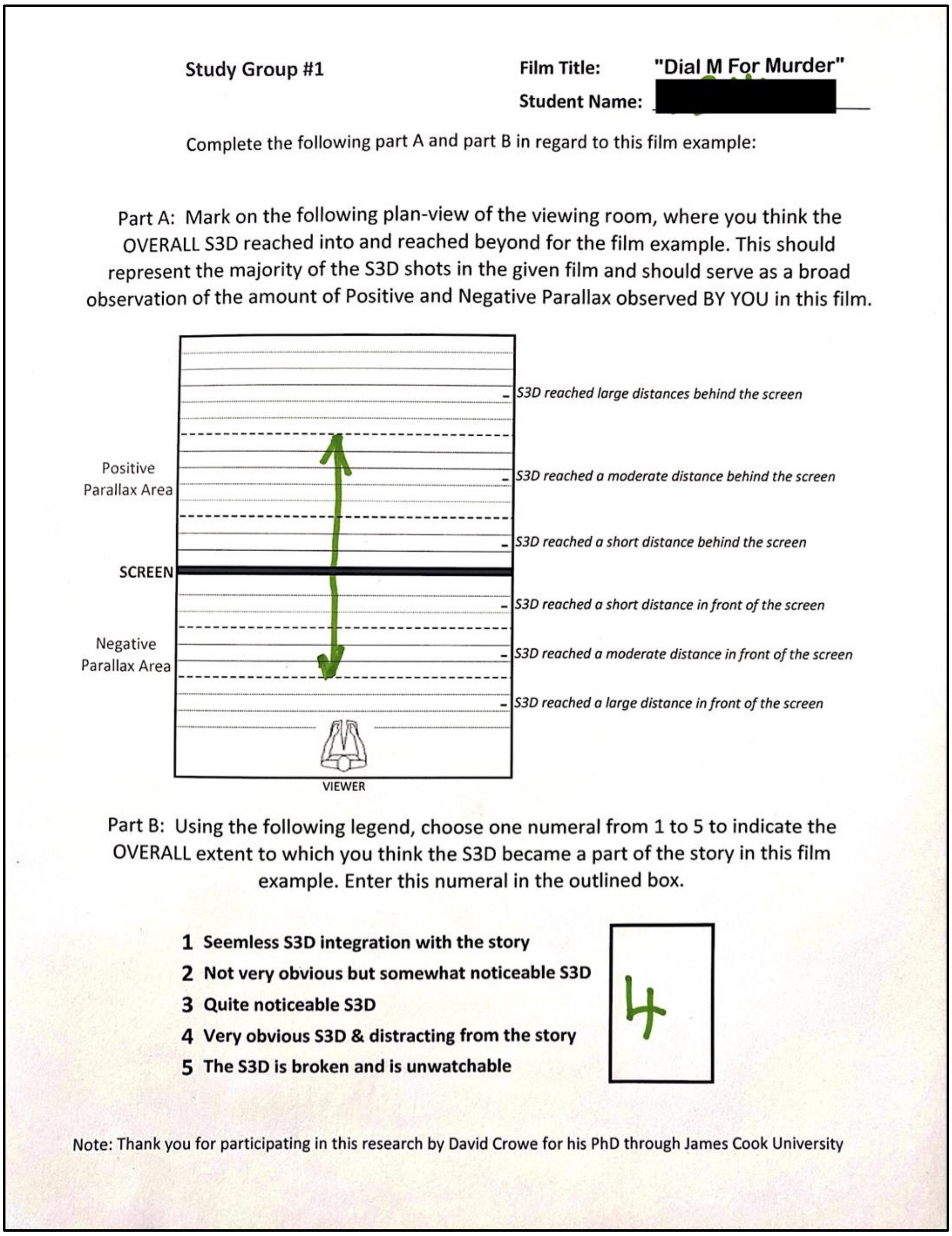
From each of these sources the data is interpreted and displayed as tables and graphs within this research study documentation.

Each of the selected S3D films chosen for the first "Event" Focus Group (named hereafter as "Case Study-1st Event" group) has its data gathered from each of the students' observations one S3D film at a time. So, for each S3D film there are depth charts, numeric coding to indicate the "effectiveness of S3D on story" as observed by each student, and then the group's discussion data which was analysed for each film. This is then followed by an analysis of the combined results from all of these films together, showing a broader view of all of the films' results which is then tabled and discussed at that point.

The initial data was gathered from each student during or directly after the screening indicating their immediately perceived view of just where the S3D was placed for each of the S3D films viewed for this research. An example of one of these filled-in sheets is shown in Figure 5-3 and is titled "S3D Depth Budget Graphic Survey". Not only does this graphic survey report the variations of parallax depth perceived in these films (similar to the Voronov data in Figure 5-1) but it also presents choices for participants for subsequent analyses of S3D characteristics on storytelling which will be independently described for this writing as "S3D & Story Integration" coded numeral.

Figure 5-3

Example "S3D Depth Budget Graphic Survey" Sheet


Study Group #1

Film Title: **"Dial M For Murder"**

Student Name: [redacted]

Complete the following part A and part B in regard to this film example:

Part A: Mark on the following plan-view of the viewing room, where you think the OVERALL S3D reached into and reached beyond for the film example. This should represent the majority of the S3D shots in the given film and should serve as a broad observation of the amount of Positive and Negative Parallax observed BY YOU in this film.

Part B: Using the following legend, choose one numeral from 1 to 5 to indicate the OVERALL extent to which you think the S3D became a part of the story in this film example. Enter this numeral in the outlined box.

1 **Seemless S3D integration with the story**
2 **Not very obvious but somewhat noticeable S3D**
3 **Quite noticeable S3D**
4 **Very obvious S3D & distracting from the story**
5 **The S3D is broken and is unwatchable**

4

Note: Thank you for participating in this research by David Crowe for his PhD through James Cook University

Note. Case Study-1st Event example "S3D Depth Budget Graphic Survey" sheet showing the "S3D and Story Integration" numeric section at the bottom.

Table 5-1

'S3D and Story Integration' Codes and Descriptors

Code	*Descriptor*
1	Seamless S3D integration with the story
2	Not very obvious but somewhat noticeable S3D
3	Quite noticeable S3D
4	Very obvious S3D and distracting from the story
5	The S3D is broken and is unwatchable

Note. Results from "S3D Depth Budget Graphic Survey" sheet

In order to capture a specification of S3D design that works in unison with the film's story being told, this set of qualitative descriptions of S3D design was placed at the bottom of this "S3D Depth Budget Graphic Survey" sheet. Along with a corresponding code number entered by participants the 'S3D and Story Integration' descriptor choices are shown in Table 5-1.

Each group participant entered their perceived view of 'S3D and story integration' for each film on the same "S3D Depth Budget Graphic Survey" sheet (Figure 5-3) for analysis.
Here again is the list of films viewed by the Case Study-1st Event students over the course of this first "Intro to S3D" course delivery:

- "Dial M for Murder" (Hitchcock, 1952)
- "Journey to the Centre of the Earth" (Brevig, 2008)
- "Gravity" (Cuarón, 2013)
- "Sanctum" (Grierson, 2011)
- "Legend of the Guardians: The Owls of Ga'Hoole" (Snider, 2010)
- "Mad Max: Fury Road" (Miller, 2015)
- "The Martian" (Scott, 2015)

Using the following structure each Event/S3D film is presented similarly:

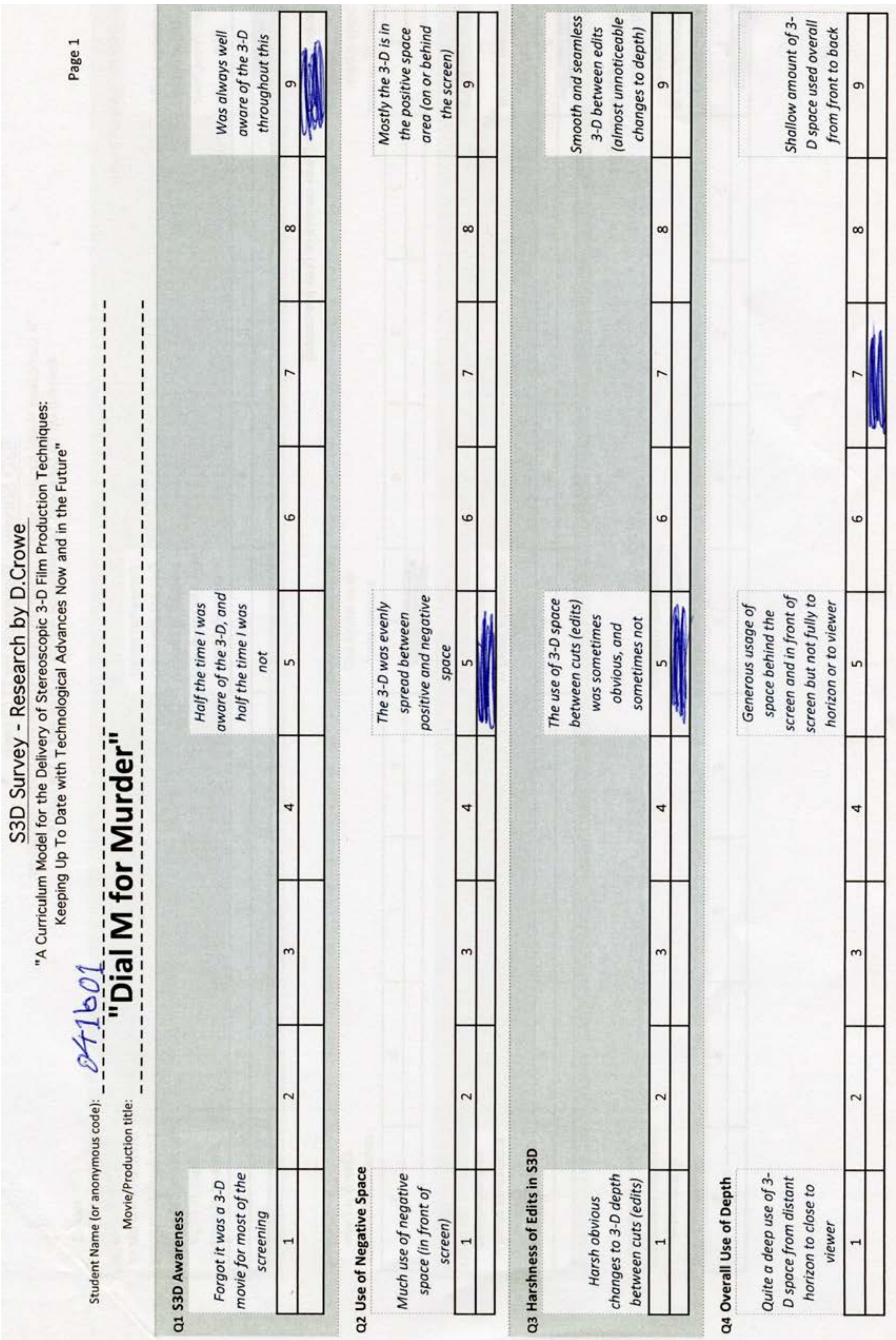
- Depth model observations of the specific S3D film title in question, including poignant points that may have come out of group discussions.
- Survey analysis of each of the S3D Depth characteristic and Likert surveys.
- A summary of the S3D depth model learning results for that film.

Starting with the first S3D film screening being "Dial M for Murder" (Hitchcock, 1952), as an explanation for the first representation of data here, the summary recorded data of the Case Study-1st Event group is shown in Figure 5-6 as a summary result from each student's individual "S3D Depth Budget Graphic Surveys" (Figure 5-3). This summarised combined data for the group's depth observations, is also represented in the form of a "top-down" view of an S3D film screening. It graphically displays a token cinema-viewer seated in place on the right, with a representation of a cinema/television screen in the centre, and the mean amount of S3D depth observed as coloured arrows. The orange arrow indicates the amount of negative parallax space usage observed by all Case Study-1st Event students as an average, and the blue arrow indicates the amount of positive parallax space usage observed by all Case Study-1st Event students as an average. On the right side of the "Combined S3D Depth Budget Graphic Survey" (Figure 5-6), there is also a listing of the summarised overall "S3D & Story Integration" rating for each of the combined group of students. A Likert Survey was also implemented for the triangulation of results. Here are the eight questions posed in the Likert survey for each film screened for each of the three Case Study events:

Question 1: S3D Awareness
From "Forgot it was a 3-D movie for most of the screening" at Likert scale of 1, to "Half the time I was aware of the 3-D, and half the time I was not" at Likert scale of 5, to "Was always well aware of the 3-D throughout this" at Likert scale of 9.
Question 2: Use of Negative Space
From "Much use of negative space (in front of screen)" at Likert scale of 1, to "The 3-D was evenly spread between positive and negative space" at Likert scale of 5, to "Mostly the 3-D is in the positive space area (on or behind the screen)" at Likert scale of 9.
Question 3: Harshness of Edits in S3D
From "Harsh obvious changes to 3-D depth between cuts (edits)" at Likert scale of 1, to "The use of 3-D space between cuts (edits) was sometimes obvious, and sometimes not" at Likert scale of 5, to "Smooth and seamless 3-D between edits (almost unnoticeable changes to depth)" at Likert scale of 9.
Question 4: Overall Use of Depth
From "Quite a deep use of 3-D space from distant horizon to close to viewer" at Likert scale of 1, to "Generous usage of space behind the screen and in front of screen but not fully to horizon or to viewer" at Likert scale of 5, to "Shallow amount of 3-D space used overall from front to back" at Likert scale of 9.
Question 5: Overall Change in Depth Usage
From "Little change to the amount of depth utilised throughout film" at Likert scale of 1, to "Somewhat varied (but not dramatic) amount of change from shot to shot of 3-D space usage" at Likert scale of 5, to "Quite a varied use of 3-D depth from scene to scene (from little depth to large amount of depth)" at Likert scale of 9.
Question 6: Awareness of S3D Process (Twin-camera or Post-processed)
From "Clearly a Post-produced S3D process" at Likert scale of 1, to "No discernible clues as to which S3D process used" at Likert scale of 5, to "Clearly a Twin-camera S3D process" at Likert scale of 9.

Figure 5-4

Likert Survey Question Sheet 1 of 2



S3D Survey - Research by D.Crowe

"A Curriculum Model for the Delivery of Stereoscopic 3-D Film Production Techniques:
Keeping Up To Date with Technological Advances Now and in the Future"

Page 1

Student Name (or anonymous code): 041601

Movie/Production title: "Dial M for Murder"

Q1 S3D Awareness

1	2	3	4	5	6	7	8	9
Forgot it was a 3-D movie for most of the screening				Half the time I was aware of the 3-D, and half the time I was not				Was always well aware of the 3-D throughout this

Q2 Use of Negative Space

1	2	3	4	5	6	7	8	9
Much use of negative space (in front of screen)				The 3-D was evenly spread between positive and negative space				Mostly the 3-D is in the positive space area (on or behind the screen)

Q3 Harshness of Edits in S3D

1	2	3	4	5	6	7	8	9
Harsh obvious changes to 3-D depth between cuts (edits)				The use of 3-D space between cuts (edits) was sometimes obvious, and sometimes not				Smooth and seamless 3-D between edits (almost unnoticeable changes to depth)

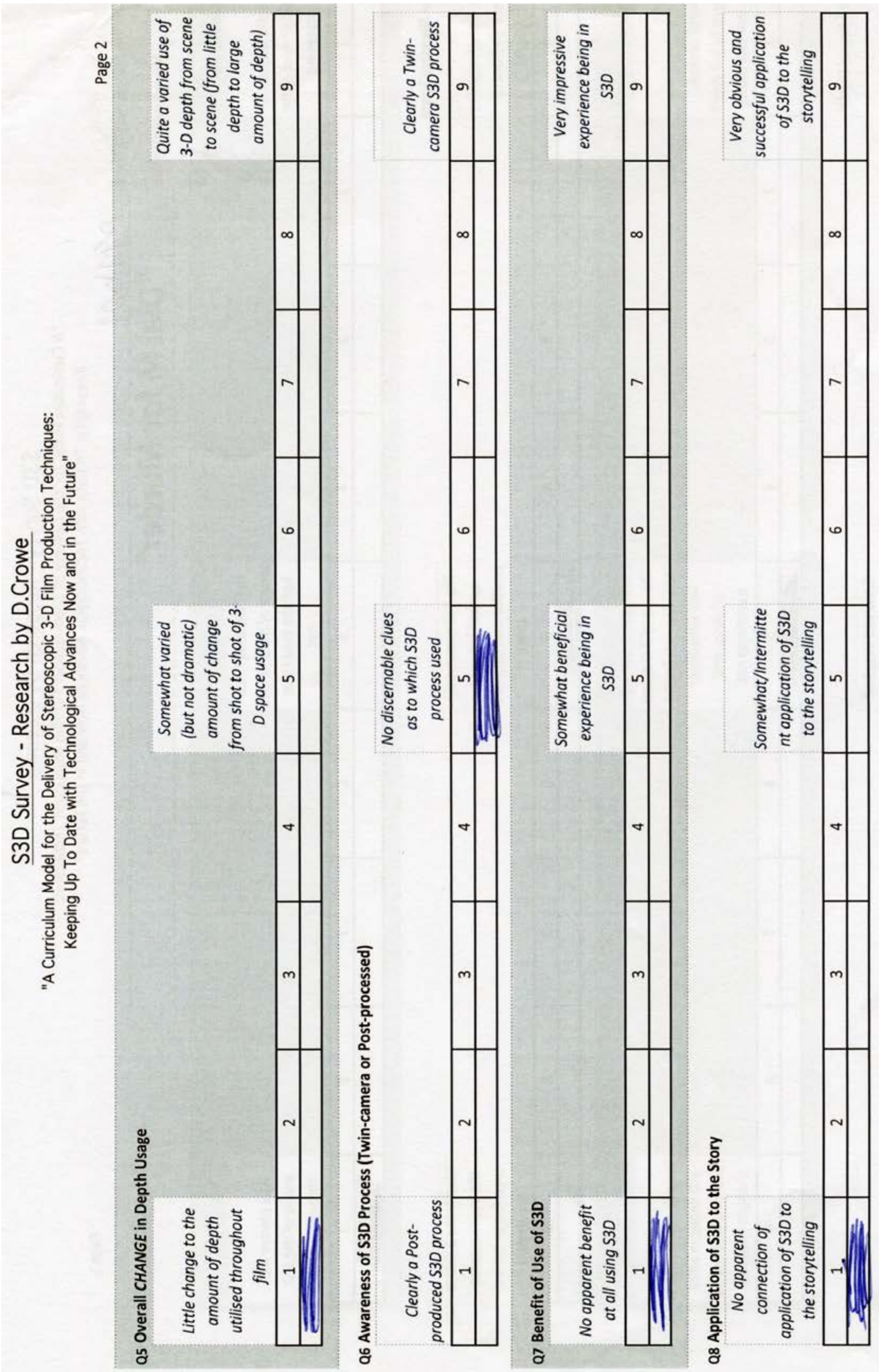
Q4 Overall Use of Depth

1	2	3	4	5	6	7	8	9
Quite a deep use of 3-D space from distant horizon to close to viewer				Generous usage of space behind the screen and in front of screen but not fully to horizon or to viewer				Shallow amount of 3-D space used overall from front to back

Note. Likert survey question sheet upon completion by student participant after screening of "Dial M for Murder" (Hitchcock, 1952)

Figure 5-5

Likert Survey Question Sheet 2 of 2



S3D Survey - Research by D.Crowe

"A Curriculum Model for the Delivery of Stereoscopic 3-D Film Production Techniques:
Keeping Up To Date with Technological Advances Now and in the Future"

Page 2

Q5 Overall *CHANGE* in Depth Usage

1	2	3	4	5	6	7	8	9
Little change to the amount of depth utilised throughout film				*Somewhat varied (but not dramatic) amount of change from shot to shot of 3-D space usage*				*Quite a varied use of 3-D depth from scene to scene (from little depth to large amount of depth)*

Q6 Awareness of S3D Process (Twin-camera or Post-processed)

1	2	3	4	5	6	7	8	9
Clearly a Post-produced S3D process				*No discernable clues as to which S3D process used*				*Clearly a Twin-camera S3D process*

Q7 Benefit of Use of S3D

1	2	3	4	5	6	7	8	9
No apparent benefit at all using S3D				*Somewhat beneficial experience being in S3D*				*Very impressive experience being in S3D*

Q8 Application of S3D to the Story

1	2	3	4	5	6	7	8	9
No apparent connection of application of S3D to the storytelling				*Somewhat/Intermittent application of S3D to the storytelling*				*Very obvious and successful application of S3D to the storytelling*

Note. Likert survey question sheet upon completion by student participant after screening of "Dial M for Murder" (Hitchcock, 1952).

Question 7: Benefit of Use of S3D

From “No apparent benefit at all using S3D” at Likert scale of 1, to “Somewhat beneficial experience being in S3D” at Likert scale of 5, to “Very impressive experience being in S3D” at Likert scale of 9.

Question 8: Application of S3D to the Story

From “No apparent connection of application of S3D to the storytelling” at Likert scale of 1, to midway at “Somewhat/Intermittent application of S3D to the storytelling” at Likert scale of 5, to “Very obvious and successful application of S3D to the storytelling” at Likert scale of 9.

The graphical layout of the above Likert questions, descriptors, and numeric values as used for each of the three events in this Case Study are shown in the two images of the double-paged survey (Figure 5-4, and Figure 5-5). These images are of one of the actual Likert surveys completed for the film “Dial M for Murder” (Hitchcock, 1952) by a Case Study-1st Event participant.

5.3.1.1 Case Study-1st Event - Depth Model Learning Results “Dial M for Murder” (Hitchcock, 1952)

The Combined S3D Depth Budget Graphic Survey data for “Dial M for Murder” (Hitchcock, 1952) as shown in Figure 5-6 suggests that very little depth space on or just in front of the cinema screen was observed to be utilised in this film. Some indication was also given by the observers that objects appeared generally forward of the screen, and also a good way behind the screen rather than near the screen. When comparing this depth usage observation with the coded ‘S3D integration with story’ (Table 5-1) descriptor choices on this same Combined S3D Depth Budget Graphic Survey, it appears that “Very obvious S3D and distracting from the story” as well as “Quite noticeable S3D” descriptors were chosen by all focus group participants.

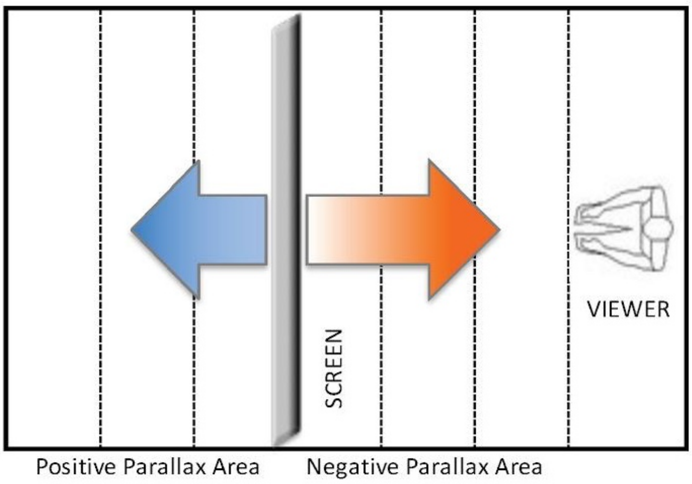
The average marked score out of 5 (with “5” being the rating of most successful integration of S3D as a part of the story, and “1” being the least effective in enhancing the story) for “Dial M for Murder” is 3.4 for this group. Keeping in mind that this film was quite a relatively early example of S3D filmmaking in cinema, this might explain the obviousness of the presence of the S3D, and aligns this with significant S3D space usage well in front of the screen, as well as proportionally allocated depth behind the screen. For this film, it appears from this survey that most participants recognised that the significant S3D depth placement supported the storytelling to only a minimal extent.

Figure 5-6

Combined S3D Depth Budget Graphic Surveys (Case Study-1st Event) for "Dial M for Murder" (Hitchcock, 1952)

Results for: **"Dial M for Murder"**

	Distance behind the screen			Distance in front of screen			
Student:	S3D reached large distances behind the screen	S3D reached moderate distance behind the screen	S3D reached a short distance behind the screen	S3D reached a short distance in front of the screen	S3D reached moderate distance in front of the screen	S3D reached a large distance in front of the screen	Rating of what extent S3D became a part of the story:
# 1		•			•		4
# 2			•		•		3
# 3		•			•		4
# 4		•				•	3
# 5			•		•		4
# 6		•			•		3
# 7		•				•	3.5
# 8		•			•		3
# 9		•			•		3.5
# 10			•		•		3



1= Seamless integration with the story
2= Not very obvious but somewhat noticeable S3D
3= Quite noticeable S3D
4= Very obvious S3D and distracting from the story
5= The S3D is broken and is unwatchable

Note. Case Study-1st Event group - Combined results from each of ten participant's observations in the S3D Depth Budget Graphic Survey, and their reading of 'Story Integration' using the codes at the bottom of the figure, after the screening of "Dial M for Murder" (Hitchcock, 1952)

When comparing this combined S3D Depth Budget Graphic survey result with the 1st Event's group discussion on the Stereoscopic 3-D in "Dial M for Murder", more detail is uncovered. This 1st Event group recorded a comment from one student that the "Dial M for Murder" screening "showed a distinct drawing of attention to foreground objects such as trees, furniture, and desk lamps, with characters and general dialogue shots occupying a literal middle ground" (Case Study-1st Event, student #3).

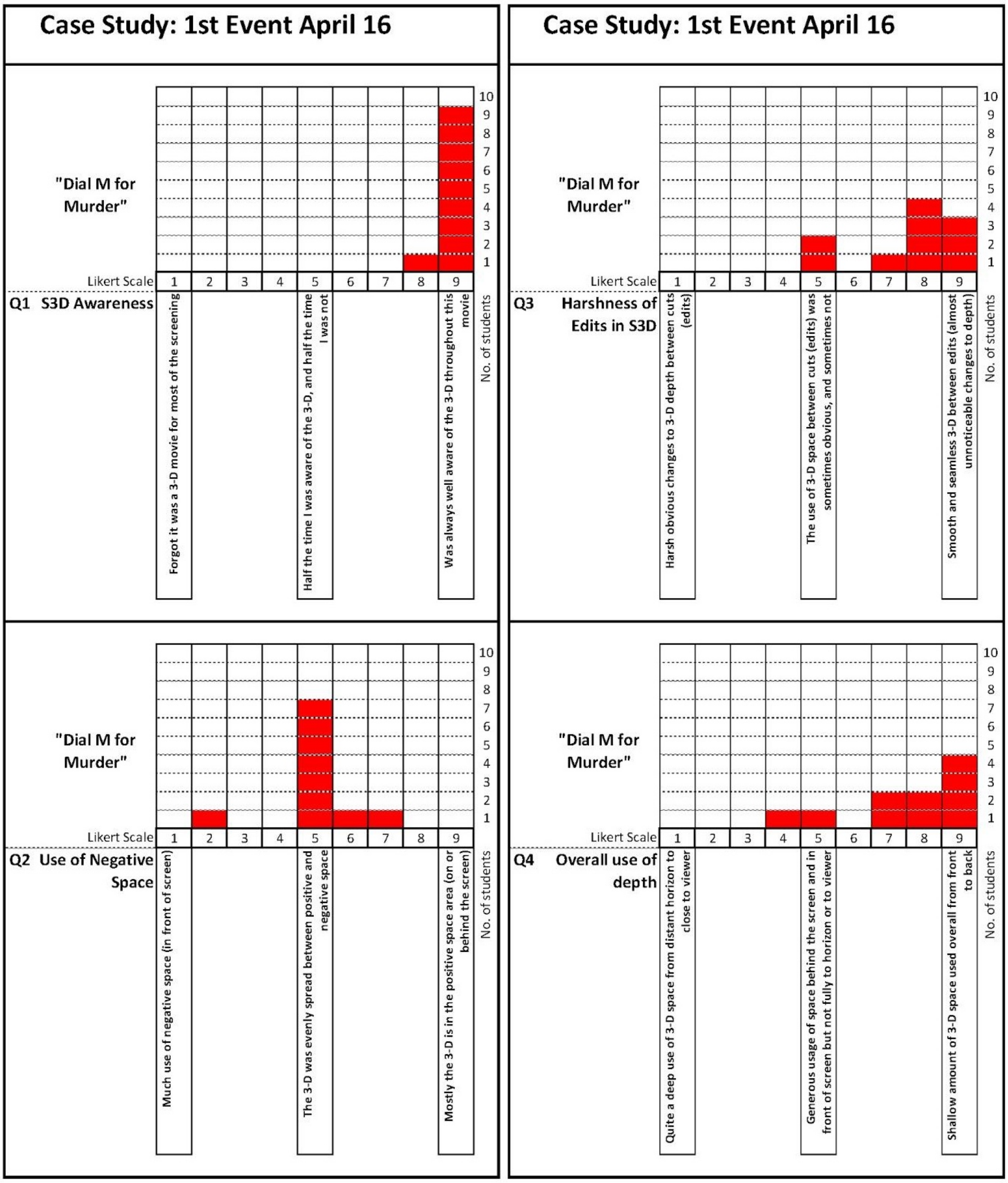
This broad characterisation by one participant in the focus group was agreed to by others in this focus group. There was also common agreement that an included dramatic sequence of the actual character's 'murder' was heightened by good use of the 3-D. "[It] highlighted the drama of the scene with the murder victim seeming to reach to the cinema viewer 'for help' using the personal space between the screen and the viewer" (Case Study-1st Event, student #6). "The intermittent use of S3D may well be more impactful to the story than regularly paced S3D implementation" (Case Study-1st Event, student #7).

Taking a look at the results of all the Likert surveys for this Case Study-1st Event team in the form of Bar Graphs of the combined group's surveys (Figures 5-7 and 5-8) the following is extracted from the combined Likert data. In Question 1 of the Likert survey for "Dial M for Murder" (Hitchcock, 1952) it is clear from the graph that in this 1st Event, without exception, the S3D was deemed to be "obvious" throughout the film with the viewers always aware of the S3D on the screen.

As far as the utilisation of the 3-D space between the viewer and the screen (the negative parallax) and the 3-D space utilised behind the screen (the positive parallax), Question 2 of this Likert survey indicated that all of the respondents had noted that the 3-D was evenly spread in front of the screen and behind the screen (Figure 5-7). Question 3 was designed to indicate observations of the participants of the harshness of the edits between 3-D shots but, as will be shown later in this study, not many students found this aspect of S3D in cinema to have much noticeable effect on the S3D at either extreme. A broader range was found from these 1st Event participants in Question 4, about how much depth was used throughout the film. There was a general consensus in this group that not a great deal of S3D depth space was utilised and the film mostly ever used a shallow amount of depth from front to back (Figure 5-7). Two respondents indicated that they observed a more generous (medium) amount of space being utilised however most (eight) respondents saw it as shallow.

Figure 5-7

Bar Graph Compilation (Case Study-1st Event) Likert Surveys Q1-Q4 for "Dial M for Murder" (Hitchcock, 1952)



Note. Compilation of ten participant's results in Case Study-1st Event surveys of Q1-Q4 for "Dial M for Murder" (Hitchcock, 1952)

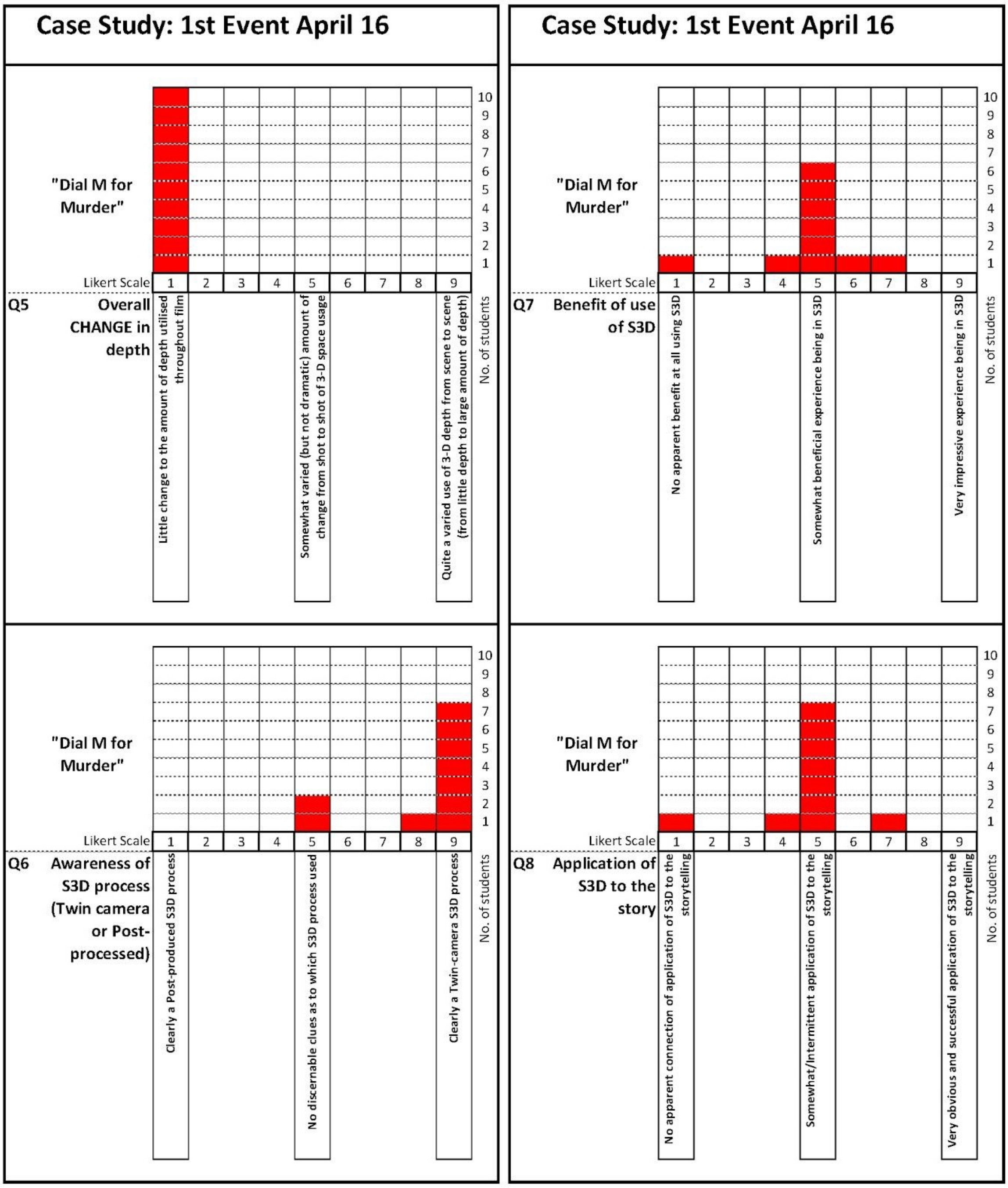
Participant observation of *changes* in the amount of 3-D depth throughout the film (Question 5) indicated that there was almost no obvious change to the variation of depth used in the S3D from shot to shot. 100% of participants marked “1” on the Likert scale indicating “Little change to the amount of depth utilised”. In question 6 of the combined Likert surveys in regard to the “Awareness of S3D Process (Twin camera or post-processed)”, most of the group participants recognised “Dial M for Murder” (Hitchcock, 1952) to have been made with the higher S3D quality of a twin-camera S3D origination rather than the lesser quality of a post-produced process of S3D of later years (not actually an option for S3D films made in 1952). This question in the survey requires some deconstruction in order to understand the significance of the twin-camera versus the post-production process of S3D. Following is a detailed unpacking of the nature of this question in order to understand its significance in this survey.

In recognising the difference between a twin-camera or a post-converted 3-D process a sometimes broadly identifiable characteristic of a cardboard cut-out/poor quality 3-D effect has been associated with the post-conversion method. This has clearly been evidenced by some disastrous early 3-D conversions on rushed 3-D feature films (like “Clash of the Titans (Leterrier, 2010)), and this cheaper but initially inferior 3-D conversion process began to find favour with budget-conscious producers. Unfortunately for the evolution of S3D in cinema, this also found an almost immediate recognition by S3D audiences that a post-converted 3-D movie would inevitably indicate that a likely bad experience of S3D was to follow. So, the fact that a film’s S3D was created via a post-conversion process, soon meant that this was a quick way to identify a likely poor quality S3D production by its ‘label’ as a post-converted S3D film over a twin-camera likely higher-quality S3D production.

Compellingly however, in light of this survey question, and also in view of some of the more successfully created S3D films of recent years, this quality gap between the two processes closed significantly after the first decade and a half of the 21st century due to advances in S3D production, and so this survey question becomes more interesting when it addresses 3-D films made after about 2015. Evidence suggests (as will be shown later in this study) that some S3D films made from around this 2015 period, that were *not* created with two cameras (which had a left and right twin image source), have actually provided quite effective S3D experiences. It has now come to the point where it is arguably quite difficult to recognise which of these two ‘opposing’ processes were employed when viewing some of the more recent S3D film productions. Therefore, in the case of “Dial M for Murder” (Hitchcock, 1952), where Question 6 concerns the observer’s awareness of a twin camera or a post-conversion S3D production process for this film, the results are likely influenced by the fact that the post-conversion process was indeed not even in existence at the time of this film’s production.

Figure 5-8

Bar Graph Compilation (Case Study-1st Event) Likert Surveys Q5-Q8 for "Dial M for Murder" (Hitchcock, 1952)



Note. Compilation of ten participant's results in Case Study-1st Event surveys of Q5-Q8 for "Dial M for Murder" (Hitchcock, 1952)

Despite this fact however, one participant still indicated that they saw little clue as to whether this film was created via twin-camera or post-conversion process. In their defence, the survey's question was explained to all the groups by the researcher, that the proposed point dealt more with any obvious S3D elements that could be characterised as being associated with the post-conversion S3D process. As such, any indication of a flattened cardboard cut-out appearance of 3-D could easily become synonymous with the likelihood of a post-conversion 3-D process. Despite the age of this early 3-D production, at least one observer from the 1st Event recognised a somewhat flattened 3-D appearance and so indicated this within this question.

The question of whether the film itself has actually benefited in a broader sense from the inclusion of S3D is addressed in Question 7. For "Dial M for Murder" (Hitchcock, 1952) most participants showed a middle ground here, where the indication was that the S3D was of a "somewhat beneficial experience". One participant saw this film as having no benefit at all with the inclusion of S3D, but 90% of the participants were in the middle on this. The final Question 8 is specifically in regard to whether the application of S3D had actually helped tell the story. The results for this question for "Dial M for Murder" (Hitchcock, 1952) also showed a strong middle ground with 80% of respondents indicating a "somewhat/intermittent application of S3D to the storytelling".

5.3.1.2 Case Study-1st Event - Summary Depth Model Learning Results "Dial M for Murder" (Hitchcock, 1952)

In the triangulation of the Likert surveys, with the group discussions, and the "Combined S3D Depth Budget Graphic Surveys", the use of S3D in the film "Dial M for Murder" (Hitchcock, 1952) can be summarised as follows:

Table 5-2

"Dial M for Murder" (Hitchcock, 1952) Case Study-1st Event Depth Model Summary Result

No.	*Depth model characteristic description*
1	Medium negative parallax space usage with obviously placed foreground objects can be distracting and tiring.
2	Conspicuously placed 3-D objects for adding depth for its own sake is distracting.
3	No apparent reason for 3-D depth space placement doesn't help effective storytelling.
4	All of the above points made the S3D usage obvious and viewer-aware.
5	Some dramatic use of negative parallax space when used in contrast to less use of it around dramatic scenes works well.

So, this combined data from the 1st Event reflected that the Hitchcock 3-D example generally conveyed 3-D depth as a very basic and regularly implemented 3-D process, and seemed to illustrate *only* the fact that 3-D was utilised in this movie as the advertising of the movie at the time would have suggested. It did, however, also show the beginnings of the potential power of S3D in storytelling in the form of the dramatic touch that 3-D utilisation can have at given appropriate points. The Case Study-1st Event group results indicated that through watching this film the use of S3D may be more impactful to the story than regularly paced S3D implementation.

Given the "S3D and Story Integration" code for "Dial M for Murder" (Hitchcock, 1952) was recorded as an average of 3.4 (Figure 5-6), this indicates an "S3D and Story Integration" (Table 5-1) rating somewhere between "Quite noticeable S3D", and "Very obvious S3D and distracting from the story". By looking at all of these summary results it indicates that the S3D characteristics of this film (Table 5-2) should be considered as far as not incorporating them into a better configured and more useful S3D model.

5.3.1.3 Case Study-1st Event - Depth Model Learning Results "Journey to the Centre of the Earth" (Brevig, 2008)

"Journey to the Centre of the Earth" (Brevig, 2008) data and analysis is presented here with the following structure:

- Depth model observations, including points that may have come out of group discussions
- Survey analysis of each of the S3D Depth characteristic and Likert surveys
- Summary of the S3D depth model learning results

"Journey to the Centre of the Earth" (Brevig, 2008) was the next S3D film sequence screened for the 1st Event group. The survey results from the "Combined S3D Depth Budget Graphic Survey" (Figure 5-9) found a consistent observation of S3D depth space usage across the group's participants. Almost all saw a significant amount of negative parallax space being utilised for the most part, without using too much extreme reaching out of the screen. However, a small but significant number of 3-D shots were observed by the participants as reaching very close to the viewer.

Very distant (positive parallax) shots to a far horizon were not observed by any of the research participants for "Journey to the Centre of the Earth" (Brevig, 2008). On the "Combined S3D Depth Budget Graphic Survey" instead, short distance horizons and backgrounds were indicated.

The responses from the 1st Event group discussion for the 2008 film "Journey to the Centre of the Earth" (Brevig, 2008) indicated that specific S3D shots appeared gratuitous in nature. Having a toy yo-yo thrown directly into the lens(es) of the S3D camera(s) for reactive S3D effect (Figure 5-10) was termed by one participant as a cliched effect. "The yo-yo in the face near the beginning was only there to be a 3-D 'thing', kinda cliched" (Case Study-1st Event, student #4).

This was agreed with by all other participants in this 1st Event group. Due to several such shots in the opening sequence of this S3D film having similar gratuitous S3D shots, there became an air of expectation as noted by one group participant, as to "when the next gratuitous S3D shot might appear" (Case Study-1st Event, student #6).

Two participants reacted favourably to at least one of the more outrageous 3-D shots presented near the beginning of the film. "The opening beetle animated scene reached way into the audience space [the negative parallax area] and was great 3-D as far as in-your-face 3-D goes. But not a lot other than that was great 3-D" (Case Study-1st Event, student #4).

The fact that at least this one particular participant saw this 3-D shot from early in the film, as one of the only 3-D shots in "Journey to the Centre of the Earth" (Brevig, 2008) that was "great" was an indication that at least one person in this early Case Study Event group was expecting such reach-out-into-the-audience shots for a positive 3-D experience. A second participant also described this same shot to be "technically proficient and were better than other S3D shots" (Case Study-1st Event, student #5).

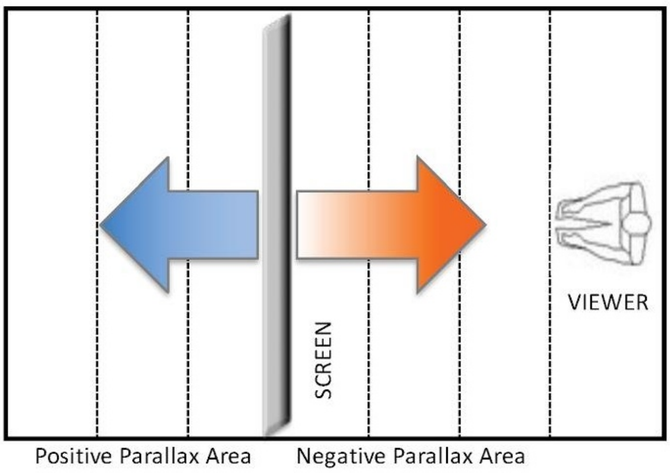
This added more weight to members of this 1st Event group expecting such S3D shots from the coursework they had undertaken. It is conceivable that such provocative S3D shots are presented to the movie-going audience in order to justify the 3-D label that they may have paid extra for at the box office to see. In which case outside of such gratuitous S3D shots the use of S3D otherwise is what will conceivably drive a better grammar with thoughtful integration of S3D. In light of this, it was observed by the 1st Event group in discussions during and after the screening, that some 3-D shots did seem to be created at a technically higher level (i.e. no painful or 'broken' S3D shots) and rose above a lot of this film's S3D sequences.

Figure 5-9

Combined S3D Depth Budget Graphic Surveys (Case Study-1st Event) for "Journey to the Centre of the Earth" (Brevig, 2008)

Results for: **"Journey to the Center of the Earth"**

	Distance behind the screen			Distance in front of screen			
Student:	S3D reached large distances behind the screen	S3D reached moderate distance behind the screen	S3D reached a short distance behind the screen	S3D reached a short distance in front of the screen	S3D reached moderate distance in front of the screen	S3D reached a large distance in front of the screen	Rating of what extent S3D became a part of the story:
# 1		•				•	3
# 2		•			•		2.5
# 3		•				•	4
# 4		•			•		3
# 5		•			•		3
# 6		•			•		3.5
# 7		•			•		2.5
# 8		•			•		2
# 9		•			•		2.5
# 10		•			•		2.5



1= Seamless integration with the story
2= Not very obvious but somewhat noticeable S3D
3= Quite noticeable S3D
4= Very obvious S3D and distracting from the story
5= The S3D is broken and is unwatchable

Note. Case Study-1st Event group - Combined results from each of ten participant's observations in the S3D Depth Budget Graphic Survey, and their reading of 'Story Integration' using the codes at the bottom of the figure, after the screening of "Journey to the Center of the Earth" (Brevig, 2008)

Figure 5-10

"Journey to the Center of the Earth" (Brevig, 2008) Novelty Value Shot #1

Note. Novelty value shot as observed by Case Study-1st Event group of yo-yo out from the screen for wow factor in "Journey to the Center of the Earth" (Brevig, 2008). Image owned by New Line Cinema but used under fair use for purposes of research, criticism, and review.

Figure 5-11

"Journey to the Center of the Earth" (Brevig, 2008) Novelty Value Shot #2

Note. Novelty value shot as observed by Case Study-1st Event group of tape measure right out from the screen for wow factor in "Journey to the Center of the Earth" (Brevig, 2008). Image owned by New Line Cinema but used under fair use for purposes of research, criticism, and review.

These noted shots were few enough however, that each of these 'better' shots were recalled easily by the same participant. This participant noted the following S3D scenes/shots in the after-screening discussion were also "technically proficient" being "a moving aerial landscape shot of mountainous terrain in Iceland, a runaway coal train shot inside a cave system within a lost mine" (Case Study-1st Event, student #5).

Most of the "Journey to the Center of the Earth" (Brevig, 2008) story is set inside an underground cave system as indicated by the title of the film being predominantly a journey underground. 1st Event participants noted that as the story developed within the close proximity of underground cave-like locations they recognised that close horizons often worked well in S3D productions due to the physics of not having to deal with distant objects, as well as close objects in the same S3D frame. For this reason, the participants agreed that most of the shots set in these close horizon underground cave systems seemed to have quite acceptable S3D production values. Mirroring this, one participant in the group discussion pointed out that "the relatively short distances between the closest objects and the furthest objects in this film made the S3D easy to view" (Case Study-1st Event, student #2).

Another participant said that "by the nature of this [the close proximity to the camera of objects] there would gratefully be less 'cheesy' S3D shots to dilute the storytelling like earlier 'cheesy' S3D shots did" (Case Study-1st Event, student #4).

Figure 5-12

Close-quarter Environment "Journey to the Center of the Earth" (Brevig, 2005)

Note. Close quarter environment of near backgrounds in underground cave settings in "Journey to the Center of the Earth" (Brevig, 2005). Image owned by New Line Cinema but used under fair use for purposes of research, criticism, and review.

This statement is referring to shots like the yo-yo in the face shot, as well as a shot with an extended tape measure coming out into the personal space of the viewer in the negative parallax area (Figure 5-10) that would be more difficult to achieve in confined space environments by the nature of S3D space requirements.

The combined results of the Likert surveys were collated and represented as a bar chart for comparison of individual student's observations. The combined Likert results for the S3D film "Journey to the Center of the Earth" (Brevig, 2008) are shown in Figure 5-13 and Figure 5-14, and later in this study we will see that a comparison between three different Event groups has been possible. "Journey to the Center of the Earth" (Brevig, 2008) was one of only a few films that were screened in this study to all three Event groups in April 2016, July 2016, and April 2017. In such a case a comparison of all questions posed in the Likert surveys are able to be compared with all three groups over the period of course deliveries and subsequent screenings. By combining the Likert survey data results from each student in each group that viewed the films, an S3D model with common features begins to emerge.

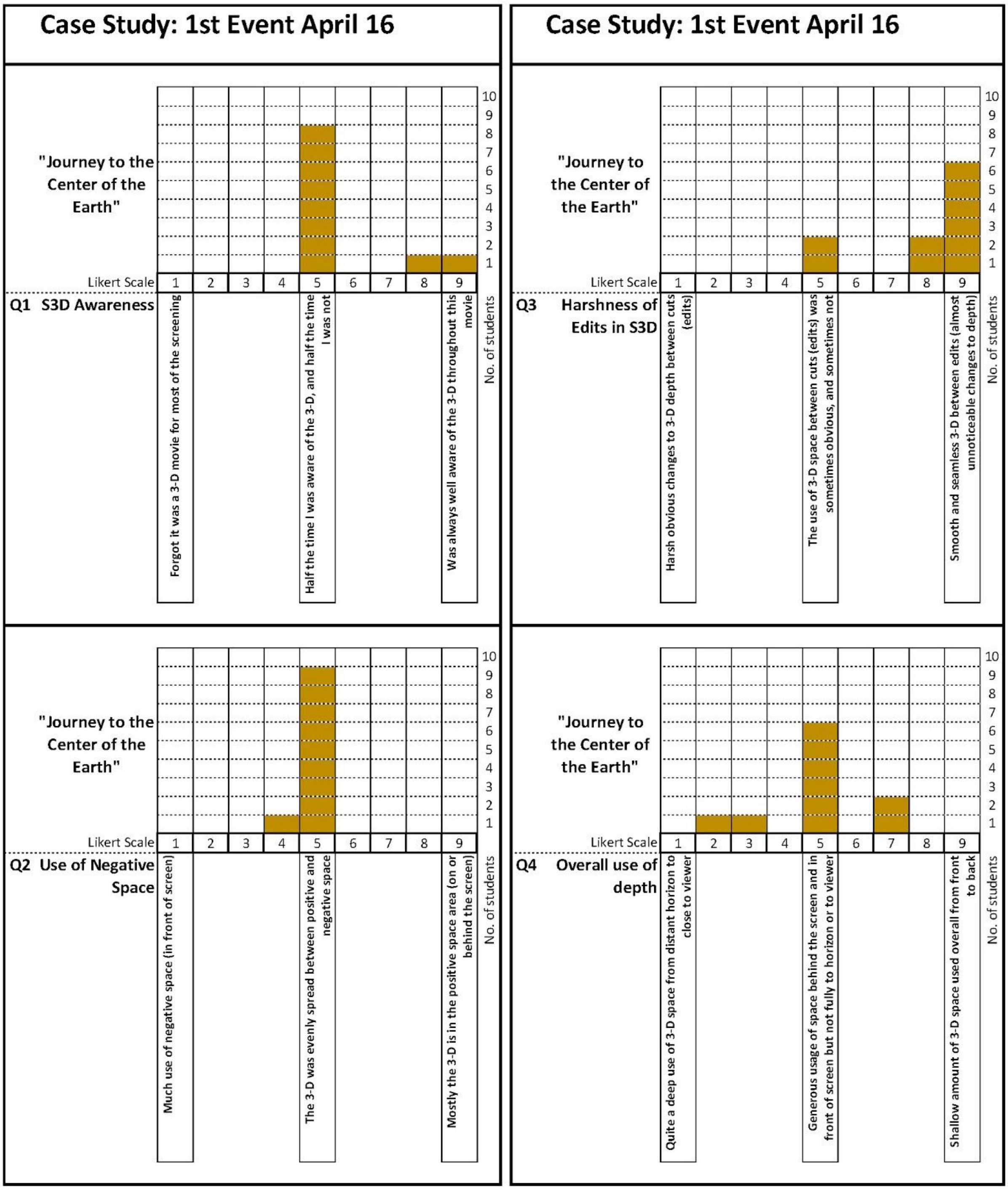
Results of the Likert survey from the April 2016 1st Event for this S3D film, "Journey to the Center of the Earth" (Brevig, 2008) drew a strong consensus in many areas, and a broadening in some other areas. By consolidating the observations of the 1st Event participants, this analysis enables the data dissection of this group for "Journey to the Center of the Earth" (Brevig, 2008).

In Question 1 of the Likert survey for "Journey to the Center of the Earth" (Brevig, 2008), it is clear from the graphs in Figure 5-13 that in the 1st Event a predominant perception was that for half the time the S3D was obvious, and for half the time it was not obvious. In regards to Question 2 of this Likert survey, as far as the utilisation of the 3-D space between the viewer and the screen (the negative parallax) and the 3-D space utilised behind the screen (the positive parallax), all of the respondents noted that the 3-D was spread evenly both in front of the screen and behind the screen (see Figure 5-13).

A very broad range was found from the 1st Event participants in how much the use of depth changed throughout the film. Two participants read it as much change from a small amount of depth space used to a large usage of space within the same film, whereas most others observed a medium to low amount of variation in depth usage.

Figure 5-13

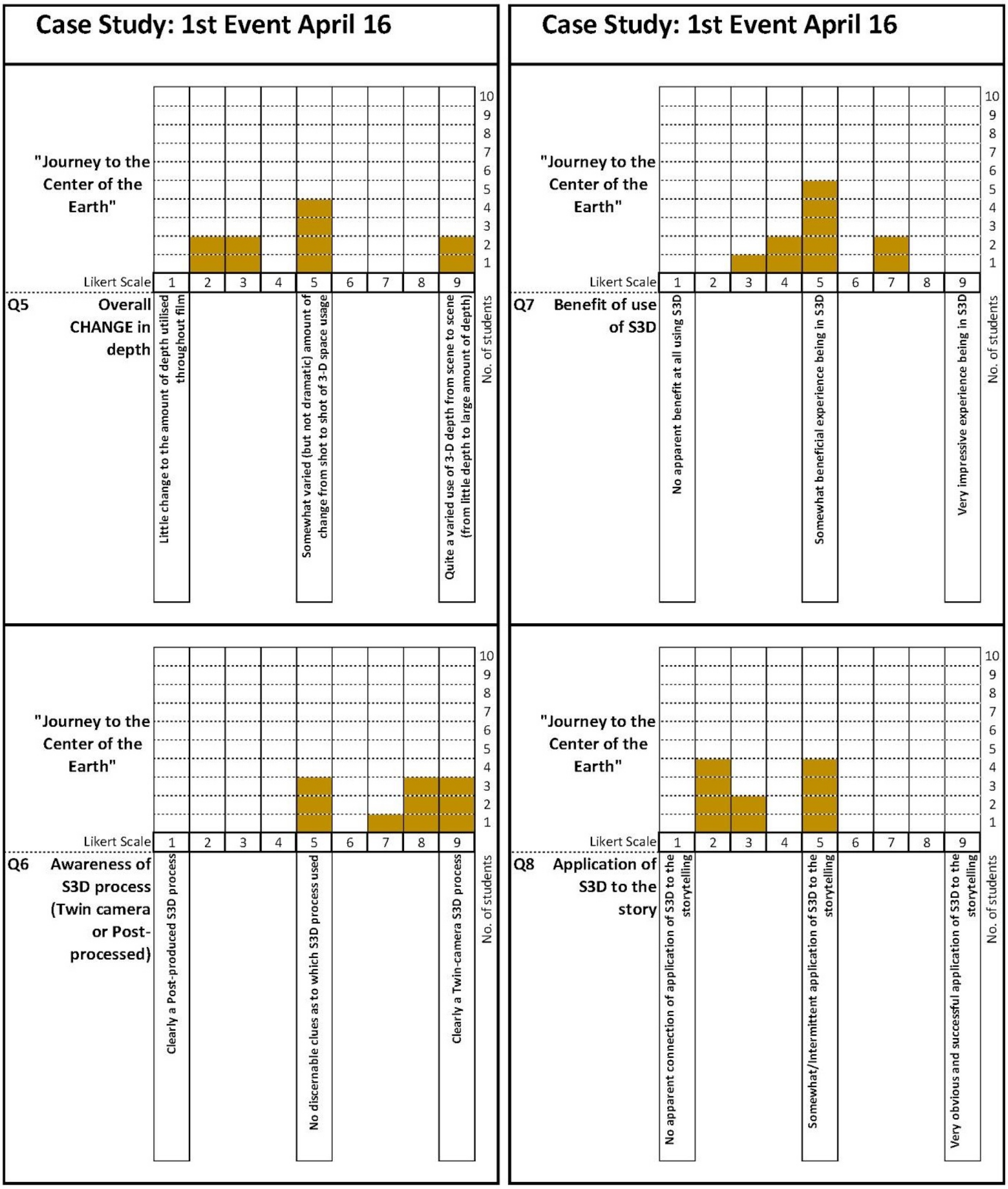
Bar Graph Compilation (Case Study-1st Event) Likert Surveys Q1-Q4 for "Journey to the Center of the Earth" (Brevig, 2008)



Note. Compilation of ten participant's results in Case Study-1st Event surveys of Q1-Q4 for "Journey to the Center of the Earth" (Brevig, 2008)

Figure 5-14

Bar Graph Compilation (Case Study-1st Event) Likert Surveys Q5-Q8 for "Journey to the Center of the Earth" (Brevig, 2008)



Note. Compilation of ten participant's results in Case Study-1st Event surveys of Q5-Q8 for "Journey to the Center of the Earth" (Brevig, 2008)

In question 6 of the combined Likert surveys in regard to the "Awareness of S3D Process (Twin camera or post-processed)", all the group participants recognised "Journey to the Center of the Earth" (Brevig, 2008) to have been made with the higher quality of a twin-camera S3D origination rather than the lesser quality post-produced process of S3D. On to Question 7 where a broader observation is asked of the participants as to whether the film itself has actually benefited from the inclusion of S3D. For "Journey to the Center of the Earth" (Brevig, 2008) most participants showed a middle ground here, where the indication was that the S3D was a "somewhat beneficial experience".

No participant observed either extreme of not being beneficial at all, nor completely beneficial to the experience. The final Question 8 is specifically in regard to whether the application of S3D had actually helped to tell the story. Significantly the results for this question for "Journey to the Center of the Earth" (Brevig, 2008) showed a clear swing to the "no apparent connection of S3D to the storytelling". For this 1st Event group, all participants were between "Somewhat/intermittent application of S3D to story" on the Likert scale descriptors, and "No apparent connection of S3D to the storytelling".

The results for "Journey to the Center of the Earth" (Brevig, 2008) from the Combined S3D Depth Budget Graphic Surveys (Figure 5-9) can be interpreted and summarised by these points:

- much negative parallax space used (significant space used in front of the screen)
- no extreme positive parallax used (not very distant depths used behind the screen)
- the implementation of S3D ranged from "somewhat noticeable" to "quite noticeable"

The average 'S3D and Story Integration' rating for the Case Study-1st Event for "Journey to the Centre of the Earth" (Brevig, 2008), resulted in a mean value of "2.9" which when rounded to the nearest unit is "3". A "3" on the "S3D and Story Integration" table (Table 5-1) is a mid-ground value whose descriptor is "Quite noticeable S3D".

5.3.1.4 Case Study-1st Event - Summary Depth Model Learning Results "Journey to the Centre of the Earth" (Brevig, 2008)

When triangulating the Likert surveys with the group discussions, the S3D Depth Budget Graphic Surveys, and the group discussions/interviews of the use of S3D in the film "Journey to the Center of the Earth" (Brevig, 2008) the results when combined can be summarised as follows:

Table 5-3

"Journey to the Centre of the Earth" (Brevig, 2008) Case Study-1st Event Depth Model Summary Results

No.	*Depth model characteristic description*
1	High amounts of variation in the use of S3D depth space can be detrimental to the S3D viewing experience.
2	Gratuitous 3-D shots for wow-factor thrills not as impressive as less obtrusive S3D shots.
3	Much usage of extreme negative parallax space (the area close to the viewer and between the viewer and the screen) can be somewhat distracting.
4	All of the above points made the S3D usage obvious and viewer-aware.
5	Twin camera S3D origination likely to give a better S3D result than cardboard cut-out S3D (post-conversion).
6	Close horizons (such as cave walls) tend to work well with S3D.

The "S3D and Story Integration" scale (Table 5-1) places "Journey to the Centre of the Earth" (Brevig, 2008) at "3" with the S3D being described in this table as "Quite noticeable S3D". Such a descriptor would indicate that the results of this study might require leaning away from the less positive aspects of the S3D characteristics of this film as listed in Table 5-3 above.

5.3.1.5 Case Study-1st Event - Depth Model Learning Results "Gravity" (Cuarón, 2013)

"Gravity" (Cuarón, 2013) data and analysis is presented here with the following structure:

- Depth model observations, including points that may have come out of group discussions.
- Survey analysis of each of the S3D Depth characteristic and Likert surveys.
- Summary of the S3D depth model learning results.

From the "Combined S3D Depth Budget Graphic Survey" for "Gravity" (Cuarón, 2013) (Figure 5-17) it is clear that all the survey participants saw only subtle use of foreground S3D depth space usage (between the viewer and the screen). A slight variation between observers for the positive parallax area of S3D depth behind the screen and to the horizon from mid to distant usage of this area of S3D space was also evident in Figure 5-17.

The Case Study-1st Event group for this film had all student participants in attendance and the film sequence was viewed on a medium cinema-sized projector screen. This screen potentially improved the S3D experience due to the subject matter of this film being set in Earth's orbit with backgrounds of outer space expanses (Atkinson, 2016, p. 71). One group participant commented that "the size of the projection screen helped with the sense of expanse of space especially as the S3D effect was quite effective" (Case Study-1st Event, student #4).

Figure 5-15

Opening Scene from "Gravity" (Cuarón, 2013)

Note. Opening scene from "Gravity" (Cuarón, 2013) showing the extreme distances used for the story in the 3-D background. This is often combined with close proximity shots of astronaut characters in the 3-D foreground in some shots. Image owned by Warner Brothers but used under fair use for purposes of research, criticism, and review.

It was also noted by one participant that even though the S3D expanse seemed quite noticeable (see Figure 5-15) there were in fact "only three objects in the opening shot from which any S3D effect could be seen being the planet Earth, a Space Shuttle orbiting the Earth, and a space-walking astronaut" (Case Study-1st Event, student #2).

This 1st Event participant group recognised that the "Gravity" (Cuarón, 2013) sequence still appeared quite subtle in its use of S3D when compared with the previous S3D film screenings especially given the spatial expanse of the subject matter. It was noted in discussion that a narrower depth of field seemed to help the S3D in this film "I'm seeing a slightly narrower depth of field in the better of the S3D shots. It looks like 3-D is better with a slightly blurred background and foreground" (Case Study-1st Event, student #2).

Another point was raised from the viewing of this movie set in space, that some shots were lit with side-light giving extra 3-D shape to the astronauts in the dark environment (Figure 5-16) "Did anyone else notice that Chiaroscuro-style side-lighting made the astronauts pop out of the dark of outer space? That's a good example of the 2-D Depth Cues we covered in the coursework" (Case Study-1st Event, student #3).

Figure 5-16

Chiaroscuro Shot from "Gravity" (Cuarón, 2013)

Note. Chiaroscuro shot from "Gravity" (Cuarón, 2013) showing the use of side-lighting that clearly delineates shape and depth. Image owned by Warner Brothers but used under fair use for purposes of research, criticism, and review.

The "Combined S3D Depth Budget Graphic Survey" results for "Gravity" (Cuarón, 2013) in the Case Study-1st Event surveys (Figure 5-17) were very positive at first glance. All participants observed that the negative parallax usage was minimal with only a slight use of space just in front of the screen between the viewer and the projected image. The positive space behind the screen was observed as having a reasonable depth to it with 40% of respondents observing a mid-distance use of depth behind the screen indicated on the survey result (Figure 5-17) as moderate depth utilisation. However, 60% of the respondents observed a much more distant use of 3-D depth to the horizon. Significantly, the "S3D and Story Integration" rating given by 100% of the respondents was a "1". The legend for the numeral "1" signifies "Seamless integration with story" (Figure 5-17) and so this is a resoundingly positive result for this movie from these 1st Event participants.

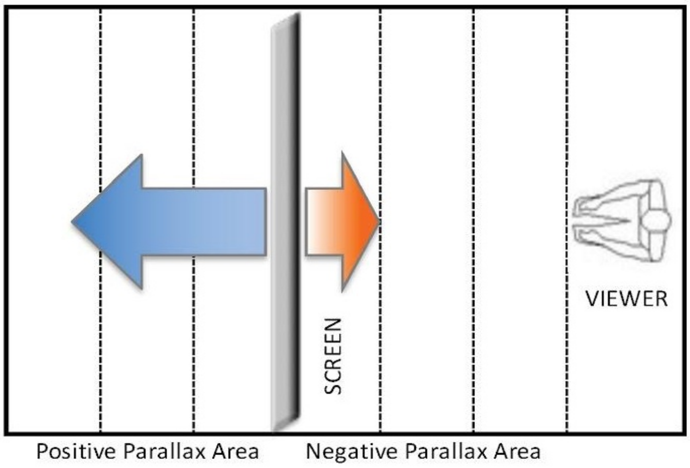
The Likert scale survey responses as reflected in the combined bar graph images (Figure 5-18 and Figure 5-19) show a similar positive response. Question 1 shows that 9 out of 10 respondents had a resounding sense of forgetting they were watching a 3-D movie at all by marking the Likert scale as a "1". This recognition of an unawareness of the S3D aspect of a movie arguably brings a greater sense of immersion in the story rather than being aware of the S3D spectacle itself.

Figure 5-17

Combined S3D Depth Budget Graphic Surveys (Case Study-1st Event) for "Gravity" (Cuarón, 2013)

Results for: **"Gravity"**

	Distance behind the screen			Distance in front of screen			
Student:	S3D reached large distances behind the screen	S3D reached moderate distance behind the screen	S3D reached a short distance behind the screen	S3D reached a short distance in front of the screen	S3D reached moderate distance in front of the screen	S3D reached a large distance in front of the screen	Rating of what extent S3D became a part of the story:
# 1	•			•			1
# 2	•			•			1
# 3	•			•			1
# 4		•		•			1
# 5		•		•			1
# 6	•			•			1
# 7		•		•			1
# 8	•			•			1
# 9		•		•			1
# 10	•			•			1



1= Seamless integration with the story
2= Not very obvious but somewhat noticeable S3D
3= Quite noticeable S3D
4= Very obvious S3D and distracting from the story
5= The S3D is broken and is unwatchable

Note. Case Study-1st Event group - Combined results from each of ten participant's observations in the S3D Depth Budget Graphic Survey, and their reading of 'Story Integration' using the codes at the bottom of the figure, after the screening of "Gravity" (Cuarón, 2013)

One of the participants marked this question as being aware of the S3D for half the time being a Likert scale number of “5”, however this contrasts greatly with every other participant in this group who recognised it as a Likert scale of “1”.

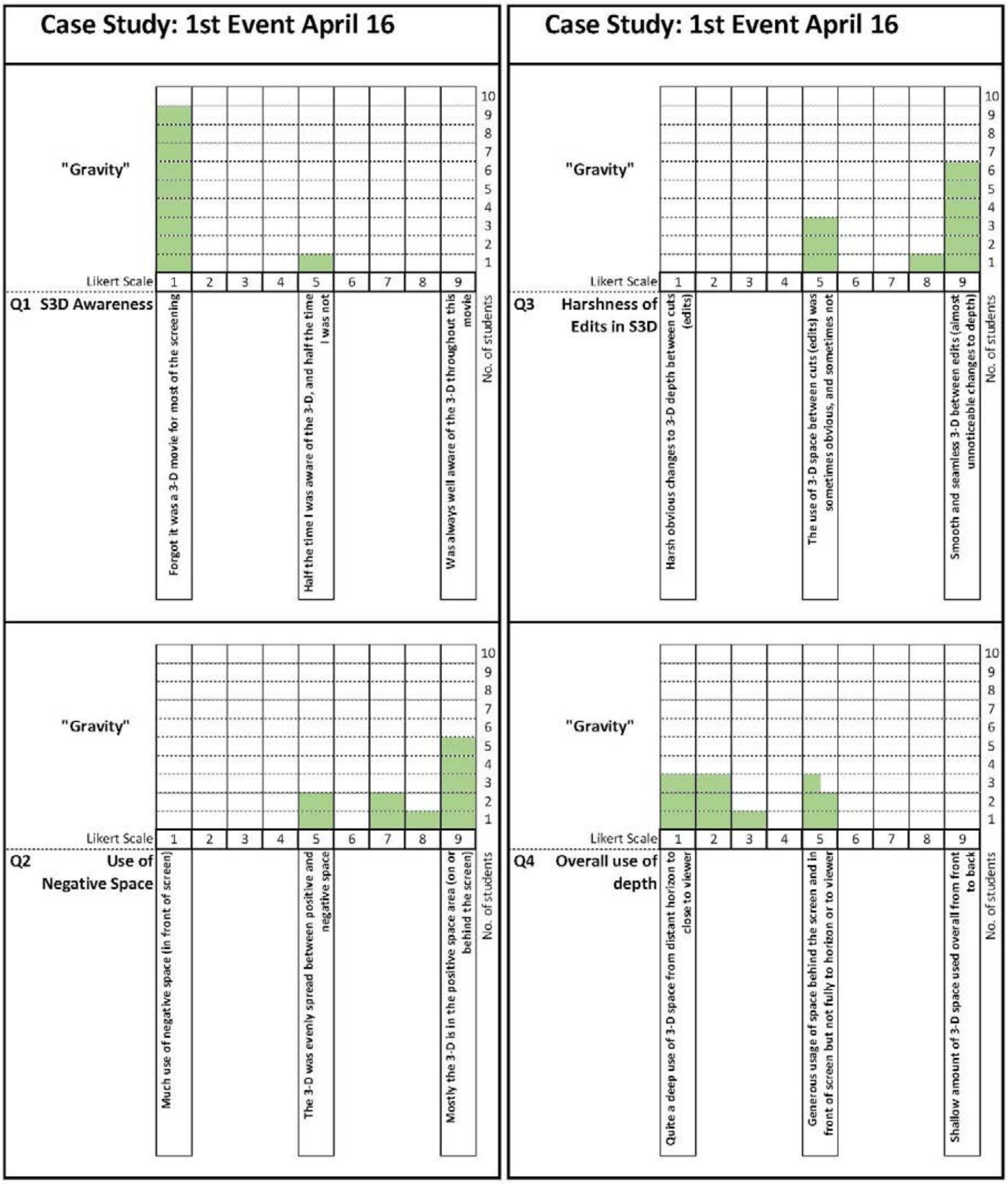
Question 2 deals with the observed amount of use of negative space (the depth space between the screen and the viewer) in this film. Despite the broad indication from this group’s Likert survey that indicates “Gravity” (Cuarón, 2013) to be primarily a film that uses the positive space most of the time, the results from this group’s Likert survey show somewhat of a spread between the mostly negative space used, through to the half-positive space used and half-negative space used. A mix of use of the depth space either side of the projection screen in the Likert survey was indicated, yet in contrast, the “Combined S3D Depth Budget Graphic Survey” indicates a much more conservative use of the negative space used with only a small amount of this area used by comparison.

The fourth question in regard to “Overall use of depth” shows a broad mix from “Quite a deep use of S3D from distant horizon to close to viewer” through to “Generous usage of space behind the screen and in front of the screen…”. This result does seem to highlight a strong variation in the observer’s perception of how much S3D depth has been utilised in this film. Such a variation may be put down to the setting/location of “Gravity” (Cuarón, 2013) being the seemingly infinite depth of space. The question may be asked as to how much bearing does the location and setting of a film’s story have on the preconceived notion by the viewer of just how much 3-D depth is actually being utilised.

Question 5 too deals with any perceived “change in depth”, and for the film “Gravity” (Cuarón, 2013) the indication ranges from little change at all in depth utilisation, through to “somewhat of a change” in depth. No participant observed a significant change in depth for this film after a Likert value of “5”. In “Gravity” (Cuarón, 2013) the scenes/locations went from broad expansive distances in space outside of the spacecraft, to claustrophobic interiors within the small spacecraft. This is arguably the most change in depth distance that can be physically achieved story-wise. Moving from infinite space distances to finite short depth distances would conceivably test any application of S3D but these statistics show a measured use of S3D despite these extremes in physical distances portrayed.

Figure 5-18

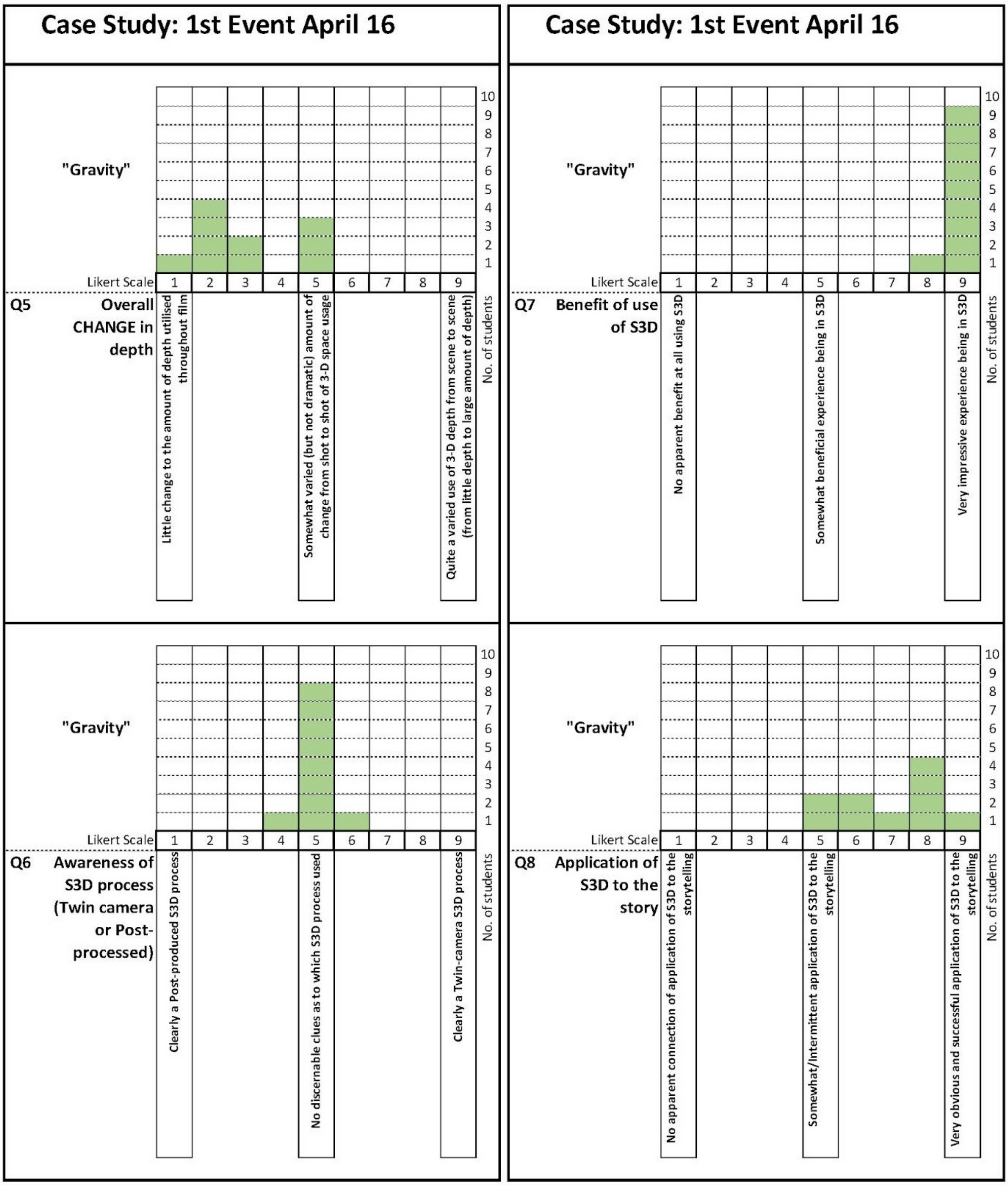
Bar Graph Compilation (Case Study-1st Event) Likert Surveys Q1-Q4 for "Gravity" (Cuarón, 2013)



Note. Compilation of ten participant's results in Case Study-1st Event surveys of Q1-Q4 for "Gravity" (Cuarón, 2013)

Figure 5-19

Bar Graph Compilation (Case Study-1st Event) Likert Surveys Q5-Q8 for "Gravity" (Cuarón, 2013)



Note. Compilation of ten participant's results in Case Study-1st Event surveys of Q5-Q8 for "Gravity" (Cuarón, 2013)

The “Awareness of S3D” process question (Question 6) compares the evidence of whether the film appears as a twin-camera S3D production or a post-converted S3D production. The observations here circle around the middle-ground of the Likert scale with a “No discernible clues as to which S3D process used” Likert descriptor as an average.

The participants of this Case Study-1st Event group had been made aware before any surveys were filled out, that this film “Gravity” (Cuarón, 2013) - despite this 1st Event group’s favourable observations that this film was a well-made S3D film - was in fact mostly shot with one-camera and therefore is considered a post-conversion S3D film.

When compared with the expectations of what a post-converted film is understood to look like (with the previously described cardboard cut-out S3D effect and is therefore unconvincing by its nature), this film soon became one of the benchmarks for the more advanced post-conversion processes. “Gravity” (Cuarón, 2013) achieved quite a positive result with very few of the artefacts frustratingly associated historically with post-converted S3D films. In its favour also is the fact that most of “Gravity” (Cuarón, 2013) was created in CGI (computer generated imagery) using digital computer modelling. Such digital creations include the spacecraft in the film, planets, stars, and all of the objects seen in space including the astronauts' space suits. Some sets were actual interiors of spacecraft for instance, but most were CGI generated. For this reason, the ‘post-converted’ label that this film was able to use, relied heavily upon the perfect conditions that a virtual (CGI) environment allows when it comes to creating Stereoscopic 3-D.

These ‘virtual’ cameras are capable of being placed in physically impossible virtual spaces if required in order to produce a better S3D image, and so it is theoretically possible to have better S3D in this way than with physical twin-camera S3D origination. Therefore, the ‘post-converted’ label of “Gravity” (Cuarón, 2013) may be a little misleading here, as post-conversion traditionally refers to the splitting of one single camera image into two faux images via digital trickery. This is quite distinct from the virtual camera generated imagery that is ‘struck’ from a CGI environment. The CGI S3D origination is in fact closer by nature to a physical twin-camera originated environment than it is to a single image that has been split (‘post-converted’) digitally. The question (number 8) of the “Benefit of use of S3D” in these combined graphs (Figure 5-19) is represented high up on the “Very obvious and successful application of S3D” end of the Likert scale at “9”. 90% of participants observed the S3D to have this descriptor of being very ‘successful’. The application of S3D to the story however was spread evenly from halfway on the Likert scale of “Somewhat/intermittent application of S3D to the storytelling”, right across to the highest Likert level being a “Very obvious and successful application of S3D to the storytelling”.

5.3.1.6 Case Study-1st Event - Summary of Depth Model Learning Results "Gravity" (Cuarón, 2013)

The distant-horizon depth that appears in "Gravity" (Cuarón, 2013) conceivably fed the positive outcome of this film's 3-D as indicated in all surveys and discussions for this film. It was suggested in group discussion that the film's setting/location of deep space conceivably leads the viewer to "want" to see a long way past the screen to the very distant horizon, as a believable 'buy-in' to the film's story. When this is combined with the discussion comments made about a large projection cinema experience for the screening of this movie helping the story due to the storyline setting, more of this 'buying into' is supported:

> "We are floating in space along with [these characters] - and doing it with a big screen, and in great 3-D - [This means] I believe I'm floating in big space out there with them. This story fits the sum of the parts really well, and I feel like I've just watched a much bigger film than most films are" (Case Study-1st Event, student #3).

Triangulation of the three sources of data is distilled into the following summary table:

Table 5-4

"Gravity" (Cuarón, 2013) Case Study-1st Event Depth Model Summary Results

No.	*Depth model characteristic description*
1	If only a small amount of intermittent S3D extended into negative space (between the screen and the viewer) this was not necessarily detrimental to the overall S3D experience.
2	Where most of the negative space usage (between the screen and the viewer) is only marginal on average, and a short distance only is used from the screen to the closest S3D elements, this can be a very effective use of depth in S3D space
3	Large 'storyline' distances (e.g. far horizon landscapes) work well when the positive parallax space (the area between the projected image and the far background) is not extreme. So, CGI "distant" horizons shouldn't require extreme positive S3D placement. The far distance can appear to be a long way away but in CGI these distances can be 'cheated' closer to the screen than it would actually be in reality.
4	A slightly narrow depth of field (slightly out of focus foregrounds/backgrounds) helps S3D look effective. (However, too much out of focus in foreground and background may be too distracting).
5	Post-converted S3D origination is capable of giving as good an S3D result as twin-camera S3D if carefully engineered.
6	Darker films (dark environments and settings) with low key lighting (less amounts of light on characters, etc.) may give a more subtle S3D effect.
7	Story setting, content, and scope can have a large effect on how well received the S3D implementation can be. Locations and setting should be considered a major influence on the amount and type of S3D is designed and instituted.

“Gravity” (Cuarón, 2013) is one of the S3D films that helped change the standard of what cinema-goers expected from post-conversion of S3D for movies. This film was screened for this 1st Event group on a large projection screen in a 65-seat lecture theatre Auditorium. Here the sheer physical size of the film experience notably added to the space setting, and also to the S3D experience as noted in group discussions by at least one participant: “The size of the big screen viewing helped with the sense of expanse of space especially as the S3D effect was really effective” (Case Study-1st Event, student #1).

From this triangulated survey and discussion group data there is clearly a model emerging from “Gravity” (Cuarón, 2013) (Table 5-4) that starts to show more characteristics that describe effective S3D rather than characteristics describing ineffective S3D as seen in some earlier S3D films, although it is understood that both effective and ineffective S3D film examples contribute to the S3D model aims of this research.

5.3.1.7 Case Study-1st Event - Depth Model Learning Results “Legend of the Guardians: The Owls of Ga’Hoole” (Snider, 2010)

“Legend of the Guardians: The Owls of Ga’Hoole” (Snider, 2010) data and analysis is presented here with the following structure:

- Depth model observations, including points that may have come out of group discussions.
- Survey analysis of each of the S3D Depth characteristic and Likert surveys.
- Summary of the S3D depth model learning results.

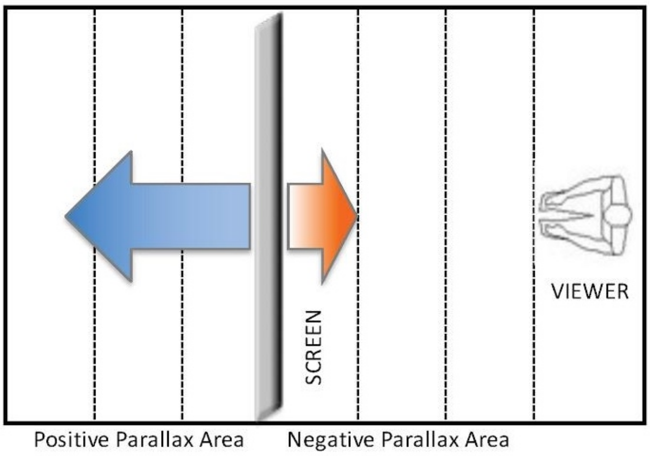
The implementation of S3D in “Legend of the Guardians: The Owls of Ga’Hoole” (Snider, 2010) garnered a strong response in the discussion group feedback in the presence of the researcher, which is also clearly reflected in the ‘S3D and Story Integration’ numeric survey as part of the Combined S3D Depth Budget Graphic Survey for this film (Figure 5-20). The most positive descriptor of “Seamless integration with the story” with its rating of “1” as reflected in Figure 5-20, had 100% of respondents agree on this highest accolade within this survey summary. Overall combined S3D depth usage was recognised by the participants as a very light amount in the negative parallax area (between the screen and the viewer), and also a broad usage of positive parallax space used from the screen to the horizon. This broad range of positive parallax area usage shown in the combined S3D Depth Budget Graphic Surveys is made up of 40% of respondents indicating far horizon usage, 40% of respondents a moderate distance used, and 10% (one respondent) indicating a short-range distance used just behind the screen. This is unusual to have such an even spread of differing observations for this usage of background depth space.

Figure 5-20

Combined S3D Depth Budget Graphic Surveys (Case Study-1st Event) for "Legend of the Guardians: The Owls of Ga'Hoole" (Snider, 2010)

Results for: **"Legend of the Guardians: The Owls of Ga'Hoole"**

Student:	Distance behind the screen			Distance in front of screen			
	S3D reached large distances behind the screen	S3D reached moderate distance behind the screen	S3D reached a short distance behind the screen	S3D reached a short distance in front of the screen	S3D reached moderate distance in front of the screen	S3D reached a large distance in front of the screen	Rating of what extent S3D became a part of the story:
# 1		•		•			1
# 2	•			•			1
# 3	•			•			1
# 4			•	•			1
# 5		•		•			1
# 6		•		•			1
# 7		•		•			1
# 8		•		•			1
# 9	•			•			1
# 10	•			•			1



1= Seamless integration with the story
2= Not very obvious but somewhat noticeable S3D
3= Quite noticeable S3D
4= Very obvious S3D and distracting from the story
5= The S3D is broken and is unwatchable

Note. Case Study-1st Event group - Combined results from each of ten participant's observations in the S3D Depth Budget Graphic Survey, and their reading of 'Story Integration' using the codes at the bottom of the figure, after the screening of "Legend of the Guardians: The Owls of Ga'Hoole" (Snider, 2010)

It could be substantially attributed to the fact that "Legend of the Guardians: The Owls of Ga'Hoole" (Snider, 2010) is a completely computer-generated animated movie. In such animated movies as previously mentioned, depths and distances to horizons can be simply manipulated digitally in order to improve the depth perceptions to be much more believable, despite the artificial manner in which it is achieved.

Such a light use of negative parallax area in front of the screen combined with a varied use of positive parallax depth behind the screen, seems to have resulted in a positive response from this 1st Event group discussion. The results of the S3D interpretation of this film are ones that suggest that almost zero use of extreme negative parallax depth in front of the screen may mean it is easier to have the film's story work without distractive objects coming at the viewer. Some of this group discussion also centred around the fact that this film's story, being in a world that is not the one that the discussion group does not live in, may have made it easier to have the S3D integrate well with this new world. This unnatural world where owls and otherwise familiar creatures live human-like existences may combine to allow the S3D to be a part of this somewhat unfamiliar world. "The setting of ["Legend of the Guardians: The Owls of Ga'Hoole"] was dark and dangerous and the 3-D added space to this dangerous place" (Case Study-1st Event, student #6).

Student discussion brought up the learned point from the coursework, that animated films were able to achieve perfectly integrated Stereoscopic 3-D camera placement over live-action films (i.e. real people, places, and objects) because they used virtual cameras. "Animated movies have better control over camera placement for better 3-D as we learned in the course" (Case Study-1st Event, student #7).

As discussed previously in regard to the S3D film "Gravity" (Cuarón, 2013), virtual cameras can be placed in the perfect but sometimes physically impossible positions required for S3D to work well without the physical limitations of two real cameras. Real cameras cannot necessarily be placed in the same positions as virtual cameras due to bulky lenses on real cameras that may prevent close proximity of two real cameras if required for instance. Such observations lead the focus group to suggest that animated 3-D productions may have a better chance of more often having more convincing and applicable 3-D as required. In light of the high score the focus group participants gave "Legend of the Guardians: The Owls of Ga'Hoole" (Snider, 2010) for its seamless integration with story (with a consistent score of "1" in Figure 5-20) it was noted in discussion that there was very little change to the arrangement of depth throughout the film. The focus group participants recognised that for a film that scored so well with its application of S3D that it did not utilise significant variation of S3D design from scene to scene or as the story traversed.

> "The 3-D was unobtrusive and the look was great. There didn't seem to be much variation though between scenes. Behind the screen [positive] depth was used a lot through the film and a little [negative depth] in front consistently. So I guess changes in 3-D throughout the film isn't necessarily important to telling the story. Unlike "Tron: Legacy" that relied [up]on it" (Case Study-1st Event, student #6).

Another respondent (student #7 in this group) also stated on this point:

> "The environment in this [owl's] world used mainly positive parallax [the 3-D depth used behind the screen] but not to a great amount. There was only a small amount of negative parallax space used [in front of the screen] with owl wingtips sometimes reaching out into the audience" (Case Study-1st Event, student #7).

This 1st Event discussion group also highlighted the overall impressiveness of the well-produced S3D as an overall impression of the 3-D application in this film: "[I] completely forgot I was watching a 3-D movie apart from wearing the glasses. The best 3-D film I've seen so far because I forgot it was in 3-D" (Case Study-1st Event, student #5).

Student #8 from this discussion group also responded on this point of integration of 3-D with this particular story: "The 3-D was mostly forgotten about. The owl's storyline seemed to merge with and be swallowed up by the 3-D. The 3-D became a part of the owl's lives" (Case Study-1st Event, student #8).

A narrow depth of field element to the clarity of the 3-D in this film was noticed by student #2. As a 2D Depth Cue being taught in the "Intro to S3D" coursework, this is a significant observation regarding the implementation of S3D:

> "The owls looked clearer and more set in 3-D space when the backgrounds on these shots were slightly out of focus. Did this happen on close-ups of owls talking maybe? Some shots didn't have out of focus backgrounds but the ones that did had that edge of 3-D looking more stark" (Case Study-1st Event, student #2).

Adding to the growing consensus within this group of the advantages of CGI animation when it comes to 3-D refinement, more observations were made about the non-physical environments created in CGI film productions such as this film. This also contributed to the fact that 3-D can potentially be viewed as a part of the story's location, not just as a photographic effect to change the "look" of the film: "The 3-D looked to be there to fill out the unusual world that the owls lived in. The setting was dark and dangerous and the 3-D added space to this dangerous place. There were no painful shots really" (Case Study-1st Event, student #6).

The Likert Survey results for "Legend of the Guardians: The Owls of Ga'Hoole" (Snider, 2010) showed some variation in some areas when cross-referenced with the combined S3D Depth Budget Graphic Survey result (Figure 5-20) and group discussions. A broader result starts to emerge when comparing the data from the Likert survey, with for instance the observed use of negative space that is spread slightly thinner than is recognised on the S3D Depth Budget Graphic Survey.

It is still within the same scale region but the Likert survey shows at least one person observing an even amount of positive and negative spread (the middle of the Likert scale) of S3D space either side of the projection screen, and eight respondents indicated around the "mostly the 3-D is in the positive space area…" at the top of the Likert range. Such a result may be because the participants were considering the rare shots early in the film where the owls reach into the negative space for a short time; "There was only a small amount of negative parallax space used [in front of the screen] with owl wingtips sometimes poking out into the audience…" (Case Study-1st Event, student #6).

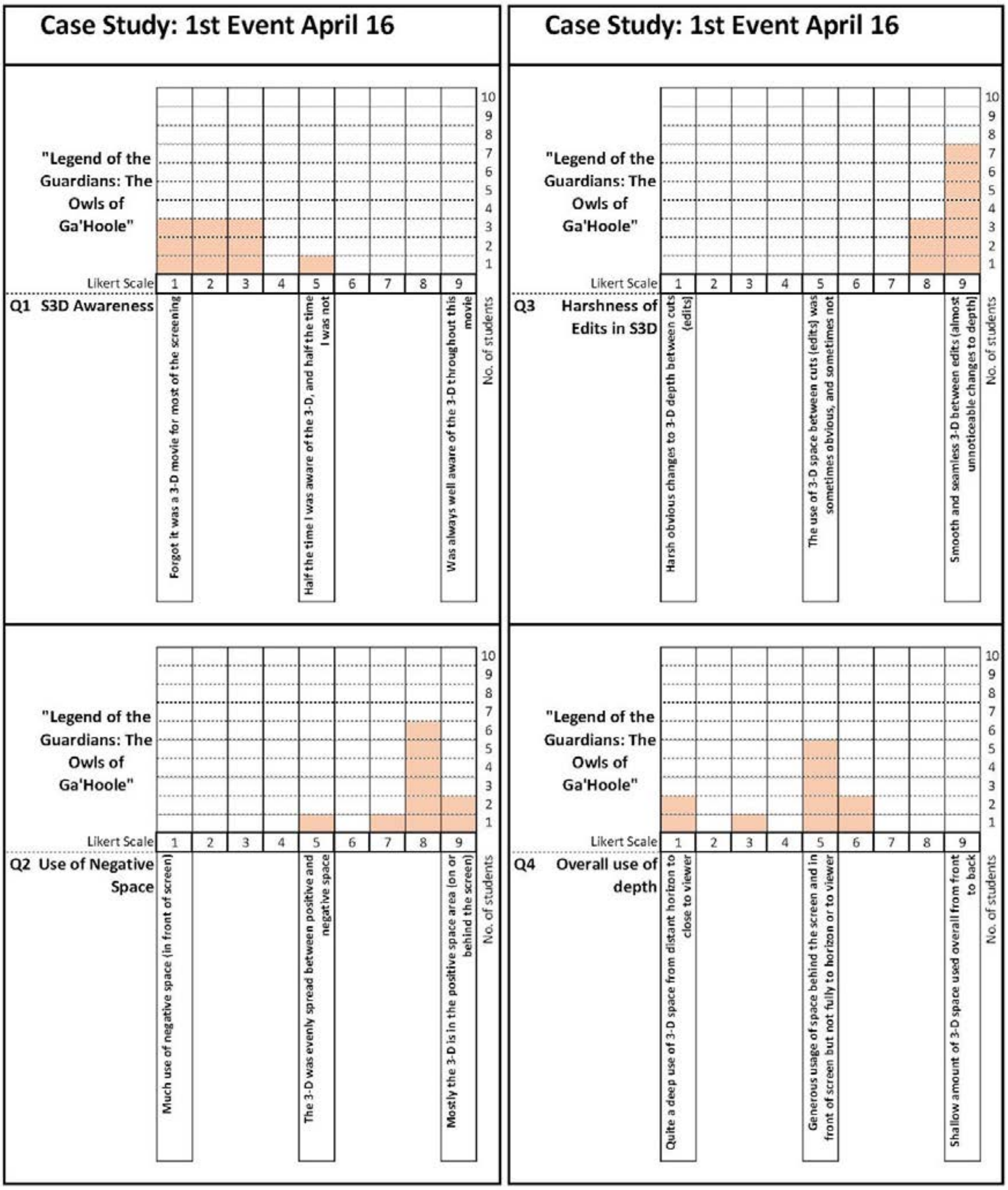
Conceivably this may be another example of the Hollywood studio system's seemingly self-imposed requirement to release S3D films with at least some 3-D shots that cater for the wow-factor 3-D audiences. The "S3D Awareness" question (question 1) indicated an overall unawareness of the film's 3-D usage by the respondents (Figure 5-21). The range was from one person noticing it half the time, to the nine other respondents at the "Forgot it was a 3-D movie…" end of the Likert scale. Such a response by most of the group to mostly not noticing the 3-D throughout the movie is a clear attribution that the 3-D is not the most noticeable aspect to this movie. Question 7 deals with the "Benefit of use of S3D" and 50% of respondents indicated that it was a "Very impressive experience being in S3D" at the highest end of the Likert scale.

The group discussion found participants were noted as identifying that: "[T]he 3-D was mostly forgotten about. The owl's storyline seemed to merge with and be swallowed up by the 3-D. The 3-D became a part of the owl's lives" (Case Study-1st Event, student #6).

A general discussion point was raised as to whether the fact that the film form itself, being animation, made it easier for the viewer to suspend disbelief in the story's characters (being talking birds), and therefore also made it easier for the audience to suspend disbelief in the S3D. This then may have helped make the S3D itself 'disappear' into the animated story.

Figure 5-21

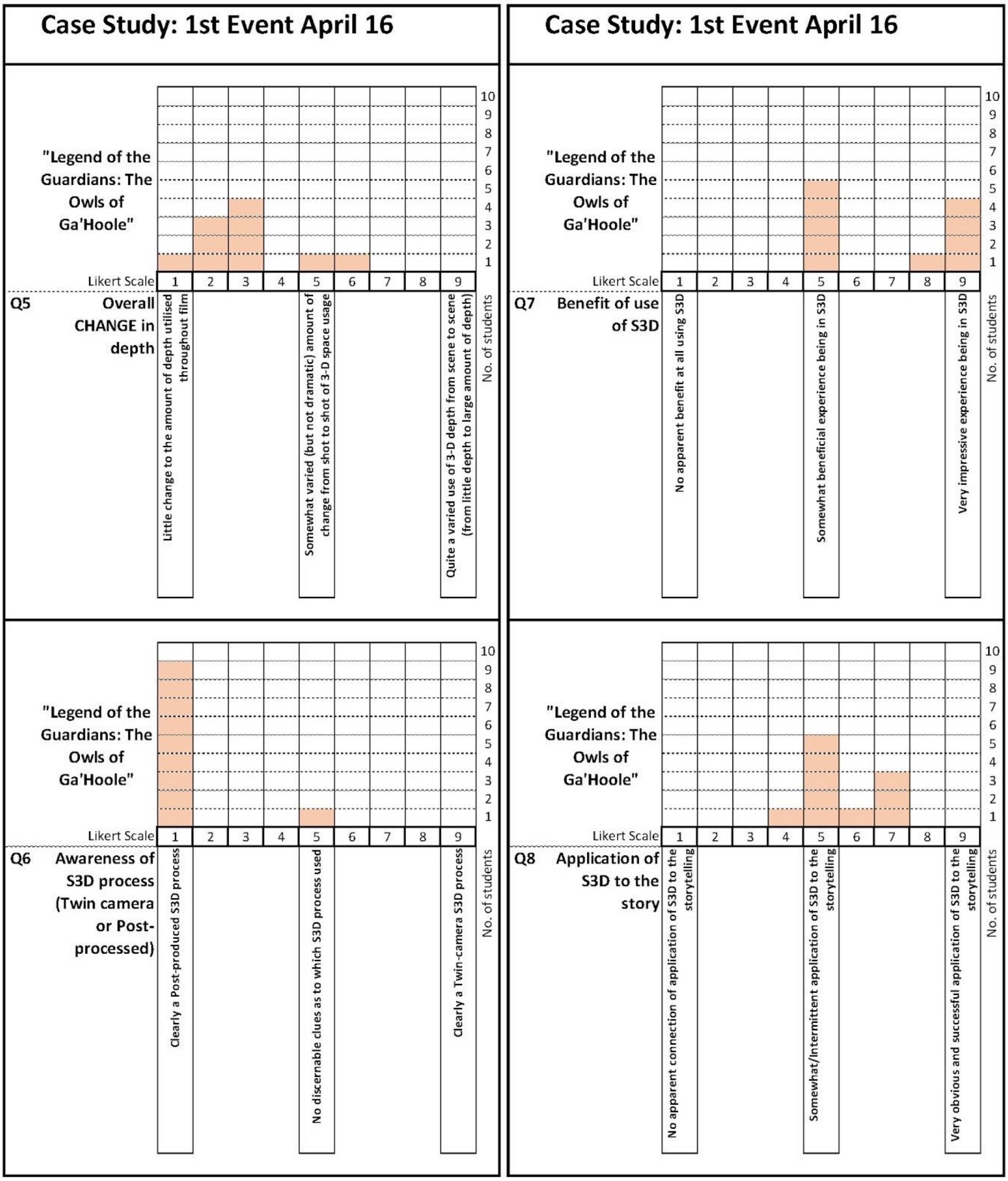
Bar Graph Compilation (Case Study-1st Event) Likert Surveys Q1-Q4 for "Legend of the Guardians: The Owls of Ga'Hoole" (Snider, 2010)



Note. Compilation of ten participant's results in Case Study-1st Event surveys of Q1-Q4 for "Legend of the Guardians: The Owls of Ga'Hoole" (Snider, 2010)

Figure 5-22

Bar Graph Compilation (Case Study-1st Event) Likert Surveys Q5-Q8 for "Legend of the Guardians: The Owls of Ga'Hoole" (Snider, 2010)



Note. Compilation of ten participant's results in Case Study-1st Event surveys of Q5-Q8 for "Legend of the Guardians: The Owls of Ga'Hoole" (Snider, 2010)

Another respondent, who presumably marked at the high end of the Likert scale in the survey said: "[I] completely forgot I was watching a 3-D movie apart from wearing the glasses. The best 3-D film I've seen so far because I forgot it was in 3-D" (Case Study-1st Event, student #5), and: "I was more caught up in the detail in the owl's feathers than the 3-D, that means the 3-D was effective I suppose" (Case Study-1st Event, student #4).

However, the other 50% of respondents in the Likert survey indicated that it was only a 'Somewhat beneficial experience being in S3D' as per the Likert descriptor. "I noticed the 3-D in this film all the way through it. Just like I noticed it was a CGI movie all the way through it. Even though the 3-D was pretty good it was quite noticeable to me" (Case Study-1st Event, student #2).

Most comments in the group discussion were positive about the seamlessness of the 3-D, despite five respondents in the Likert survey indicating that the use of S3D was of mixed benefit. Question 8's reference to 3-D application to story scored in the middle to upper end of the Likert scale from "Somewhat/intermittent application of S3D to the storytelling" to "Very obvious and successful application of S3D to the storytelling".

Overall the group discussion result for "Legend of the Guardians: The Owls of Ga'Hoole" (Snider, 2010) generally held the application of S3D in high regard with much of the discussion reflecting on the seamlessness of the S3D and the moderate use of depth space. The Likert survey had a less one-sided overall response with a sense that somewhat and intermittent S3D application tempering the positive responses.

5.3.1.8 Case Study-1st Event - Summary Depth Model Learning Results "Legend of the Guardians: The Owls of Ga'Hoole" (Snider, 2010)

A combination of the triangulated sources in this 1st Event has resulted in commonalities, but also some mixed results with some slightly opposing data between the group discussion and the surveys. Some of the anomalies are to do with impression of amount of S3D depth utilised in this film. Such variations can be explained by simple difference of opinion, especially when this early in the coursework, the understanding of relative depth usage is still in its early stages with these new 'students'.

Table 5-5

"Legend of the Guardians: The Owls of Ga'Hoole" (Snider, 2010) Case Study-1st Event Depth Model Summary Results

No.	*Depth model characteristic description*
1	CGI animated movies presents significant control over the believability of 3-D depth distances to appear natural/realistic.
2	3-D can act as a part of the "look" of the environment/setting. It can appear as a production design element as well as a photographic effect.
3	Little use of the negative space in front of the projection screen brings less awareness of the presence of the 3-D whilst still having a breadth to the depth aspect.
4	Fantasy genre (i.e. story and environment) may make the S3D more noticeable by the fact that the world by its different nature calls attention to itself.
5	A slightly narrow depth of field helps the S3D application.

5.3.1.9 Case Study-1st Event - Depth Model Learning Results "Sanctum" (Grierson, 2011)

"Sanctum" (Grierson, 2011) data and analysis is presented here with the following structure:

- Depth model observations, including points that may have come out of group discussions.
- Survey analysis of each of the S3D Depth characteristic and Likert surveys.
- Summary of the S3D depth model learning results.

"Sanctum" (Grierson, 2011) was viewed by Case Study-1st Event students as the fifth 3-D film instalment for analysis. It is important to note that as the weeks of the coursework went by, not only did the participants watch the prescribed S3D films to then be able to apply their newly acquired S3D knowledge, many of the participants also took upon themselves to watch other S3D films not necessarily on the screening list just to add to their experience. Regardless of how many S3D films were watched by the students over the course of the S3D sessions, they each had the benefit of cumulative learning as the weeks progressed and so had an ever-increasing awareness of when S3D was applied well or when it was not.

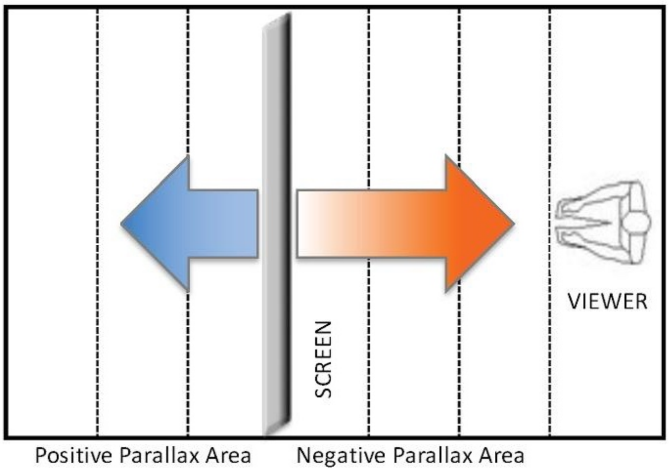
In this light, the S3D film "Sanctum" (Grierson, 2011) was screened to the Case Study-1st Event group participants at around midway through the "Intro to S3D course held in April 2016. This 2011 film did not score particularly well in the initial "Combined S3D Depth Budget Graphic Survey" averaging a "4" in the 'story effectiveness' data indicating that the 3-D was "very obvious and distracting from the story" (see Figure 5-23). This is next to the worst overall 'S3D and Story Integration' score available in this first survey. Discussion comments included mentions of eye strain and S3D elements that did not resolve at all creating what is known as "broken" Stereoscopic 3-D.

Figure 5-23

Combined S3D Depth Budget Graphic Surveys (Case Study-1st Event) for "Sanctum" (Grierson, 2011)

Results for: **"Sanctum"**

Student:	S3D reached large distances behind the screen	S3D reached moderate distance behind the screen	S3D reached a short distance behind the screen	S3D reached a short distance in front of the screen	S3D reached moderate distance in front of the screen	S3D reached a large distance in front of the screen	Rating of what extent S3D became a part of the story:
	Distance behind the screen			Distance in front of screen			
# 1		•				•	4
# 2		•				•	4
# 3		•			•		4.5
# 4		•			•		3.5
# 5			•		•		4
# 6		•			•		4
# 7		•			•		4
# 8		•			•		3
# 9		•				•	4.5
# 10		•			•		4



1= Seamless integration with the story
2= Not very obvious but somewhat noticeable S3D
3= Quite noticeable S3D
4= Very obvious S3D and distracting from the story
5= The S3D is broken and is unwatchable

Note. Case Study-1st Event group - Combined results from each of ten participant's observations in the S3D Depth Budget Graphic Survey, and their reading of 'Story Integration' using the codes at the bottom of the figure, after the screening of "Sanctum" (Grierson, 2011)

"There seemed to be a number of "broken" S3D shots. I was waiting for the next painful eye shot - even though the whole film wasn't full of painful shots to watch, I was still waiting for the next one" (Case Study-1st Event, student #4).

"Sanctum" (Grierson, 2011) is set in underground water caves with the plot revolving around scuba diving in deep floating environments. The negative parallax space usage between the screen and the viewer, was recorded by the 1st Event "S3D Depth Budget Graphic Survey" as very close to the viewer from the projection screen, with some mid-ground positive space usage used behind the screen also. This less than extreme usage of positive parallax behind the screen is most likely by design due to the close proximity of cave walls (similar to the setting of "Journey to the Centre of the Earth" (Brevig, 2008)). The participants in the discussion group noted obvious changes to the design of the S3D with much variation from shot to shot. "Lots of changes in the 3-D depth usage brought attention to the fact it ["Sanctum"] was a 3-D film" (Case Study-1st Event, student #3).

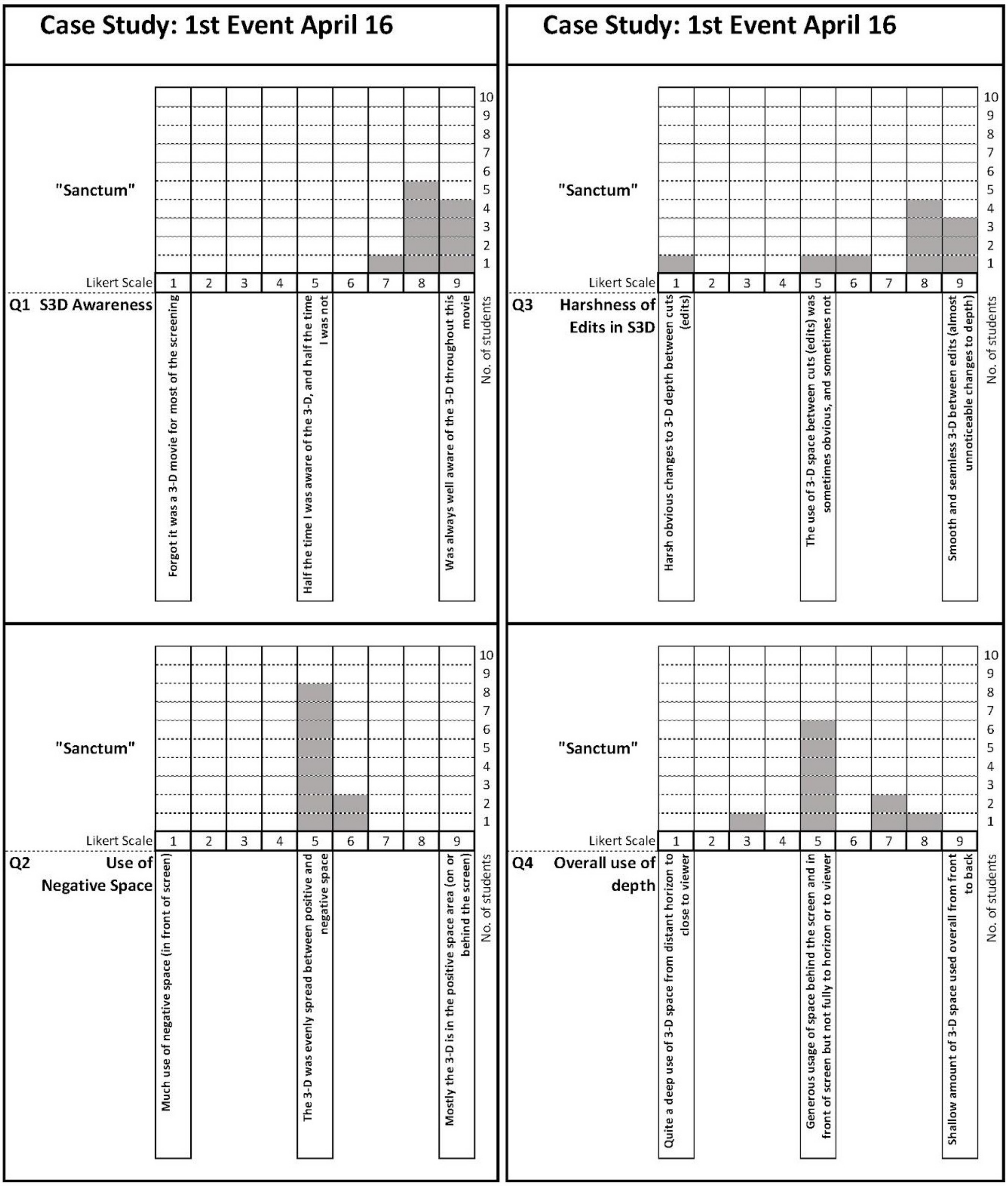
Badly created early shots elicited this response from a 1st Event discussion group participant: "The first opening shots hurt my head! Not a good intro to the film! This is not a post-converted 3-D film either" (Case Study-1st Event, student #2).

By making such a comment regarding this film not being 'a post-converted 3-D film', this 1st Event participant (Case Study-1st Event, student #2) has realised that the "broken" S3D shots in the early portion of this film would more likely be expected from a poor post-conversion process. The fact that "Sanctum" (Grierson, 2011) was created with the inherent advantages of a twin-camera S3D system would be expected to have reduced the chances of such broken S3D shots being included in the film's final release. So, from this it can be drawn that a twin-camera S3D process, with its potential advantages, is not a guarantee of "unbroken" S3D results. "...quite a few awkward 3-D shots in amongst some interesting ones. I thought close back walls and floating scenes would make for good 3-D but not much good in this one" (Case Study-1st Event, student #3).

As has been touched upon previously, S3D films that have settings where people or objects are in a floating environment such as space, underwater, skydiving, trapeze acts, etc. are likely to be able to produce good S3D. The fact that there is no visible means of support of such people or objects means there is no supporting object leading the viewer out of the frame. For instance, whenever a person is disconnected from the edge of frame, such as floating in space like in the 3-D film "Gravity" (Cuarón, 2013), the effect is one of free floating and helps present the person or object more clearly in S3D space by the fact there is no visible means of connection.

Figure 5-24

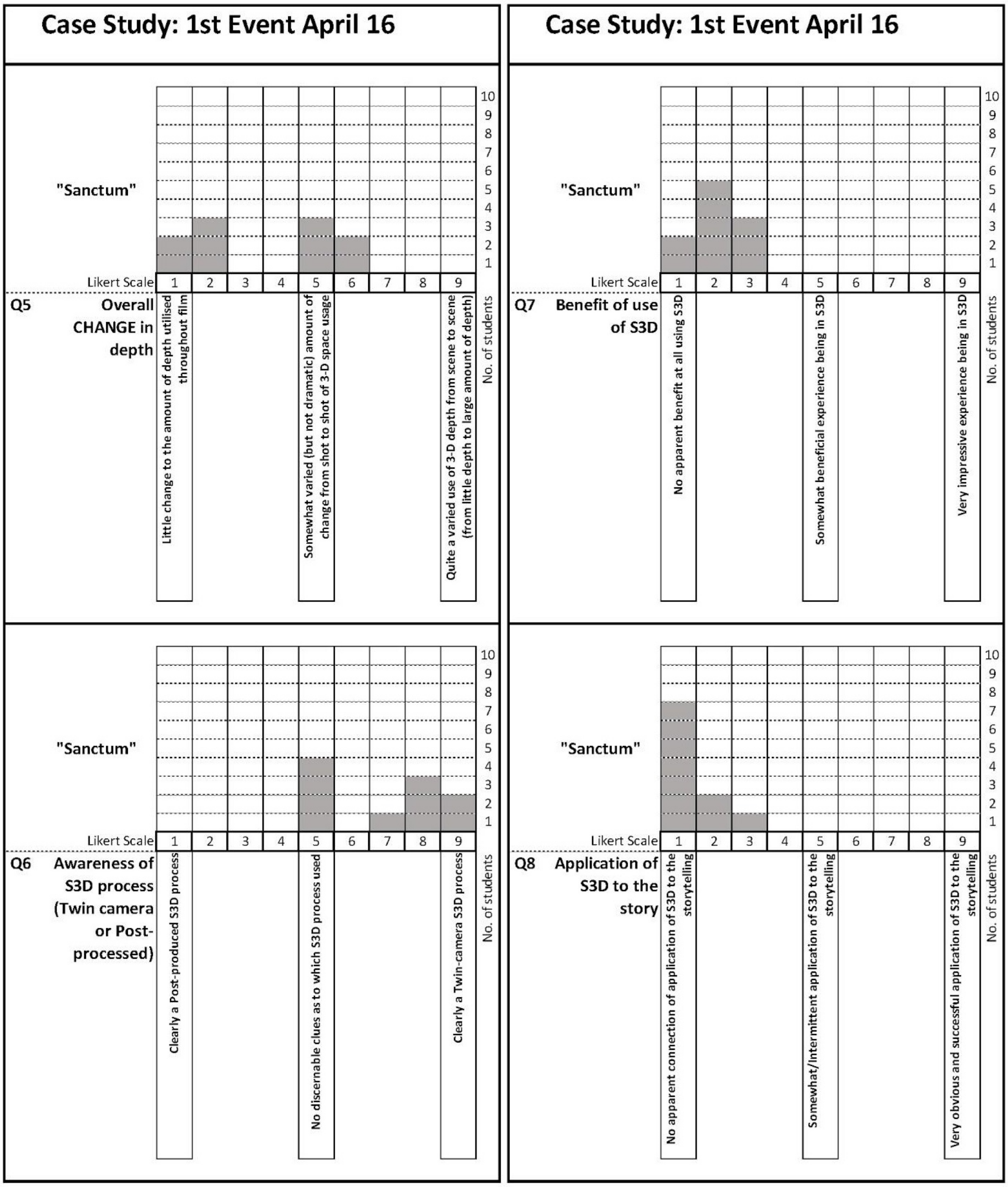
Bar Graph Compilation (Case Study-1st Event) Likert Surveys Q1-Q4 for "Sanctum" (Grierson, 2011)



Note. Compilation of ten participant's results in Case Study-1st Event surveys of Q1-Q4 for "Sanctum" (Grierson, 2011)

Figure 5-25

Bar Graph Compilation (Case Study-1st Event) Likert Surveys Q5-Q8 for "Sanctum" (Grierson, 2011)



Note. Compilation of ten participant's results in Case Study-1st Event surveys of Q5-Q8 for "Sanctum" (Grierson, 2011)

If there is a viewable connection to the edge of the image frame, the creation of good S3D is still of course possible, but the floating effect helps to get a good S3D shot consistently.

In a film such as “Sanctum” (Grierson, 2011) that is set in underwater cave systems, with scenes of actors floating in clear and still water lagoons, coupled with short distanced backgrounds, there is a great opportunity to utilise this mix of attributes for S3D brilliance. The 1st Event group made a number of comments in the discussion period about the variations of S3D within this film, despite the similar location/settings used in this film. Changes in the amount of depth used (i.e. depth budget) seemed to be somewhat arbitrary according to participant comments such as: “Changes to where objects were in relation to the screen didn’t match the sameness of the location of short-background underground caves” (Case Study-1st Event, student #7).

Such an observation may indicate that changes in character/object placement particularly in the negative parallax area, were not done to necessarily affect the story progression, but possibly just to add 3-D in places that were otherwise common locations of this story.

The Likert survey results for “Sanctum” (Grierson, 2011) to a large extent matched the tone of the group discussions, with the first question about S3D Awareness placing all ten observers up toward “Was always well aware of the 3-D throughout the movie” (Figure 5-24). Use of negative space looked to be equally distributed between the positive and negative area rather than one side or the other. The individual S3D Depth Budget Graphic Surveys that were summarised in the Combined S3D Depth Budget Graphic Survey (Figure 5-23), were filled in during/immediately after the screening. They clearly identify more negative space usage than positive space usage with 30% of respondents observing a very close S3D placement to the viewer. The “Overall use of depth” indication from the fourth question in the Likert survey, was spread across the Likert scale with most in the middle area of “Generous usage of space…”. Three respondents however observed this up near the “shallow amount of 3-D space used” end of the Likert scale so a mixed perception here of how much 3-D space was utilised in this film.

A somewhat varied amount of 3-D depth change indicated in Question 5 helps explain the previous question (Question 4) result with observations of deep 3-D distances in some shots mixed with shallow 3-D distances in other shots. “No discernible clues” was indicated by four respondents in Question 6 as to whether they thought this was a twin-camera or post-converted film. The other six respondents also saw this as a twin-camera S3D production. It may be drawn from this that the harsh variations in 3-D depth used in this film are being mistaken for the disappointing result that traditionally came from poorly post-converted S3D films. Even though this film was shot with high quality twin-camera origination (and therefore better quality 3-D was more likely), the harshness of the extreme 3-D depth variations from shot to shot made the resulting discomfort comparable to the odd-looking harshness of a post-converted 3-D process. Question 7 on the "Benefit of use of S3D" also shows choices by the participants around the "No apparent benefit at all using S3D" end of the scale (Figure 5-25). This was a similar result when question 8 refers to the "Application of S3D to the story", with the predominant results being around "No apparent connection of application of S3D to the storytelling".

5.3.1.10 Case Study-1st Event - Summary Depth Model Learning Results "Sanctum" (Grierson, 2011)

In summary, "Sanctum" (Grierson, 2011) exhibited characteristics recognised by the Case Study-1st Event group that included the following:

Table 5-6

"Sanctum" (Grierson. 2011) Case Study-1st Event Depth Model Summary Results

No.	*Depth model characteristic description*
1	Quick changes in S3D depth placement from shot to shot become tiring.
2	S3D usage had little connection to the story.
3	Many shots had placement of 3-D objects uncomfortably close to the viewer (in the negative parallax space).
4	S3D shots that did not resolve (i.e. "broken" shots). Shot with incorrect geometry in lining up of cameras.

These characteristics have clearly been identified by the focus group as characteristics considered less than ideal.

5.3.1.11 Case Study-1st Event - Depth Model Learning Results "Mad Max: Fury Road" (Miller, 2015)

"Mad Max: Fury Road" (Miller, 2015) data and analysis is presented here with the following structure:

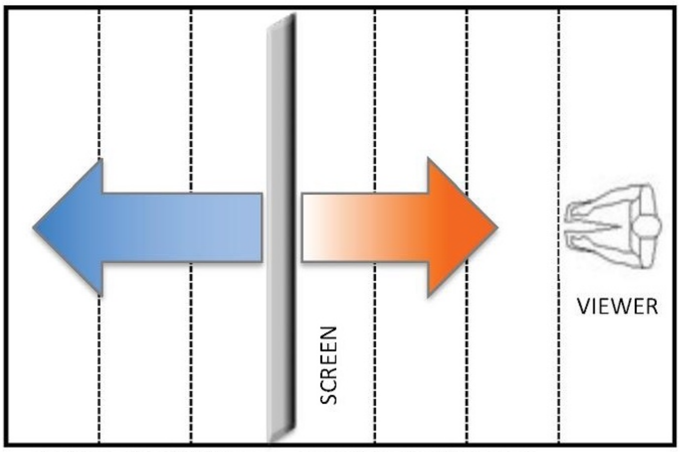
- Depth model observations, including points that may have come out of group discussions.
- Survey analysis of each of the S3D Depth characteristic and Likert surveys.
- Summary of the S3D depth model learning results.

Figure 5-26

Combined S3D Depth Budget Graphic Surveys (Case Study-1st Event) for "Mad Max: Fury Road" (Miller, 2015)

Results for: **"Mad Max: Fury Road"**

	Distance behind the screen			Distance in front of screen			
Student:	S3D reached large distances behind the screen	S3D reached moderate distance behind the screen	S3D reached a short distance behind the screen	S3D reached a short distance in front of the screen	S3D reached moderate distance in front of the screen	S3D reached a large distance in front of the screen	Rating of what extent S3D became a part of the story:
# 1	•					•	3
# 2	•					•	3
# 3		•			•		3.5
# 4	•				•		3
# 5	•					•	3.5
# 6		•			•		3
# 7	•				•		3
# 8	•				•		2
# 9	•				•		3
# 10	•					•	3



Positive Parallax Area Negative Parallax Area

1= Seamless integration with the story
2= Not very obvious but somewhat noticeable S3D
3= Quite noticeable S3D
4= Very obvious S3D and distracting from the story
5= The S3D is broken and is unwatchable

Note. Case Study-1st Event group - Combined results from each of ten participant's observations in the S3D Depth Budget Graphic Survey, and their reading of 'Story Integration' using the codes at the bottom of the figure, after the screening of "Mad Max: Fury Road" (Miller, 2015)

“Mad Max: Fury Road” (Miller, 2015) was screened in week 4 of the coursework and the survey results from the 1st Event group participants (Figure 5-26) suggest some variation in their perception of how much negative parallax space between the viewer and the screen was used. No participants perceived this negative parallax S3D space to have been used only slightly. All participants found the use of this negative parallax area to be heavily pronounced. This is also reflected in the behind the screen space (being the positive parallax area) with extremes of depth utilised here too, with no result in the data gathered indicating only a slight amount of behind the screen space utilised. Such extended S3D use of depth is interpreted in conjunction with the same survey’s results of how well the S3D usage integrated with the story.

A common observation by the 1st Event group participants was the disconcerting flattened and layered look of some of the shots in “Mad Max: Fury Road” (Miller, 2015). “Great setting for the movie [Namibian desert] but a lot of cardboard cut-out style 3-D noticeable throughout the otherwise great cinematography” (Case Study-1st Event, student #1).

Such cardboard cut-out looking and layered S3D has been previously observed in early S3D films that had the 3-D creation done completely in the post-production stage of the process. Colloquially termed “post-converted” S3D is financially a far better proposition for film producers than twin camera live-action S3D but early adopters of the post-conversion process in some cases suffered major layered-looking S3D. The most cited film example of this flat and layered 3-D problem being “Clash of the Titans” where even the director of the film Louis Leterrier called the 3-D post-conversion of his film “absolutely horrible” (Abramovitch, 2013). Regardless of this, it was acknowledged by the student viewers during the screening that “Mad Max: Fury Road” (Miller, 2015) was a spectacular looking film with notable cinematography and production design, however when it came to the intermittent layered 3-D shots one focus group participant described their inclusion in this way: “It really seemed a bit careless to be honest when you have all other aspects of the film having so much attention to detail” (Case Study-1st Event, student #9).

In view of the importance to this study of what aspects of S3D application might be a part of any film grammar model for S3D into the future, any techniques or observations that may be useful for inclusion are carefully noted. In this light, an unusual observation was made by one participant in this focus group whilst viewing “Mad Max: Fury Road” (Miller, 2015). At the 27 minute 13 second time mark of the film during a shot where a struggle for survival by the protagonist is happening on a moving vehicle, there is, for only a few frames, a part of the character’s limb that actually protrudes in S3D BUT it is protruding outside the otherwise limit of the picture frame. This unusual technique is to presumably accentuate the in-your-face S3D effect of the action in this shot.

Such a particularly noteworthy S3D method can only be seen on a screen that presents the film at the original narrow aspect ratio (i.e. the widescreen effect with black bars across the top and bottom of the screen). As with many high definition presentations the original aspect ratio of Hollywood productions has been more recently presented in 2.35:1 aspect ratio leaving a perceived blank black space at the top and bottom of the screen. Many film viewers conceivably see this as a loss of image area and therefore think they are missing out on original screen footage from these areas of the screen.

Such a belief is incorrect as these viewers are in fact seeing the complete image after all, by having the wide frame fit within the television screen being viewed. By including all of the original rectangular image on the screen so as not to miss any of the originally shot image, the viewer is *not* missing any of the shot imagery and is seeing the fully captured view as recorded by the widescreen camera(s).

Therefore, unusually, for a few frames in "Mad Max: Fury Road" (Miller, 2015) the character Max's foot actually protrudes outside this rectangular "original" aspect ratio for an increased boost to the standard negative parallax 3-D depth technique (Figure 5-27).

Group discussion after the screening of "Mad Max: Fury Road" (Miller, 2015) also highlighted the possibility of the setting of this movie being significant in the S3D choices being made. "The huge desert location made the trucks and the characters stand out in 3-D. In some scenes, characters were on an infinite desert that stretched to the horizon. This gave the 3-D more strength, and made the desert seem like a much bigger place to escape through" (Case Study-1st Event, student #5).

Interpreting this, the film's location and storyline setting of predominantly large stretches of barren desert wasteland, contrasting with characters and protagonists being placed close to camera or within vehicle cabins, boosted the 'character' of the S3D in the film by its simplicity of contrast.

Figure 5-27

Unusual S3D Protrusion Outside the Edge of the Screen Frame

Note. This unusual object protrusion at the 00:27:13 time mark accentuates the S3D depth reach from an otherwise finite frame edge in "Mad Max: Fury Road" (Miller, 2015). Image owned by Warner Bros but used under fair use for purposes of research, criticism, and review.

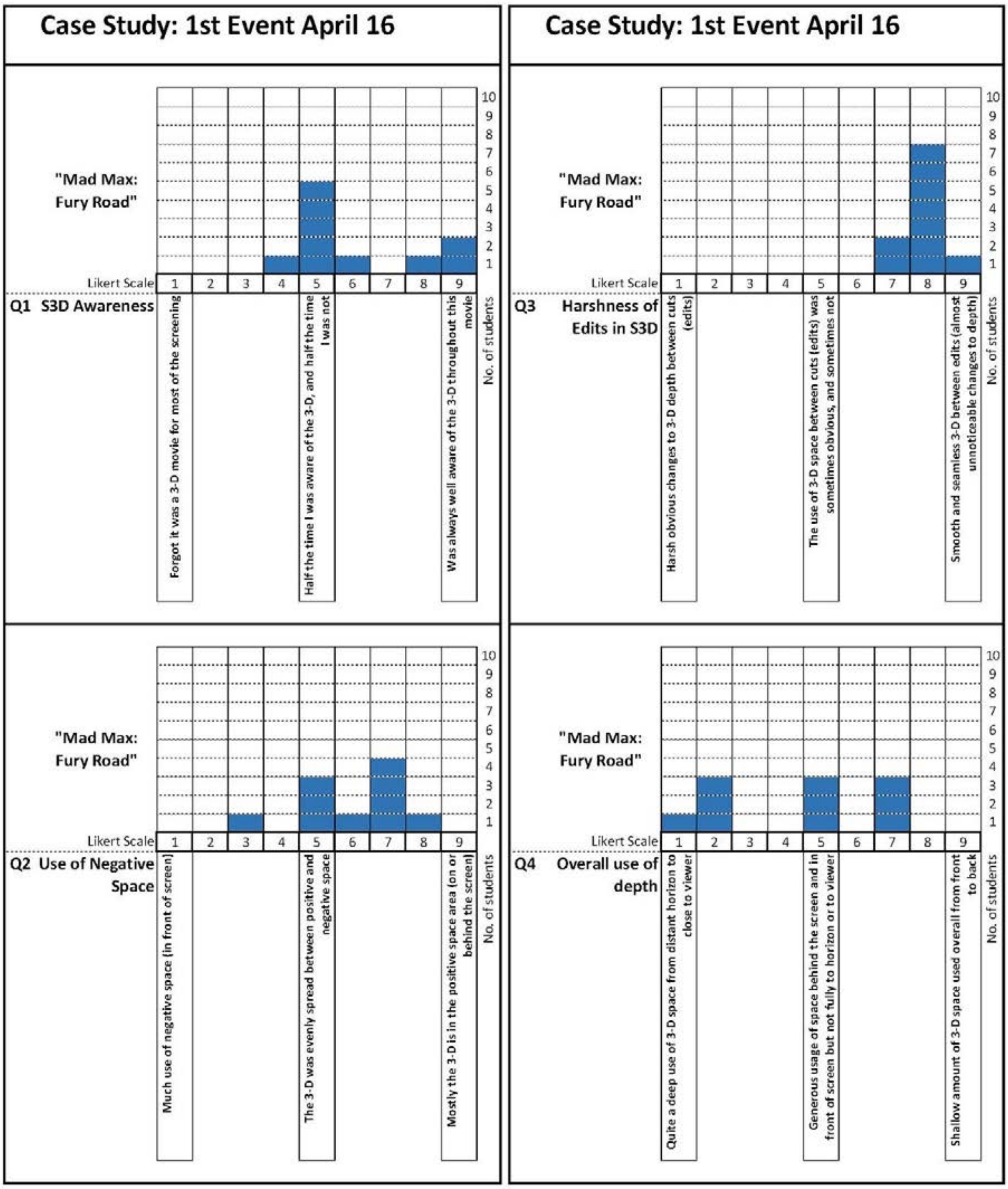
There was a common observation by a number of participants that the cardboard cut-out S3D effect evident in this film reduced the quality of the S3D experience considerably: "Great setting for the movie [Namibian desert] but a lot of cardboard cut-out style 3-D noticeable throughout the otherwise great cinematography. Mostly broad depth of field shots (with little soft-focus background shots) used, then added to by cardboard cut-out 3-D" (Case Study-1st Event, student #1).

However, the large expanse of desert used for the location for "Mad Max: Fury Road" (Miller, 2015) was seen by one observer as wasted as far as the S3D is concerned: "Quite a big reach of foreground and background space is used even though the story doesn't seem to require its use. The 3-D is all there all the time and is conspicuous for this reason. If it were used "at the right time" it might have worked more effectively in this film" (Case Study-1st Event, student #6).

It became clear to the 1st Event observers that "Mad Max: Fury Road" (Miller, 2015) used the post-conversion process to enable the S3D. A number of shots appeared to suffer from some of the recognised negative aspects of an S3D post-conversion process. A flattened and cut-out look to a number of shots is reflected in both the survey feedback and in the group discussion responses also:

Figure 5-28

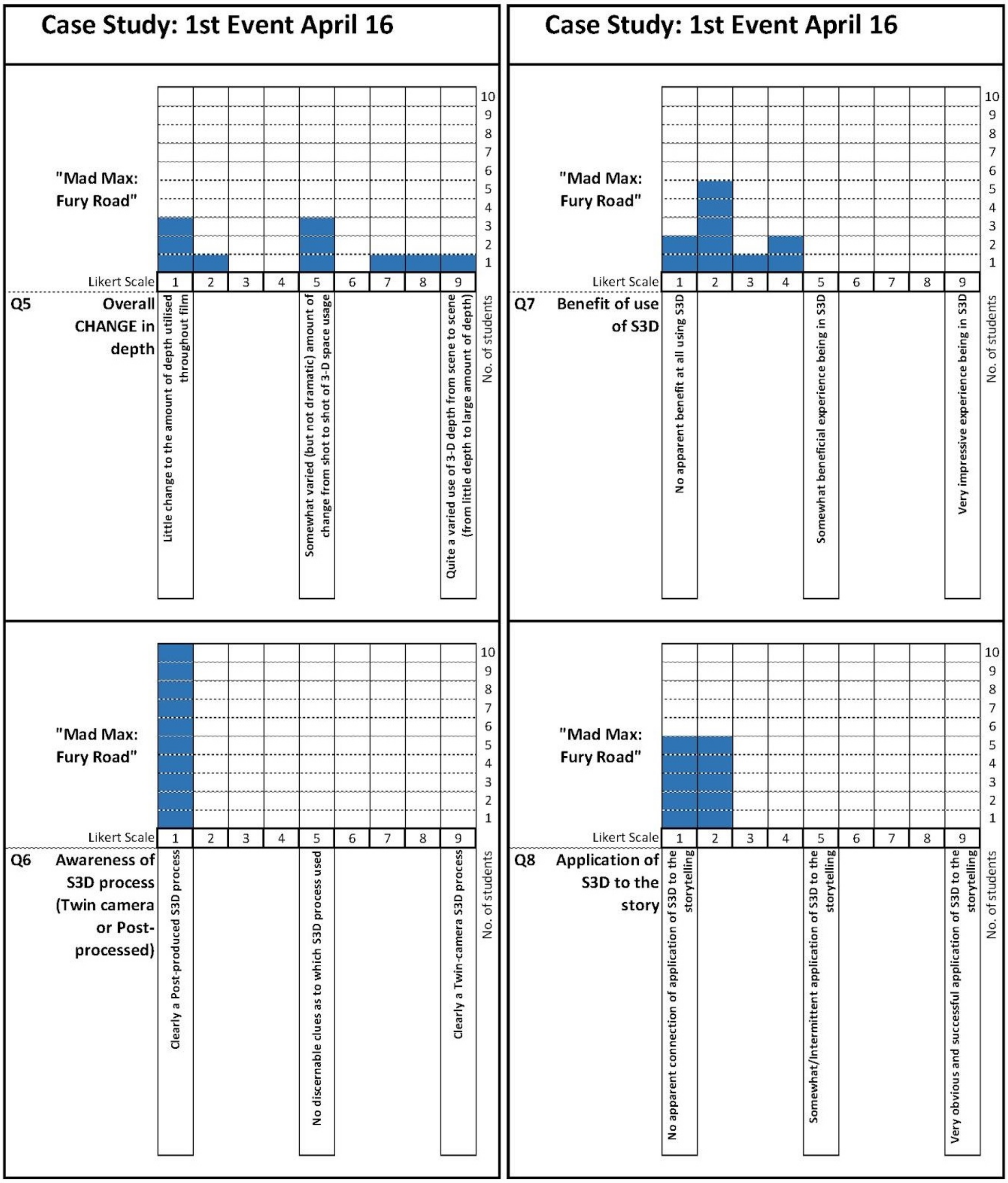
Bar Graph Compilation (Case Study-1st Event) Likert Surveys Q1-Q4 for "Mad Max: Fury Road" (Miller, 2015)



Note. Compilation of ten participant's results in Case Study-1st Event surveys of Q1-Q4 for "Mad Max: Fury Road" (Miller, 2015)

Figure 5-29

Bar Graph Compilation (Case Study-1st Event) Likert Surveys Q5-Q8 for "Mad Max: Fury Road" (Miller, 2015)



Note. Compilation of ten participant's results in Case Study-1st Event surveys of Q1-Q4 for "Mad Max: Fury Road" (Miller, 2015)

> "Quite obvious 3-D. Seemed like the filmmaker was a first-time user of 3-D and felt the need to use it all the time just because it was there. It appears to be a post-converted process of 3-D and some shots did not work well in the conversion" (Case Study-1st Event, student #2).

> "Reminded me of "Clash of the Titans" in some parts as far as the cardboard pop-up look. It seems a bit careless to be honest [to use post-conversion process] when you have all other aspects of the film having so much attention to detail" (Case Study-1st Event, student #4).

One participant observed that potential utilisation of two-dimensional composition techniques (as learned by the group participants in the "Intro to S3D" coursework) such as side-light, diminishing perspectives, receding textures, etc. could have helped improve this issue: "Some shots looked cardboard cut-out but others with shadows and sidelight didn't. Maybe the post-converted process needs to use more 2D depth cues used to stop the cardboard cut-out look" (Case Study-1st Event, student #5).

Despite some of the less complimentary feedback from the group discussion some of the close-quartered interior sets garnered a good response: "The busy truck cabin interior with bits and pieces, chains, rust, lots of detail looked good in 3-D" (Case Study-1st Event, student #5).

This may be a result of another employment of a 2D Depth Cue as taught in the "Intro to S3D" coursework, where scenes with much texture works well in S3D. Another interesting comment from student #2 observed that the inclusion of a narrow depth of field (a slightly soft focus in foreground and background of an otherwise sharp camera shot) worked differently to narrow depth of field shots in previous S3D films: "Slightly blurred background and foreground [depth of field] makes the flattened "converted" look in this film look worse" (Case Study-1st Event, student #2).

Compared with other S3D films that used a narrow depth of field this contrasts with the otherwise increasing view that a slightly narrow depth of field helps with the quality of the S3D. An observation was made of what appeared to be "added in" S3D effects that appeared as an obvious special effect addition:

> "[There was a] lot of negative parallax space used for the 3-D particularly with sand/smoke/ burning matter particles around the near space. This was odd to view as it seemed to be the filmmakers used the 3-D space just because it needed filling rather than it be there for any other reason" (Case Study-1st Event, student #2).

With the results of the 1st Event group discussion, it is no surprise that in the Likert surveys for "Mad Max: Fury Road" (Miller, 2015) 100% of respondents recognised it to be made via the post-conversion S3D process over the twin camera S3D production method. The positive and negative space usage in Question two was seen by most participants as evenly spread with half in front of the projection screen and half behind the projection screen. The use of depth question in the Likert survey shows as mixed with most respondents indicating a generous amount of S3D depth used both sides of the screen.

5.3.1.12 Case Study-1st Event - Summary Depth Model Learning Results "Mad Max: Fury Road" (Miller, 2015)

"Mad Max: Fury Road" (Miller, 2015) characteristics that were recognised by the Case Study-1st Event group include the following in summary:

Table 5-7

"Mad Max: Fury Road" (Miller, 2015) Case Study-1st Event Depth Model Summary Results

No.	*Depth model characteristic description*
1	Post-conversion S3D process is capable of distracting cut-out look S3D if not considered carefully
2	Textured surfaces (interiors of vehicles) create a strong boost to S3D success
3	Implementation of 2D Depth Cues when done well can produce improved S3D results
4	Added foreground CGI 3-D effects is obvious and distracting

5.3.1.13 Case Study-1st Event - Depth Model Learning Results "The Martian" (Scott, 2015)

"The Martian" (Scott, 2015) data and analysis is presented here with the following structure:

- Depth model observations, including points that may have come out of group discussions.
- Survey analysis of each of the S3D Depth characteristic and Likert surveys.
- Summary of the S3D depth model learning results.

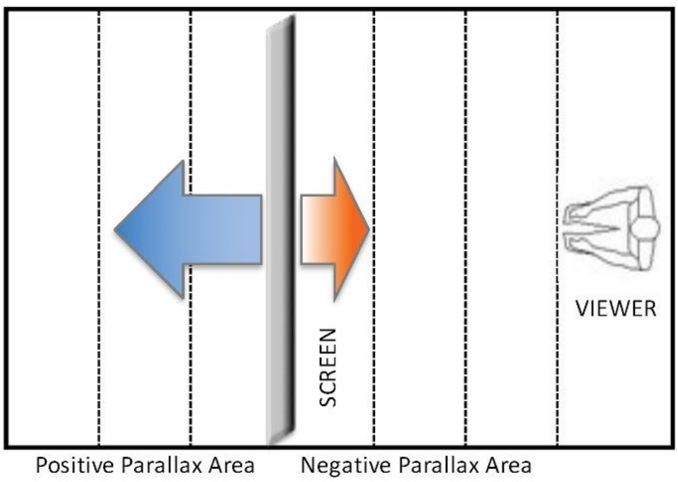
The final S3D film screened for the 1st Event group was, "The Martian" (Scott, 2015).

Figure 5-30

Combined S3D Depth Budget Graphic Surveys (Case Study-1st Event) for "The Martian" (Scott, 2015)

Results for: **"The Martian"**

	Distance behind the screen			Distance in front of screen			
Student:	S3D reached large distances behind the screen	S3D reached moderate distance behind the screen	S3D reached a short distance behind the screen	S3D reached a short distance in front of the screen	S3D reached moderate distance in front of the screen	S3D reached a large distance in front of the screen	Rating of what extent S3D became a part of the story:
# 1		•		•			1
# 2		•		•			1
# 3			•	•			1
# 4		•		•			1
# 5		•		•			1.5
# 6			•	•			1
# 7		•		•			1
# 8		•		•			1
# 9		•		•			1
# 10	•			•			1



1= Seamless integration with the story
2= Not very obvious but somewhat noticeable S3D
3= Quite noticeable S3D
4= Very obvious S3D and distracting from the story
5= The S3D is broken and is unwatchable

Note. Case Study-1st Event - Combined results from each of ten participant's observations in the S3D Depth Budget Graphic Survey, and their reading of 'Story Integration' using the codes at the bottom of the figure, after the screening of "The Martian" (Scott, 2015)

The more recent year of production of this film once again suggests simply that there is a better chance that a more refined application of Stereoscopic 3-D might have been utilised in line with Hollywood's, by now, long line of S3D productions. Nine of the ten case study participants attended this screening due to one participant being ill. It was also screened on a 65" LCD screen rather than on the cinema-sized projection screen. The tenth participant who was ill during the group screening, viewed the film and filled in the survey a week after the rest of the focus group.

The opening scene of this film is set on the surface of Mars, which presumably has similar near and far horizons as any broad exterior location on Earth (albeit more red in colour). For this reason, one of the expected issues as observed by participant #1 in this 1st Event group, is the difficulty in implementing S3D when there are locations with far horizons and also within the same shot, including objects that are placed close to the lens.

The group noted the fact that quite subtle S3D was implemented in these opening shots without any sign of unworkable or uncomfortable viewing: "This movie had no broken 3-D shots - no eye strain shots at all here. Surprising for a movie with lots of distant horizons but also character close-ups on Mars" (Case Study-1st Event, student #1).

At the end of the first delivery of the "Intro to S3D" course (April, 2016) with at least seven S3D films having been viewed and discussed by the participants, the beginnings of the effect of S3D on story was noted in discussion on this film "The Martian" (Scott, 2015).

> "This film ["The Martian"] used 3-D for quite good story effect. The theme of aloneness and isolation was boosted by the use of 3-D in this film. It didn't rely on the 3-D [for accentuating these themes] but it worked well with this use of it" (Case Study-1st Event, student #5).

Students noted that the location of Mars was likely to be a CGI background and not a real location enabling an easier S3D depth design. Further discussion showed that if it were a CGI location then knowledge gained from the "Intro to S3D" course pointed to increased control over the manipulation of the S3D and is likely to be the reason that the S3D in a distant horizon scene (Figure 5-31) works well. The group were then surprised to learn that the locations for these exterior scenes of Mars were in fact not a CGI creation but an actual region in southern Jordan called the Valley of the Moon in Wadi Rum (Scherer, 2016, p. 1).

Figure 5-31

Distant Horizon Shot in "The Martian" (Scott, 2015)

Note. A distant horizon shot in "The Martian" (Scott, 2015). Similar panoramic aspects in some S3D movies were found difficult to resolve in S3D. Image owned by 20th Century Fox but used under fair use for purposes of research, criticism, and review.

This highlighted now a surprising fact, that despite prior beliefs in regard to the difficulty of creating S3D with large vista background distances, it is apparently quite possible to have vast landscape shots in S3D without having to compromise on the quality of the S3D, and without having to resort to CGI landscapes for this reason.

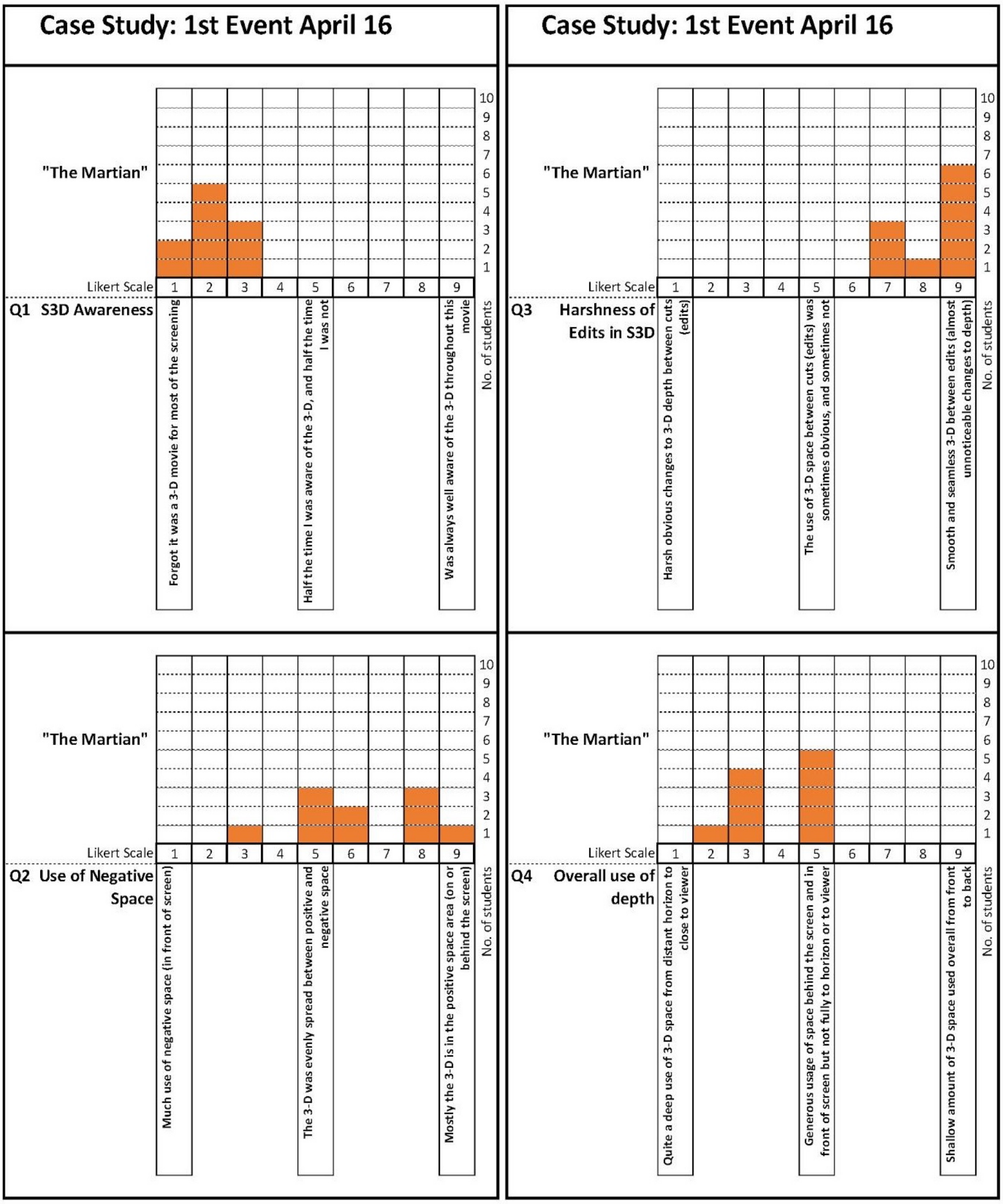
Figure 5-32

Close Horizon Shot "The Martian" (Scott, 2015)

Note. Such close horizon shots in "The Martian" (Scott, 2015) allowed more leeway with S3D options. Image owned by 20th Century Fox but used under fair use for purposes of research, criticism, and review.

Figure 5-33

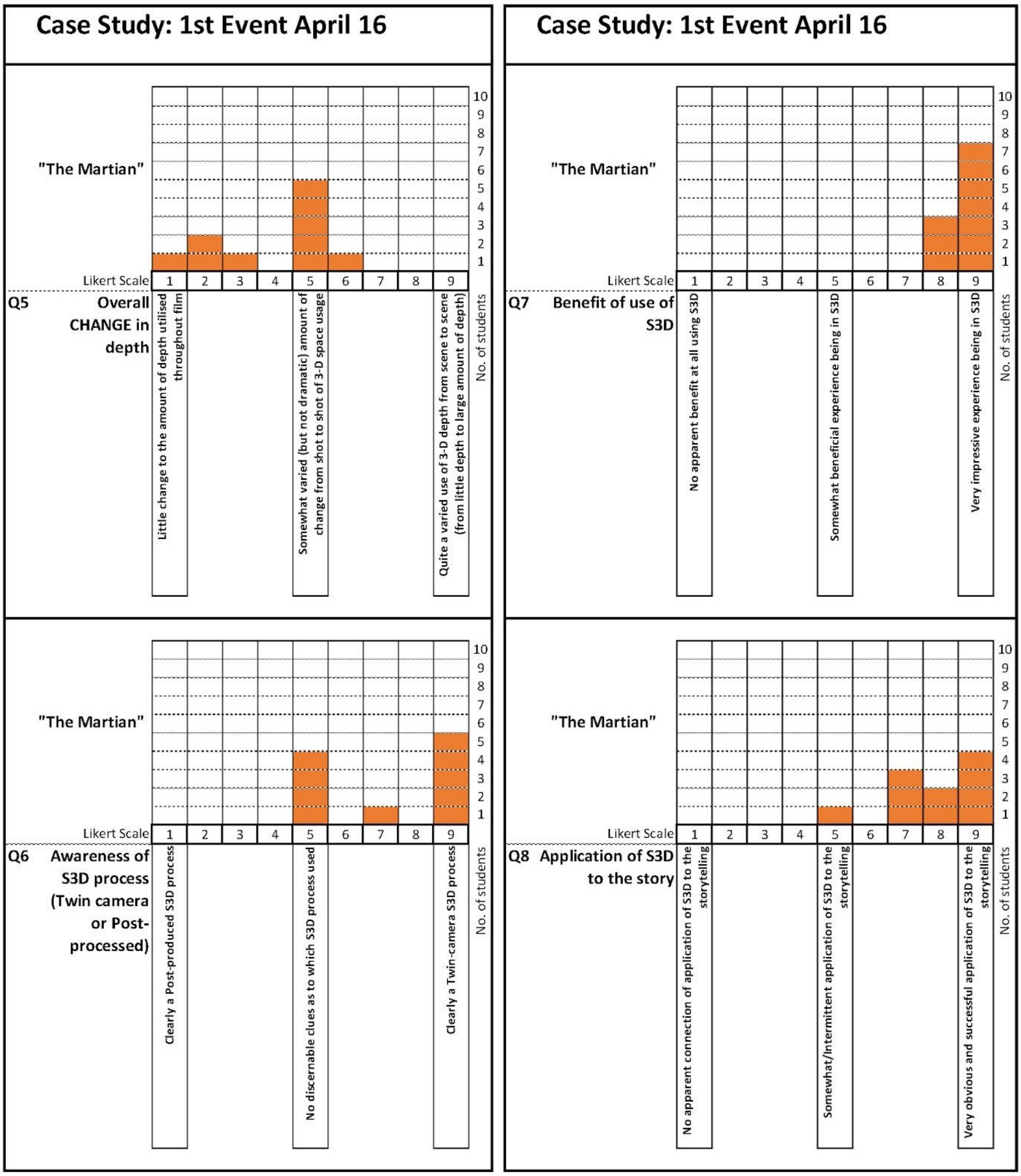
Bar Graph Compilation (Case Study-1st Event) Likert Surveys Q1-Q4 for "The Martian" (Scott, 2015)



Note. Compilation of ten participant's results in Case Study-1st Event surveys of Q1-Q4 for "The Martian" (Scott, 2015)

Figure 5-34

Bar Graph Compilation (Case Study-1st Event) Likert Surveys Q5-Q8 for "The Martian" (Scott, 2015)



Note. Compilation of ten participant's results in Case Study-1st Event surveys of Q5-Q8 for "The Martian" (Scott, 2015)

Most of the other scenes in “The Martian” (Scott, 2015) sequence viewed by the participants were set inside closed interiors, being a Mars station base in this instance. In these scenes the S3D was designed around an effort to complement the main character who is stranded in a small hut for most of the sequence (Figure 5-32). This is a clear example of how S3D can be used with a formalist film leaning to distort reality to suit the story being told.

The 1st Event group recognised that, despite the knowledge that they were viewing an S3D sequence, they generally became less aware of the S3D in this scene, and became more interested in the story and also just how the character remaining on Mars would be rescued.

> “I’m looking for the 3-D in the beginning of this movie of course but I noticed the 3D less in this movie after a while. I didn’t forget it was there, but it kind of merged into the film’s story and became a part of it” (Case Study-1st Event, student #4).

Figures 5-33 and Figure 5-34 show the Likert surveys for “The Martian” (Scott, 2015) with combined data from this 1st Event group. The results from this Likert survey indicate a much stronger S3D result than some of the previous S3D films. The “S3D awareness” question (Question one) got strong participant feedback of “Forgot it was a 3-D movie for most of the screening” with all indicators at the “1” end of the Likert scale. The design of the depth space usage in “The Martian” (Scott, 2015) was observed as evenly spread around the projection screen with some usage in front of the screen. Despite some spread within this indication, there is a broad response here of strong positive parallax usage. Question five indicated 40% of respondents observed little change in the amount of depth used, with over half of the respondents indicating a “Somewhat varied (but not dramatic) amount of change” of 3-D space usage”. The “Benefit of use of S3D” question (Question 7) delivered an overwhelming Likert scale numeric value of “8/9” being around a “Very impressive experience being in S3D”. The Question eight “Application of S3D to the story” also scored a high rating with 90% of respondents rating around the “very obvious and successful application of S3D to the storytelling” scale marker.

5.3.1.14 Case Study-1st Event - Summary Depth Model Learning Results “The Martian” (Scott, 2015)

For a film that lies within the science fiction genre where planetary sizes of landscapes are usually involved, along with tight interiors of fragile human living quarters, “The Martian” (Scott, 2015) seems to have used less of the S3D space available to it than some of its contemporary science fiction films had seemed compelled to use.

Table 5-8

"The Martian" (Scott, 2015) Case Study-1st Event Depth Model Summary Results

No.	*Depth model characteristic description*
1	Minimal negative parallax space used for higher quality S3D.
2	Variations in depth amounts only for story changes from scene to scene where required.
3	Distant horizons on S3D can be actual physical locations in order to achieve good S3D without needing to resort to CGI.
4	Positive parallax space used mostly, but limited to medium/short distances generally.
5	Limited extents of S3D depth usage allows the vast locations/settings to work on their own.
6	Subtle narrow depth of field shots adds extra S3D perception.

This retreat from the temptation to extend huge S3D distances in such a 'Martian' environment, has not only made the film easier to watch, but brings the character's story into focus rather than taking advantage of the S3D possibilities of such terrestrial environments.

With the 1st Event group's rating in the 'S3D and Story Integration' numeric code survey (Figure 5-30) showing a "1" (with a single "1.5" also), the group has recognised a very successful S3D integration example in this film. Overall, this means that "The Martian" (Scott, 2015) was well above average in the application of S3D to the storytelling, its subtle use of positive parallax as far as distant depth usage, and the careful and minimal use of negative parallax in front of the screen.

5.3.2 Case Study-1st Event - Curriculum Resource Results

After the first delivery of the "Intro to S3D" five-week course in April 2016, feedback on the actual course delivery itself was taken from the students who undertook the course via a survey completed after the course finished. It was also informed by observations made by the researcher during the class delivery sessions of any subsequent variations in the understanding of important points by the students in the class. These observations were noted by the researcher throughout each "Intro to S3D" course delivery, and were also fed by discussions from throughout the class sessions that reflected the students' experience in the course.

The early stages of the April 2016 Case Study-1st Event delivery were based upon a slide-deck presentation format, in a predominantly face-to-face environment. Attendance was 100% for all participants for all sessions except for one student who could not attend one session (session 4). The curriculum written by the researcher for this 1st Event student group delivery in April 2016, was informed by a previous, more basic S3D course designed by the researcher some years earlier. In the intervening years, more technological concepts were incorporated into the delivery design, particularly when it came to displaying 3-D imagery in a classroom setting.

Eventually an online component was introduced to the delivery that eventually evolved into a fully online course by late 2017.

The collected feedback from the surveys for the 'Curriculum Resource' aspect of the study of an S3D Grammar model's use within the course content was based on a set of questions that directly addressed the content of the course delivery. This gathered survey data was also strengthened by discussion and interview feedback that triangulated data to determine refinements to the content and structure of the course delivery, by way of the student's own perceptions. The "S3D Coursework Survey" questions specifically included on this Case Study-1st Event group's survey feedback were the following:

Table 5-9

S3D Coursework Survey Question List

Question No.	*S3D Coursework Survey Question*
Q.1	With the "Intro to S3D" course structured in 5 parts: 1. Brief History of Stereoscopic 3-D 2. S3D Theory (How It Works) 3. S3D Screening and Discussion 4. S3D Techniques & Benchmarks 5. S3D Storyboarding & S3D Into the Future were there any of these sectors that you consider to be instrumental in your understanding of the potential of S3D to help tell the story?
Q.2	With your prerequisite understanding of the physics of how a film is made (i.e. aspects of cinematography, or sound design, or production design that inform a film's "story"), how has your consideration of Stereoscopic 3-D's effect on story changed from when you started this "Intro to S3D" course?
Q.3	After viewing the listed S3D films as a component of the "Intro to S3D" course, were there any particular S3D films that provided any "aha" moments for you regarding application to story? If so can you identify which moments or scenes specifically made an impression on you as to S3D's impact on telling the story?
Q.4	Did such identifying moments get discussed in your class amongst the "Intro to S3D" course's students?
Q.5	Which aspects of the "Intro to S3D" course do you think worked well in your learning?
Q.6	Which aspects of the course could be improved upon and why?
Q.7	Could any of the 5 sectors be elaborated upon in the coursework for clearer learning?
Q.8	Are there any of the 5 sectors in the coursework that you think should be reduced for any reason?

Analysis of the responses from the Case Study-1st Event group to the above questions regarding the S3D Coursework Survey feedback are organised as in the following table (Table 5-10). For example, listed here are the results from the survey for Question 1:

Table 5-10

Question 1 from S3D Coursework Survey

Q.1	With the "Intro to S3D" course structured in 5 parts: 1. Brief History of Stereoscopic 3-D 2. S3D Theory (How It Works) 3. S3D Screening and Discussion 4. S3D Techniques & Benchmarks 5. S3D Storyboarding & S3D Into the Future were there any of these sectors that you consider to be instrumental in your understanding of the potential of S3D to help tell the story?

Table 5-11

Question 1 Responses from Case Study-1st Event S3D Coursework Survey

Student No.	*Student comment*
Student #1:	*All were interesting. The 'S3D Theory' was most dense learning. Applying 'S3D Theory' to 'S3D Screenings' session was where I learnt the most, in-class discussion helped. Maybe spread the 'S3D Theory' content over more sessions lessen the brain load?*
Student #2:	*S3D Screenings where theory started to make sense was most informative session. The S3D Techniques section made sense when I saw them used in some 3D movies. For 3D for story there wasn't much coursework that helped this. I wanted to learn how 3D worked. I started to see 3D helping tell the story AFTER I finished the course.*
Student #3:	*Watching 3D films after learning how 3D works I saw how much 3D can be used for a film storyline. I see lots of 3D films that don't use 3D for the story at all. The 2D Depth Cue part in the Theory session was good in regard to how much 3D is not actually 3D.*
Student #4:	*Overall the S3D Theory week showed me how to control the 3D. It will be longer before I can tell stories with it.*
Student #5:	*S3D Theory section and S3D Techniques section had the most facts. Individual screenings was the most educational aspect.*
Student #6:	*Screening class was the best teaching of 3D. I learned more watching 3D films than reading about 3D. None of it would be clear without the Theory class still. Especially 2D Depth Cues, very surprising.*
Student #7:	*3D concepts combined with screenings had most impact. Also 'how 3D works' demonstration with 3D glasses in class*
Student #8:	*The first class on history of 3D made me more interested in doing the course. Basic theory was a bit boring but was needed for the films we watched. The in-class demo of how changes in camera distances change 3D was good for explaining 3D*
Student #9:	*The theory was intense but was the most important I guess. The 3D in the films was different after knowing how it's done. Talking after each screening helped me understand 3D more.*
Student #10:	*Applying the 3D Theory section to how the plot formed in the 3D movies made sense. The more 3D I watched the more I understood about 3D on story. Mainly what didn't work in some films as well as what did work in 3D films.*

Analysis of the supplied answers to the Coursework Survey particularly with Question 1:
"With the "Intro to S3D" course structured in 5 parts:

1. Brief History of Stereoscopic 3-D
2. S3D Theory (How It Works)
3. S3D Screening and Discussion
4. S3D Techniques & Benchmarks
5. S3D Storyboarding & S3D Into the Future

Were there any of these sectors that you consider to be instrumental in your understanding of the potential of S3D to help tell the story?"

A look at the combined answers for Question 1 in the Case Study-1st Event Survey (Table 5-11) showed a clear majority of respondents saw the screening of S3D films in class as the best opportunity to learn. The benefit of discussion between the facilitator and the students after the screenings came up in many of the answers from this Case Study-1st Event group. The point was also raised about the importance of having to learn the S3D theory. A sense of it being harder to take in (presumably as it is quite a lot of theoretical content when compared to simple screening sessions) points to a need to either spread the load over more sessions, or alternatively start including online mirroring of this content in the form of lecture content available for download. In this way less emphasis can be placed on the one session as the only opportunity to learn the concepts of the 3-D subject matter, with access to this same content available for online download.

Another aspect that was mentioned seven times in this first survey in response to Question 1 and particularly Question 5 (Table 5-11 and 5-20 respectively) was the clear success of the "live" 3-D demonstration during the theoretical session. This was a technical achievement in being able to show to an auditorium of students 3-D on screen via original creations of 3-D models viewed in Stereoscopic 3-D. For this first course delivery this "live" 3-D aspect was enabled by having all students in the lecture auditorium wear red and blue (anaglyph) 3-D glasses allowing a basic viewing of 3-D from the auditorium screen (see Figures 5-35, 5-36, and 5-37).

Anaglyph glasses for this experience meant that no technical requirements are needed to view basic 3-D other than a red/blue double image on the screen. By using pre-visualisation software that allows manual animation of CGI models a set of three red/blue anaglyph images were made viewable in 3-D by simply displaying them in a simple 2D slide deck application (see Figures 5-35, 5-36, and 5-37).

Figure 5-35

Anaglyph Image #1 from April 2016 "Intro to S3D" Coursework

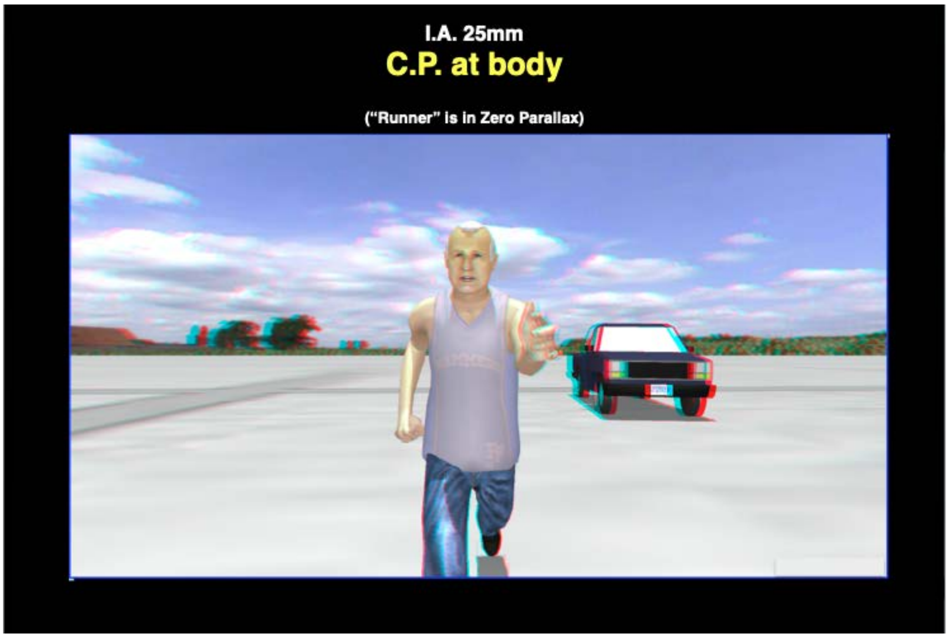
Note. Red/blue anaglyph image from slide deck in April 2016 "Intro to S3D" Course showing 'behind the screen' S3D placement. This image can be viewed here in 3-D with anaglyph glasses. Image used by permission of the author.

By moving between these three consecutive images in a slide deck presentation a clear 3-D change was seen by the students in the class. These three images also indicate the camera settings that enabled these particular 3-D characteristics.

The positive feedback on this aspect of the S3D theory delivery resulted in the construction of a higher grade of 3-D viewing of the same principle by creating the same example film scene directly in the pre-visualisation software. By operating this software in the class delivery directly from the facilitator's computer into an S3D capable projector, the same S3D characteristics can be seen by the students but now using the much higher S3D visual quality of polarised S3D glasses. The S3D characteristics are the same as the anaglyph version of this S3D projection but now in significantly higher S3D quality. The resulting S3D is commensurate with the best of S3D film playback technology. The reproduced anaglyph images here are the images used in the first April 2016 Course delivery (see Figures 5-35, 5-36, and 5-37) and these three images can be viewed in S3D on these pages using anaglyph glasses. More feedback from these first course participants showed a mix of responses as to the effect that S3D had on the potential to help benefit the telling of the story (see Table 5-13).

Figure 5-36

Anaglyph Image #2 from April 2016 "Intro to S3D" Coursework



Note. Red/blue anaglyph image from slide deck in April 2016 "Intro to S3D" Course showing 'on the screen' S3D placement. This image can be viewed here in 3-D with anaglyph glasses. Image used by permission of the author.

Figure 5-37

Anaglyph Image #3 from April 2016 "Intro to S3D" Coursework

Note. Red/blue anaglyph image from slide deck in April 2016 "Intro to S3D" Course showing 'in front of screen' S3D placement. This image can be viewed here in 3-D with anaglyph glasses. Image used by permission of the author.

Results showed that 60% of the respondents believed that S3D had only a slight influence on story when compared with the traditional aspects of cinematography, editing, production design, and screenwriting. The remaining 40% stated that they saw S3D as having the same amount of influence on story as these traditional aspects. It is interesting to note that none of the respondents saw S3D as having more influence than these traditional methods.

Table 5-12

Question 2 from S3D Coursework Survey

Q.2	With your prerequisite understanding of the physics of how a film is made (i.e. aspects of cinematography, or sound design, or production design that inform a film's "story"), how has your consideration of Stereoscopic 3-D's effect on story changed from when you started this "Intro to S3D" course?

Table 5-13

Question 2 Responses from Case Study-1st Event S3D Coursework Survey

Number of respondents	*Level of influence S3D has on story:*
6	"...I think that S3D has only a **slight** influence on story when compared to the sound design, production design, etc. effect on story…"
4	"...I think that S3D has roughly the **same** amount of influence on story when compared to the sound design, production design, etc. effect on story…"
0	"...I think that S3D has significantly **more** influence on story than the influence of sound design, production design, etc. on story…"

Table 5-14

Question 2A from S3D Coursework Survey

Q.2A	With your prerequisite understanding of the physics of how a film is made (i.e. aspects of cinematography, or sound design, or production design that inform a film's "story"), how has your consideration of Stereoscopic 3-D's effect on story changed from when you started this "Intro to S3D" course?

Table 5-15

Question 2A Responses from Case Study-1st Event S3D Coursework Survey

Number of respondents	*Whether my opinion on how much effect S3D has on story HAS CHANGED since doing this "Intro to S3D" coursework:*
6	"My opinion on how much effect S3D has on story HAS CHANGED since doing this "Intro to S3D" coursework"
4	"My opinion on how much effect S3D has on story HAS NOT CHANGED since doing this "Intro to S3D" coursework"

Table 5-16

Question 2 Comments from Case Study-1st Event S3D Coursework Survey

Student No.	*Student comment*
Student #1:	*Wasn't sure S3D had anything to do with story until I did this course. I see more films that use 3D as a theme park ride trick though not as part of the story.*
Student #2:	*3D should be part of making a film as much as sound or editing etc. I watch 3D films where they are made just for the fun of 3D. But films like "Martian" look different for the way 3D is used, maybe more will come probably. Doing this opened my eyes to what 3D can do but not many are done that way.*
Student #3:	*I think that 3D CAN have an influence on story but usually doesn't until better 3D films are produced.*
Student #4:	*There is not much storytelling happening with 3D but I see how 3D is a part of the mise-en-scene like cinematography and directing. 3D will probably be important for this in the future.*
Student #5:	*Looks like 3D will be more a part of the elements that make a film if it is used to tell the story in the future like 'Gravity' or 'The Martian'.*
Student #6:	*I think 3D will work with the storyline more with new films.*
Student #7:	*I believed 3D worked with story before I came here. It [3-D] has the same effect on story as other parts of filmmaking.*
Student #8:	*That 3D could make a film's story better I didn't know until doing this subject ["Intro to S3D" course]. 3D is not a huge change to a film though like special effects can be a major part of a film.*
Student #9:	*3-D has influence on story more than I knew before but it still could have more.*
Student #10:	*I did not see how 3D could be used for storyline but I see it now*

Above are the results from the survey for Question 2 section where participants added comments if they wished as to whether their view on S3D's effect on story had changed since beginning the course.

Question 3 on the survey asked whether there were any particular S3D films that provided any "aha" moments regarding application to story? This question was designed by the researcher to find if any particular applications of S3D had been recognised by the participants as breaking away from the more common practice of just using 3-D for wow-factor shots.

Table 5-17

Question 3 from S3D Coursework Survey

Q.3	After viewing the listed S3D films as a component of the "Intro to S3D" course were there any particular S3D films that provided any "aha" moments for you regarding application to story? If so can you identify which moments or scenes specifically made an impression on you as to S3D's impact on telling the story?

Table 5-18

Question 3 Responses from Case Study-1st Event S3D Coursework Survey

Student No.	*Student comment*
Student #1:	*"The Martian" was the first aha re S3D showing the character's journey.*
Student #2:	*I liked Journey to the Centre of the Earth because the 3D was obvious. Even though some shots didn't work well in 3D.*
Student #3:	*Journey to the Center of the Earth showed me that 3D can be good but is wasted on thrills. Gravity was most impressive 3D with outer space really looking like outer space in a movie. The Martian felt like the 3D showed the lost astronaut's predicament so this was best aha moment.*
Student #4:	*The most conspicuous 3D that wasn't bad 3D was Journey to the Center of the Earth. [Mad Max:] Fury Road had some good 3D but the whole film was good so hard to tell how much of it was because of the 3D. The Martian was best 3D – no bad 3D shots.*
Student #5:	*'The Martian' when he is left alone on Mars. He has more space around him when he is alone than when he was with his crew* *'The Martian' when he is left alone on Mars. He has more space around him when he is alone than when he was with his crew*
Student #6:	*Big screen viewing of "Gravity" showed me that the subject matter (outer space) in the first scene up to and including the debris attack works well in 3D.*
Student #7:	*"Hugo" had much 3D that was good but "The Martian" was mind blowing with the 3D between Earth, the shuttle, and the astronauts.*
Student #8:	*Aha moment is the opening of 'Gravity' which made the 3D look amazing. The interiors of the small space pods that the astronauts were in had good 3D too almost the same size as the outer space outside.*
Student #9:	*["Legend of the Guardians: The Owls of Ga'Hoole''] was great 3D and made a good impression overall. The opening car chase and battle in "Mad Max: Fury Road" was great in 3D.*
Student #10:	No entry recorded

From this Question 3 summary, it appears that "Gravity" (Cuarón, 2013) and "The Martian" (Scott, 2015) were mentioned the most of the seven films that were screened for the 1st Event group. Of the ten participants who submitted these surveys nine completed this question. Five of those nine participants cited "The Martian" (Scott, 2015) as having "aha" moments, notably each a different scene from that film. Three of the nine participants cited "Gravity" (Cuarón, 2013) as having "aha" moments, with each commonly identifying the opening scene amongst their noted S3D moments. For the purposes of refining this coursework through the survey data, having 90% of the participants capable of identifying such specific moments from all of the S3D films that were screened to them, is significant. It indicates that the learning from the "Intro to S3D" coursework has instilled a confidence that they are able to understand, identify, and explain such benchmark points in their own evolution of understanding S3D.

It is also worth noting that “Journey to the Center of the Earth” (Brevig, 2008) was also cited three times by the 1st Event group respondents in this “S3D Coursework Survey” (Table 5-18) as containing S3D benchmark scenes, yet from a majority of respondents in the “S3D Likert Surveys” (Figure 5-13 and 5-14), this film drew few redeeming S3D characteristics. This could be attributed to the fact that first impressions possibly became the observer’s overriding opinion of the S3D in this film, rather than any considered reflection of the whole film where the advantage of extra time might have given a fuller picture. In the first few minutes of “Journey to the Center of the Earth” (Brevig, 2008) there were extremes of S3D with shots ranging quickly from impressive and well made, to shots that were painful to watch and ‘broken’ (from the point of view of well-crafted S3D). After watching a larger portion of this film these same observers will likely have spent more time considering the film’s better qualities, as well as its less-appealing qualities, and conceivably then be seen to have drawn a different view than they did with their first few minutes’ impressions.

These “S3D Coursework Survey” results (Table 5-11, 5-13, 5-14, 5-15, 5-16, 5-18, 5-20, 5-22, 5-24, and 5-26) is data that was drawn after the end of the entire “Intro to S3D” course. Therefore, participants had time to consider not only the film in larger portions, but also from a newer consideration being from the point of view of “students” who had a much better understanding of S3D as a result of completing the “Intro to S3D” course. These research participants were therefore recording observations in this later survey after they had a firmer understanding of what constitutes well-produced S3D.

Research by Thomas Mann and Melissa Ferguson on such reinterpretation and reversal of implicit evaluations backs up this reasoning in a hypothesis as reported in the “Journal of Personality and Social Psychology” in 2015. They found that after a number of experiments regarding a change in belief after first impressions were formed that “[research] participants fully reversed their implicit evaluation ... after reinterpreting earlier information” (Mann & Fergusson, 2015, p. 825). This is further supported by Melissa Ferguson, Thomas Mann, Jeremy Cone, and Xi Shen in “Current Directions in Psychological Science” where their further research showed “that implicit impressions are responsive to information that is highly diagnostic, believable, or reframes earlier experience” (Ferguson et al., 2019, p. 332).

This premise can be seen to describe the formative education that the S3D course participants received by undertaking the “Intro to S3D” course. A stronger understanding of how to produce cinema S3D that doesn’t assault the viewer’s senses is one of the goals of the refinement of this S3D Grammar resource for the coursework delivery of S3D film production techniques. Mann and Ferguson’s research is summarily reflected in this study’s participants’ change in S3D interpretation of the viewed “Journey to the Center of the Earth” (Brevig, 2008) from early in the course (Figure 5-9), to their beliefs as stated after the course had finished and with the passage of time (Table 5-18).

None of the feedback from this 1st Event course delivery reflected significant issues with the course. A number of responses to the question of what needed changing were: “No changes needed” (1st Event Course Feedback Survey #1, student #5).

In response to a question about what could be improved in the coursework some suggested that the course could be longer (i.e. with additional sessions), and at least one respondent suggested that the course be eventually made a part of formal qualifications in their Bachelor of Film degree.

A number of respondents mentioned the significant viewing benefits of having high quality screening facilities in order to learn this level of S3D. Several feedback points were made about the benefit for students of being able to view S3D films on these high-quality viewing facilities outside of class. Discussions during class also touched upon the much different experience of S3D when viewing the set screenings on significantly higher quality of S3D than most domestic S3D viewing allowed. It is interesting to note that from a verbal survey at the beginning of the course delivery it became evident that very few of the participant students undertaking this course had any S3D viewing facility at all outside of the coursework facility.

Over the five weeks of course delivery it was mentioned a number of times by the participants how impressive the S3D experience was because of the high technical standard of 3-D viewing. It was also fed back to the students that this high level of S3D standard was due to careful choice of appropriate equipment even though this equipment is still chosen from reasonably priced and commercially available domestic products at that time. It soon became clear to the course participants that knowledge of what to acquire for advanced S3D viewing was not necessarily a matter of money, but more a matter of careful consideration and selective choices prior to acquisition.

Table 5-19

Question 5 from S3D Coursework Survey

Q.5. Which aspects of the “Intro to S3D” course do you think worked well in your learning?

Table 5-20

Question 5 Responses from Case Study-1st Event S3D Coursework Survey

Student No.	*Student comment*
Student #1:	*Viewing S3D films and talking about them in class. Watching more S3D films between class sessions.*
Student #2:	*Talking about the 3D during and after screenings.*
Student #3:	*Seeing the difference in 3D in the class on screen by changing camera distances was the reason I understood how it worked.*
Student #4:	*All of it.*
Student #5:	*Watching the 3D demonstration of the theory in class with 3D glasses was awesome.*
Student #6:	*Seeing 3D change by movement of interaxial distance in class with glasses was aha moment for me. Also great quality 3D film screenings.*
Student #7:	*The screenings in relation to the discussions afterwards.*
Student #8:	*Mostly talking about the 3D whilst watching the films. Group discussion after sessions I learnt the most. Also talking to David during the week between classes he helped me understand more.*
Student #9:	*Watching 3-D films was best learning.*
Student #10:	*In class 3D changes on-screen with 3D glasses made it easy to understand.*

Table 5-21

Question 6 from S3D Coursework Survey

Q.6	Which aspects of the course could be improved upon and why?

Table 5-22

Question 6 Responses from Case Study-1st Event S3D Coursework Survey

Student No.	*Student comment*
Student #1:	*Having better accessibility to S3D movie screening facilities between sessions would mean I could watch [more 3-D].*
Student #2:	*Maybe more 3D films to watch.*
Student #3:	*Access to more 3D movie viewing in between weekly sessions. I don't have 3D screening equipment at home so rely on the school's 3D equipment and movies!*
Student #4:	*Was all ok.*
Student #5:	*More 3D classes.*
Student #6:	*More films to watch if there was more time.*
Student #7:	*Maybe a longer course with camera experience added.*
Student #8:	*A longer course.*
Student #9:	*Make this a part of the film degree subjects.*
Student #10:	*Longer course as a full subject for degree.*

Table 5-23

Question 7 from S3D Coursework Survey

Q.7	Could any of the 5 sectors be elaborated upon in the coursework for clearer learning? If so, please describe:

Table 5-24

Question 7 Responses from Case Study-1st Event S3D Coursework Survey

Student No.	*Student comment.*
Student #1:	*No more elaboration required that I can think of. Facilities between sessions would mean I could watch [more 3-D].*
Student #2:	*Having a 3D camera to shoot something would help the concepts even more.*
Student #3:	*No, it was very clear.*
Student #4:	*Less talking. An advanced set of 3D classes where we actually put the 3D theory to practice.*
Student #5:	*No.*
Student #6:	*Seemed fine.*
Student #7:	*I don't think so.*
Student #8:	*Not really.*
Student #9:	*No.*
Student #10:	*More online viewable stuff.*

Table 5-25

Question 8 from S3D Coursework Survey

Q.8	Are there any of the 5 sectors in the coursework that you think should be reduced for any reason? Please describe:

Table 5-26

Question 8 Responses from Case Study-1st Event S3D Coursework Survey

Student No.	*Student comment*
Student #1:	*S3D Theory could be spread thinner as it is high amount of content for one session.*
Student #2:	*The theory part was a lot in one session compared to the other sessions but it has to be covered.*
Student #3:	*No.*
Student #4:	*No.*
Student #5:	*Increased number of classes. The content was good though.*
Student #6:	*No.*
Student #7:	*Definitely not.*
Student #8:	*No.*
Student #9:	*No.*
Student #10:	*Definitely not.*

Question 6 asked about which aspects of the course could be improved upon and why. 50% of respondents replied with a request for more 3D film screenings, and 40% of respondents requested that the course be a longer one. More screenings in a student's own time would be a possible blended learning improvement, and the flipped classroom aspect puts the onus on the student to do much of this high time requirement aspect of the learning (watching many S3D films). The requirement for Stereoscopic 3-D capable playback and viewing equipment becomes an issue for numbers of students who do not have this equipment readily at hand. Therefore, S3D viewing online or at some premises becomes the needed resource. As the course is titled an "Intro to S3D" course, it was designed to be an introduction. In this way the basic premise of Stereoscopic 3-D is learned, and the theory of how it works gets to be the foundation for a future more advanced course that would likely be a practical and production-based extension of this "Intro to S3D" course.

In considering responses to Question 7 in the coursework feedback survey, which was "Could any of the 5 sectors be elaborated upon in the coursework for clearer learning?", the results from the 1st Event participants had 70% of respondents stating that there were no areas that required more elaboration. However, 20% of respondents suggested incorporation of the use of a Stereoscopic 3-D camera into the coursework would boost the understanding of the theory. One participant suggested more online content would help the course (see Table 5-24).

Question 8 asked "Are there any of the 5 sectors in the coursework that you think should be reduced for any reason?", and the responses showed that 20% of respondents thought that the S3D Theory section was a high amount of content for one session and suggested that it could be reduced. Seven respondents stated that they thought that no reduction in coursework was required, (with one respondent taking the opportunity to request an "increased number of classes" instead).

5.4 `Case Study-1st Event Conclusions

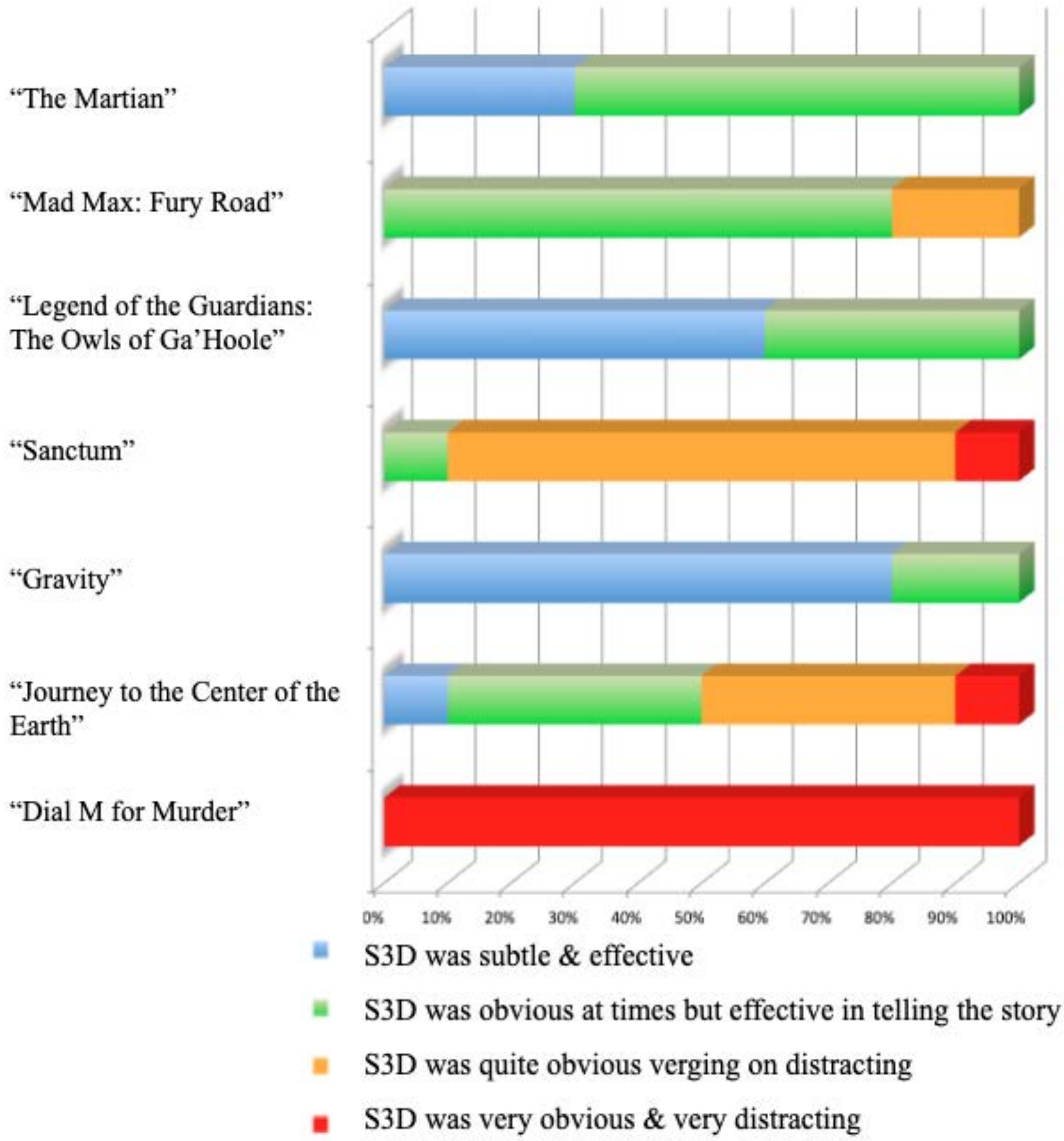
For conclusions from this case study within this research, first the result of observations of an appropriate depth model is listed, followed by observations for the incorporation of the S3D Grammar model into the coursework as a learning resource.

5.4.1 Depth Model Conclusions from Case Study-1st Event

In consideration of the Depth Model analysis from this 1st Event group, the discussions and survey results found clear characteristics that defined an S3D model that had more grammatical use on storytelling, was less obtrusive, and was a positive addition to the film's overall presentation.

Figure 5-38

Case Study-1st Event - S3D Story Effectiveness collated results



Note. This is an alternative view of the 'effective storytelling' results comparison drawn from the "S3D Depth Budget Graphic Surveys".

For a broad interpretation of the level of S3D positive responses to the films viewed in this case study Event, an overview is illustrated in the graph in Figure 5-38. These results came from the initial S3D impressions of the Case Study-1st Event participant students on the "S3D Depth Budget Graphic Surveys" using the 'S3D and Storytelling' codes. With all the studied S3D films shown in one view, a positive S3D attribution is shown here by cooler blue and green colours, and the less supportive responses to the S3D are shown here as warmer oranges and red tones.

The overarching view therefore indicates broadly that the cooler blue/green represented S3D films:

- "The Martian" (Scott, 2015)
- "Legend of the Guardians: The Owls of Ga'Hoole" (Snider, 2010)
- "Gravity" (Cuarón, 2013)

are the films that elicited the most positive responses to the application of S3D from the Case Study-1st Event participants.

Before the analysis is defined succinctly for case study conclusions, it is important to be aware that characteristics other than pure depth model designs have a bearing on the 3-D results as observed by the Case Study-1st Event respondents. For example, this 1st Event focus group's discussion observations included the benefits to S3D in storytelling of 2D Depth Cues, choice of S3D origination being either real Stereoscopic 3-D twin camera production or post-converted S3D production, and choice of setting/location as examples. The 1st Event group observed that all three of these films had a high utilisation of 2D Depth Cues, and that none of these films were made using physical Stereoscopic 3-D twin cameras. "Gravity" (Cuarón, 2013) and "The Martian" (Scott, 2015) both were post-converted S3D films, and "Legend of the Guardians: The Owls of Ga'Hoole" (Snider, 2010) being a CGI animated movie also had the benefit of digital S3D production rather than real-world optical camera production. From this list of three films it is appropriate to also note that two of these three S3D films are categorised as science-fiction by genre and have a common setting of being in outer space. The commonality of these films being set in outer space may be indicative of S3D viewers expecting to see S3D depth characteristics more suited to a story that contains floating/weightless environments. It may also be that they are wishing to see S3D in an environment that may often be characterised by boundless distances and extraordinarily large objects (i.e. planets, panoramas, star fields, spacecraft).

In drawing conclusions from this case study in regard to a template S3D Depth Model, gathered clear observations of such positive S3D results from across all sequences, were distilled and summarised here:

1. Location and setting has an effect on how well the S3D appears to work.
2. Close-distanced horizons (interiors for instance) allow for more manipulation of S3D than far distanced horizons.
3. Less extreme negative parallax space usage in front of the screen gave better viewer responses.
4. Identifying the characteristics of a film's themes and then using S3D to illustrate these thematic points is more likely to garner good S3D responses.
5. S3D is better used as one of a number of tools rather than an end unto itself. For instance, when S3D is employed in unison with appropriate cinematography, and appropriate production design, this creates a more impressive product than just the deployment of S3D on its own.
6. The Post-converted process for S3D can produce excellent S3D results when used carefully, despite a previous industry belief that the post-converted S3D process was an inferior process. For instance, when post-converted S3D is used in conjunction with selective 2D Depth Cue models then problematic cardboard cut-out issues are reduced.
7. Animated (CGI) films have a better chance of great S3D than real-world films due to controllability of the CGI environment. For instance, environments with large geographic topography can be built within a CGI world with much closer horizons (creating smooth S3D depths) than would a real-world geological horizon.
8. Careful inclusion of 2D Depth Cues will have a significant effect on S3D quality.
9. Narrow depth of field can exaggerate the S3D. Broader DOF works too but narrow DOF forces the 2D Depth Cues to add to the experience.
10. Telephoto shots look fake and flatten the image even in S3D.
11. Painful shots in some outdoor shots seem unnecessary with better science.

By applying the above results to structuralist and formalist film theories, the depth model attributes that resulted from this 1st Event's research complement the storytelling techniques that were understood by the film theorists who refined these theories in the 20th century (Buckland, 2004). There is no clash with the newness of such S3D principles and its integration with traditional 2D principles in cinema narrative and storytelling. In other words, the manipulation of the film image to project a more embellished aspect of the story being told, easily applies to these found S3D characteristics in the same way, because there are no differences between 2D and 3-D in what is being manipulated as far as bending the perceived imagery. For instance, in "The Martian" (Scott, 2015) the enlarging of the otherwise small physical habitat space of the protagonist by the embellishment of S3D clearly draws upon classicist/formalist film theory principles to annunciate this predicament.

5.4.2 Curriculum Resource Conclusions from Case Study-1st Event

In consideration of the Curriculum Resource results from this Case Study-1st Event, the refined observations of S3D characteristics within a structuralist/formalist view started to build a focal point of the application of S3D in the coursework delivery. It did this by refining and including some of the following discussion and survey results in the next round of S3D course delivery.

1. The theoretical content in session two to be spread over more sessions, and to have a flipped classroom aspect where students are required to read and view clips prior to attending the S3D theory session.
2. The 2D Depth Cue content to have more emphasis and more examples to boost its importance in S3D storytelling.
3. Triangulated data showed that S3D screenings were very important to learning. Therefore, more S3D content to be played every week to reinforce learning.
4. A higher quality demonstration of S3D technique (through polarised S3D models) for a better understanding of the S3D production process. This to replace the more basic anaglyph method for the same demonstration.
5. Downloadable content for each session to be made available to students after the session delivery for multiple viewings and revision. This will be in the form of pdf copies of the slide deck presentations, as well as links to extra online reading content.
6. Choice of screening titles to be discussed with the class in regard to lineage of S3D progression. The fact that early S3D productions did not necessarily employ the best examples of what S3D can do for storytelling. More recent S3D titles to be used in the screening and discussion sessions to evidence great examples in the initial stages.

The content within the S3D Techniques session to be moved earlier in the schedule so that students get the benefit of the importance of specific tricks and techniques during the initial S3D screenings.

5.5 Reflection and Redesign of Coursework

In an environment where "new media" concepts are being added to popular culture on a seemingly regular basis, (such as Virtual Reality (VR), multi-screen entertainment where stories are formatted for viewing on smartphones as well as big screen televisions, storified social media, and television series story structures now designed for binge-watching), the pace of such change is rapid in the keeping up of what is accepted by the movie-going public. In reflecting on the coursework delivery and the subsequent redesign of the course structure, an approach of systematic S3D film viewing by the students from the subsequent survey feedback and discussions as a group informed the plan for a stronger model of S3D understanding and also for the pursuit of a more substantial S3D language model.

The sequence screening order of the S3D films in the first delivery of the "Intro to S3D" coursework in April 2016 was designed to reflect a cross section of 3-D releases over the time period when many 3-D feature films experienced popularity. The choices of 3-D films for screening to the students in this first course delivery also blended genre, live-action/ animation, and year of release (where a certain amount of evolution became evident in the improvements in 3-D standards the later that these 3-D films were released). For the course participant experience by their vintage, as being one of the earlier examples of 3-D feature films produced, such early S3D films were also likely to have a limited and basic if any utilisation of S3D's storytelling potential. For this reason, the order of S3D sequence screenings for the focus groups was planned to be mixed for each consecutive course delivery.

Two respondents noted when answering Question 1 regarding what they considered to be "instrumental to their understanding" of S3D was the aspect of 2D Depth Cues being in the "S3D Theory" session of the course. This becomes a salient point when understanding how S3D works when many aspects of advanced S3D success is in fact from traditional two-dimensional techniques (Blundell, 2015, p. 8). For instance, side light and shadows in a 2D movie will indicate aspects of depth quite well just as in real life shadows help with navigating our world without falling over. For this point to be appreciated so early in students' understanding of S3D (it is only a five-week course after all) is a point that will be emphasised more in future course iterations. In regard to the feedback from Question 2 regarding the "influence of S3D on telling the story" (see Table 5-13), the 60% result of respondents who believed that S3D had only a slight influence on story when compared to the sound design, production design, etc. effect on story may be a result of the selection of S3D film sequences chosen for screening for that group. As stated previously some of the film titles were S3D films created early in the evolutionary timeline of S3D technology and storytelling. Films like "Dial M for Murder" (Hitchcock, 1952) and "Journey to the Center of the Earth" (Brevig, 2008) in the first group of S3D screenings received feedback from these same respondents that were less than complementary regarding the S3D usage. For instance, one response from this group in discussion for "Dial M for Murder" (Hitchcock, 1952) said; "it seems like a primitive 3-D film with the benefit of seeing better 3-D films made in the decades since 1952" (Case Study-1st Event, student #2).

Again, in the discussion responses for "Journey to the Center of the Earth" (Brevig, 2008) a student noted the inclusion of "...'cheesy' S3D shots that dilute the storytelling..." (Case Study-1st Event, student #4). So as a result, it became apparent that the students who experienced a mix of S3D films in the April 2016 Coursework (as chosen by the facilitator to enable a cross-section of S3D productions for study), had not considered these films in an historical light as intended. Even though other films in this same chosen set list of S3D films such as “The Martian” (Scott, 2015) scored quite highly in their application of S3D in storytelling, where a student in discussion after the screening stated “...[“The Martian”] used 3-D for quite good story effect. Themes of loneliness and isolation were lifted by the use of 3-D in this film. It didn’t rely upon the 3-D [for these themes] but it worked well with this good application of it” (Case Study-1st Event, student #6). The students did not seem to have considered the evolutionary element of this S3D title choice progression. To help put perspective to the S3D films that may have not scored well in S3D storytelling feedback, more emphasis was subsequently placed on explaining the timeline of S3D film development for the next iteration of the S3D course. An S3D timeline for such historical significance of stereoscopic evolution was reinforced with a detailed Gantt chart and made as a point to discuss the potential of S3D storytelling rather than the stasis of S3D storytelling in some of these early S3D films. The positive response in the Course Survey feedback to the aspect of “2D Depth Cues” suggested that a more active learning approach to this topic might inspire even more enthusiasm to understand this aspect of S3D theory in the coursework. The S3D Theory portion of the coursework was named several times in the feedback as possibly a little dry and somewhat dense in its implementation. By elaborating on the in-class experimental side of constructivist delivery some simple physical activities were planned to improve the teaching of the basic physiological and optical aspects of human stereoscopic vision and perception. This led quickly to the expansion of the 2D Depth Cue concept that was praised in this first course feedback, and so built upon improving the required S3D Theory aspect of the course content.

In order to address further the feedback of high content levels for the S3D Theory section, a model for more flipped class content was instigated for the 2nd Event “Intro to S3D” course delivery. This resulted in a set of readings and online videos that participants were asked to view in the week prior to the next weekly “class”. The plan for this was to alleviate the theory content load within the face-to-face 3-hour session in Week 2. For extra development of a course that is expected to become a formal course offering two assessment items were included in the 2nd Event “Intro to S3D’ coursework. These assessments were added to the 2nd Event coursework for three reasons. One, so that the students had a stronger sense that this “Intro to S3D” course was looking to be on par with other film related course deliveries rather than just a passing interest course. Two, so that an indication of their learning could be recorded by the researcher, and three, so that there was an additional item of feedback for evaluating the coursework.

6 Chapter Six: Case Study-2nd Event

6.1 Introduction

The 2nd Event in this case study research reflected the second delivery of the “Intro to S3D” film course which ran in July of 2016, and was delivered on the same premises that the 1st Event was delivered being SAE Creative Media Institute in Sydney, NSW. Again, this research was designed to refine the resourcing of the course content from the previous Event course delivery, and also to establish if any S3D models from films studied were emerging as a model for widespread use and acceptance. Just as the first model of course delivery in the 1st Event included film screenings, in-class slide deck presentations, and practical demonstrations, so did this 2nd Event delivery. It was once again run outside of formal accredited degree coursework, and was delivered to a different set of volunteer film students. These students had the same understanding as the 1st Event’s students that their participation was completely separate from their formal studies, and that their performance in the “Intro to S3D” course had no influence at all on their grades in their formal Bachelor of Film studies.

The participant students in this 2nd Event, as in the 1st Event, were somewhat S3D novices when it came to understanding S3D in movies (each student confirmed with the researcher at the beginning of each course that they enrolled in this module because they did not know how S3D worked and wished to learn). Their interpretation of the use of depth in these films started without any formal understanding of any standard set of depth attributes. However, as with the 1st Event’s students, these 2nd Event students came with an understanding of cinematographic principles at a basic undergraduate level, giving a strong base from which these students could build when it came to applying and interpreting S3D principles. As a result, when these students were asked after each screening to describe the application of depth placement, they had no preconceived notions as to what this would be as far as being a comparable characteristic between films.

6.2 Student Participation

As in the 1st Event “Intro to S3D” course, there were again ten students who volunteered to attend this July 2016 “Intro to S3D” 2nd Event, comprising a similar set of five three-hour sessions of introductory knowledge of ‘how Stereoscopic 3-D is created’. From a college-wide number of approximately two-hundred film students, an invitation was sent for those of the two-hundred enrolled students who had achieved at least the basic foundational modules, who might be interested in participating in this research. The five three-hour sessions covered enough technical knowledge to understand the constraints of the S3D medium but more importantly, these sessions were intended to teach the most apt processes for implementation of the most appropriate S3D for best storytelling. Just as in the 1st Event, these weekly three-hour sessions added to their existing traditional 2D knowledge, so that the gained S3D knowledge would be an *additional* skill base to the traditional model rather than an *alternative* model to 2D. Focus group discussions were again employed along with surveys for qualitative data retrieval.

These focus group discussion meetings were subsequently transcribed and tabled for thematic analysis. After each of the weekly 2nd Event coursework sessions the students were screened sections of six S3D films. Each film excerpt screened (being either a complete film or at least thirty minutes of each film screened) was followed by a discussion between the students and the researcher regarding their perceived use of the 3-D space in each film and whether it accomplished three things. How much of the 3-D space was used and whether it benefited the story or not, highlighted differences between individual students' perceptions of the application of S3D depth, and how well the course itself worked in delivering appropriate S3D knowledge.

6.2.1 Participation in Viewing Sessions

Participation in the S3D viewing sessions in the 2nd Event appeared to this group of students to be a highlight of the overall course experience (with their audible astonishment upon first screenings). It is likely that with this "new media" aspect of the film industry where S3D is starting to gain traction in the cinema market, having the opportunity to see S3D in its best technological light in these course screenings, seems to be a rare experience when compared to even S3D cinema screenings. For this reason, the screening sessions in this coursework showed most students what S3D cinema, or poor-quality home 3-D system viewers miss out on and so participation for these S3D screenings was high.

In one case, a participant watched the S3D film "Conan the Barbarian" (Nispel, 2011) in their own time as they were unable to attend the set screening for a single unavoidable absence only. As a result, this student discussed the film with the researcher the next day with the same questions as the group got for this one film screening.

Interestingly, all participants in this 2nd Event attended the screening sessions but not all of the participants were very vocal when responding to discussion points after the screenings. Perhaps culturally and also due to individual personality traits, some of these students were quiet by nature.

The researcher tried to entice them into contributing to the discussion but some were reticent to speak. These same participants were however quite happy to confirm with facial gestures and head movements what other less shy participants expressed at certain times. This is one reason that some of the transcribed group sessions have fewer than the ten students responding verbally to some discussion points.

6.2.2 Participation in the Learning Environment

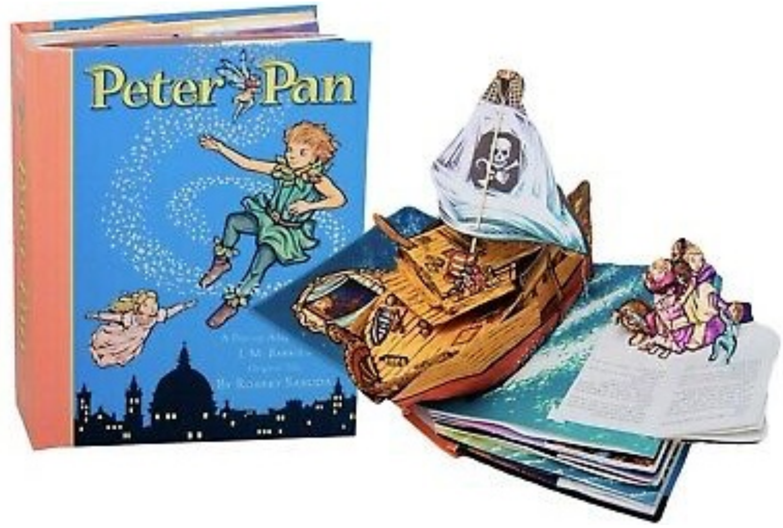
The five-session coursework of the 2nd Event delivery of the "Intro to S3D" course included a blended learning approach (Graham, 2013b) as an improvement to the 1st Event delivery. Student feedback from the 1st Event indicated that a three-hour session of mostly face-to-face delivery could get tiring - despite the clear enthusiasm for the 3-D topic by the participants. This was initially addressed in the 2nd Event delivery by involving the students in added out-of-their-seat activities within the classroom which also strengthened the constructivist aspect to their learning (Piaget, 1978). An example of such newly introduced activities in this 2nd Event can be seen in the delivery of the important S3D aspect of how binocular vision and the third dimension is actually perceived by human physiology.

A series of physical activities was introduced to the class sessions in order for students to tangibly experience their own physiological perception of depth. For instance, by throwing a foam (lightweight) ball to each student for them to catch, this highlighted the physiological eye perception aspect of S3D. Each student formed groups or at least pairs, then performed this physical activity by catching the thrown foam ball, first with both eyes open, then trying to catch this same foam ball with only one eye open. This instantaneously demonstrated to each student that depth perception is a result of a number of aspects, most of which none of the 2nd Event participants had ever thought to consider previously. In doing this in-class activity it showed that when certain visual aspects were removed, a much clearer depth perception understanding and experience was presented.

A series of classic pop-up story books were also used as a tool in face-to-face class in having participants manually handle items that challenged their traditional 2D and 3-D perceptions. By simply having participants handle, then open, a very complex and detailed pop-up story book, "Peter Pan: Peter Pan (A Classic Collectible Pop-up)" (Sabuda, 2008), a quite different experience of "reading a book" was explored (see Figure 6-1).

Figure 6-1

3-D Pop-up Book Demonstrated in Class



Note. Detailed pop-up book used in class for hands-on appreciation of perception of 3-D. "Peter Pan: Peter Pan (A Classic Collectible Pop-up)" (Sabuda, 2008)

By also incorporating blended content into this 2nd Event coursework a broader opportunity for the students to gain more foundation knowledge was introduced. According to Oliver and Trigwell (2005, p. 19) the term "blended content" encompasses a broad suite of learning including curated online coursework, webinars, YouTube, as well as self-paced learning of online content. So, embedded within the coursework for this 2nd Event delivery was a selection of such online blended content that included journal article readings, interviews with filmmakers, and significantly, the opportunity to watch selected S3D content online before class sessions. This flipped classroom approach mixes synchronous and asynchronous learning, which to a certain extent also allowed students to progress through some of the skeletal coursework at their own pace, as well as also actively encouraging cooperative learning amongst the participant students. The original content created by the researcher for the 1st Event sessions was expanded upon with the addition of this asynchronous aspect, which not only saved time in the face-to-face classroom but helped ensure that no student participant got left behind on any of the foundational S3D elements. More flipped classroom techniques were used where students in this 2nd Event were asked to bring examples of 2D images sourced from the internet to the next session, in order to illustrate that they had understood the points made about 2D Depth Cues (whose theory required only easy to source 2D images rather than 3-D images).

The first iteration of this "Intro to S3D" coursework saw all ten enrolled undergraduate students participate with 100% attendance, and this was also the case with the 2nd Event coursework with again 100% attendance. This continued high student retention indicated to the researcher that these students were more driven to attend each class where possible for the three reasons stated for the 1st Event being; no risk to formal studies' grades, no cost to undertake the S3D learning, and no other similar S3D course offerings in Australia available at the time. An additional reason for this strong attendance figure was the high value that Bachelor of Film students were putting on the opportunity to be involved. A maximum limit of ten participants meant a high value was placed on obtaining a seat in the course when more than ten students were interested in participating in each iteration. For these reasons, the motivation to learn and the high attendance figures were shown as well above the average of the accredited Bachelor of Film coursework that these students otherwise attended.

6.3 Results of Learning

The analysis in this 2nd Event - July 2016 "Intro to S3D" delivery was again by triangulation of the data collected after screenings of the following six 3-D feature films. "Pina" (Wenders, 2011), "Journey to the Centre of the Earth" (Brevig, 2008), "Hugo" (Scorsese, 2011), "The Martian" (Scott, 2015), "Gravity" (Cuarón, 2013), and "Conan the Barbarian" (Nispel, 2011). This film selection was chosen as a mix of films from the films already screened to the 1st Event "Intro to S3D" course (three of these titles being common to both courses), and also from a list of newer S3D films that may have the benefit of more current S3D thinking by the filmmakers. Each film was screened to the research participants in 3-D, either as the complete film or a significant portion of it, so that by concentrated viewing over a period of a few weeks, the Case Study participants could make direct comparisons between the six films' use of 3-D.

Once again, from the data supplied from the "Combined S3D Depth Budget Graphic Surveys" (Figure 5-3) which contains participant's overall impressions of S3D's application to storytelling, through the 'S3D and Story Integration' codes and descriptor ratings (Table 5-1), a reflection of the characteristics for the seamless use of S3D in storytelling and other associated S3D characteristics will describe possible best practice in future S3D production. This is where the results from this project, as drawn from the combined surveys, group discussions, and interviews, will triangulate along with the 1st Event's results, and the third Event's results, to an S3D model that addresses this study's research questions and aims.

The film "Pina" (Wenders, 2011) was chosen as a sample film for this research due to the director's reputation of being a filmmaker's filmmaker. Wim Wenders has made what is popularly considered arthouse genre films for more than fifty years. This foray by him into 3-D filmmaking surprised many of his peers, as 3-D's reputation as being on the gimmicky side of cinema did not sit easily with the 'arthouse' community (BBC, 2011, p. 1). "Pina" (Wenders, 2011) is essentially a film about modern dance and was intended to be a documentary about a particular dancer, until just before production started when this particular dancer unfortunately passed away. Wenders then went on to make this film as a homage to this beloved dancer, and so went on to film a number of choreographed dance sequences performed by the dance troupe that studied under this famous dancer. The story then is about dance, and about the meaning to the dance sequences themselves. In shooting this documentary-styled production in 3-D the filmmaker created a 3-D film that was not similar to most 3-D films at the cinema.

"Journey to the Centre of the Earth" (Brevig, 2008) was again chosen by the researcher as an example of the 3-D films released relatively early in the 21st century resurgence of 3-D in cinemas. Having selected this title for the 1st Event also, a direct side-by-side comparison of the data from both groups of the same film made for a useful contrast. "Hugo" (Scorsese, 2011) was also a film that was created by a filmmaker whose roots lay in traditional cinema (although originally in arthouse circles too) (Annett, 2014, p. 170), and as "Hugo" (Scorsese, 2011) is set in a time period and location that lends itself to much detail, nuance, and texture, a solid comparison can be made with the other S3D films in this Event's screening list. Ridley Scott's "The Martian" (Scott, 2015) is a more recent S3D production and also compares well with other titles in this study by having space and science fiction as a recurring setting/genre.

Alfonso Cuarón's "Gravity" (Cuarón, 2013) is one of the more recent examples of single-camera post-converted Stereoscopic 3-D processes and as it garnered very positive results from the 1st Event's participants, the researcher chose it again for this 2nd Event for direct comparison with the 1st Event results, and also again, as a science fiction/space genre title for comparison. "Conan the Barbarian" (Nispel, 2011) is the final film for this Event and was chosen for its curious genre amongst these 3-D titles, as well as it being an example 3-D film produced near the height of the last wave of 3-D's popularity.

This cross-section of film titles creates a set of data possibilities based on genre contrasts, genre similarities, potentially more current 3-D processes, and 3-D creative advances by highly respected filmmakers who are taking a turn at 3-D. The mix of film genres used in this 2nd Event also helped differentiate the application of S3D using existing structuralist/formalist film theories. This was done without finding negative results that may otherwise have excluded such traditional film theory application.

6.3.1 Case Study-2nd Event - Depth Model Learning Results

The second class of ten students of the July 2016 2nd Event of the "Intro to S3D" course completed surveys, interviews, and group discussions during and after finishing this course. The triangulated results from the combination of qualitative and quantitative methods of data collection on S3D depth placement models, when combined with all three Event results, has supplied data for a refined S3D model for the future of S3D production.

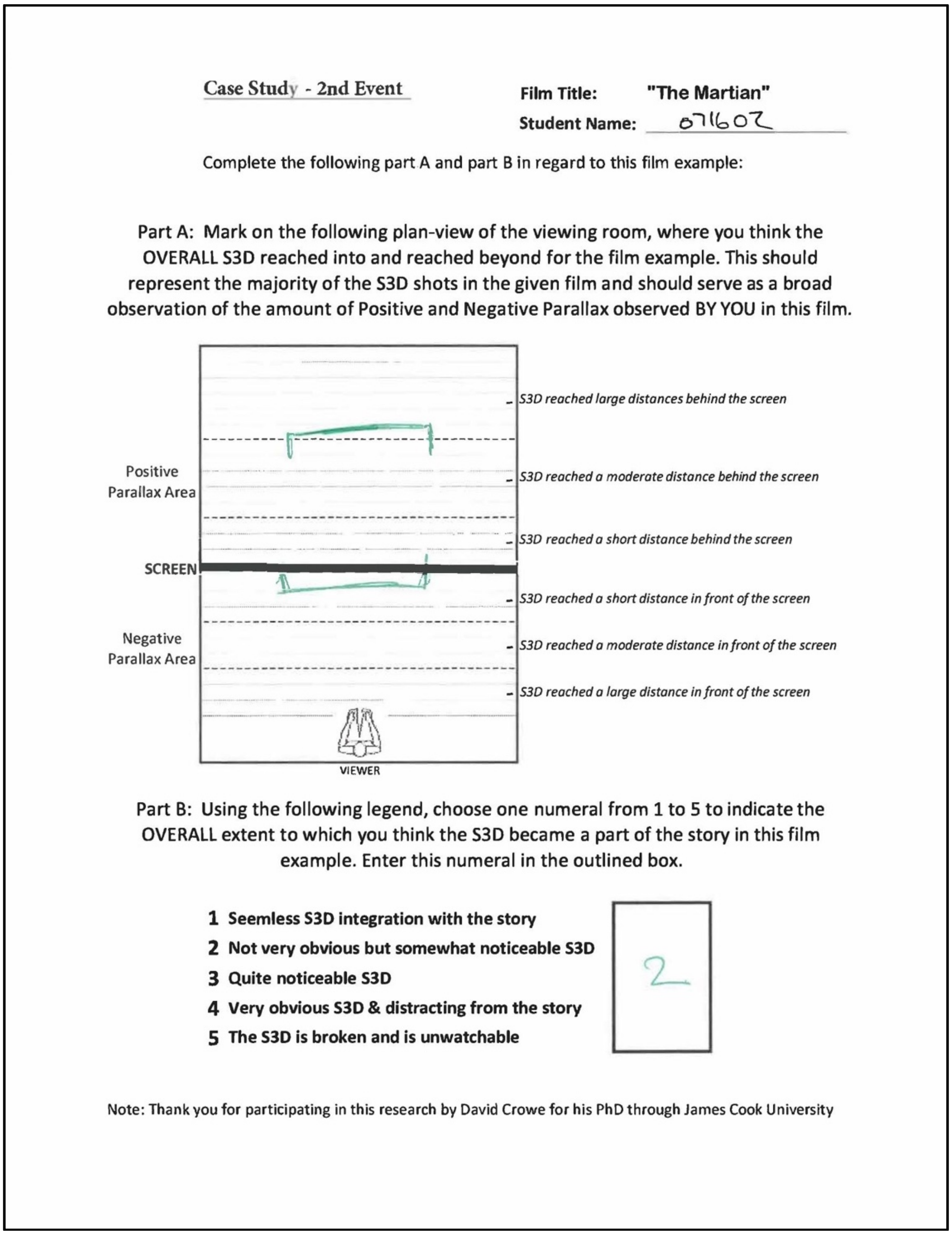
As in the 1st Event in April 2016, all 2nd Event students participated in group discussions about the S3D screenings both during the screenings, and also as a group after each of the screenings. At the end of the course, students also participated in group discussions and surveys about the coursework itself. All discussions about the S3D screenings were annotated by the researcher and used as one of the primary qualitative data sources for this study. The participant students for this 2nd Event once again also filled out data gathering surveys as a significant quantitative data source collected for this research. Here is the list indicating the same survey forms and transcriptions used for this 2nd Event's data collection:

- An "S3D Depth Budget Graphic Survey" sheet completed by each participant indicating their perceived reading of the depth characteristics for each S3D film viewed.
- 'S3D and Story Integration' data gathered on each student's reading of the effect of S3D on that film's storytelling.
- A Likert Survey with eight questions relating to S3D usage in each film.
- Transcriptions of each focus group's discussions after each S3D film screening.
- "Intro to Stereoscopic 3-D" Course Survey for feedback and data on the delivery of the actual coursework.

From each of these sources the data is interpreted and displayed as tables and graphs within the text of this document. After screening of each of the selected S3D films chosen for the 2nd Event group, data was gathered about each of the students' observations of each film. From these data sources there are depth charts, numeric coding to indicate the "effectiveness of S3D on story" as observed by each student, and then the group's discussion data taken for analysis for each film. This was then followed by an analysis of the combined results from all of these films together, showing a broader view of all of the films' results which is then tabled and discussed at that point. It was then added to the earlier Case Study Event data undertaken in this research for a final drawing of results. As in the 1st Event, the initial data was gathered from each student during and directly after the screenings, indicating their immediately perceived view of where the S3D was placed for each of the S3D films viewed for this research. Not only did these "S3D Depth Budget Graphic Survey"s report the variations of parallax depth perceived in these films, but it also presented choices for participants for subsequent analyses of S3D characteristics on storytelling, which has been named as "S3D & Story Integration".

Figure 6-2

Example "S3D Depth Budget Graphic Survey" sheet Case Study-2nd Event


Case Study - 2nd Event

Film Title: "The Martian"

Student Name: 071602

Complete the following part A and part B in regard to this film example:

Part A: Mark on the following plan-view of the viewing room, where you think the OVERALL S3D reached into and reached beyond for the film example. This should represent the majority of the S3D shots in the given film and should serve as a broad observation of the amount of Positive and Negative Parallax observed BY YOU in this film.

Part B: Using the following legend, choose one numeral from 1 to 5 to indicate the OVERALL extent to which you think the S3D became a part of the story in this film example. Enter this numeral in the outlined box.

1. Seemless S3D integration with the story
2. Not very obvious but somewhat noticeable S3D
3. Quite noticeable S3D
4. Very obvious S3D & distracting from the story
5. The S3D is broken and is unwatchable

2

Note: Thank you for participating in this research by David Crowe for his PhD through James Cook University

Note. Case Study-2nd Event example "S3D Depth Budget Graphic Survey" sheet showing the "S3D and Story Integration" numeric section at the bottom.

Table 6-1

'S3D and Story Integration' Codes and Descriptors

Code	*Descriptor*
1	Seamless S3D integration with the story
2	Not very obvious but somewhat noticeable S3D
3	Quite noticeable S3D
4	Very obvious S3D and distracting from the story

Note. From the "S3D Depth Budget Graphic Survey" sheet

In order to capture a specification of S3D design that works in unison with the film's story being told, this set of qualitative descriptions of S3D design was placed at the bottom of this "Combined S3D Depth Budget Graphic Survey" sheet. Along with a corresponding code number entered by participants the 'S3D and Story Integration' descriptor choices are shown in Table 6-1.

Each group participant entered their perceived view of 'S3D and story integration' for each film on the same "Combined S3D Depth Budget Graphic Survey" sheet for analysis.

Here is the list of films viewed by the Case Study-2nd Event students over the course of this 2nd Event "Intro to S3D" course delivery:

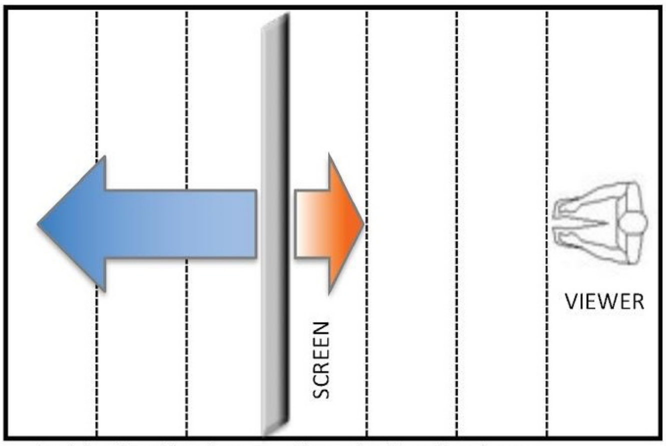
- "Pina" (Wenders, 2011)
- "Journey to the Centre of the Earth" (Brevig, 2008)
- "Hugo" (Scorsese, 2011)
- "The Martian" (Scott, 2015)
- "Gravity" (Cuarón, 2013)
- "Conan the Barbarian" (Nispel, 2011)

For the Wim Wenders film "Pina" (Wenders, 2011) the summary recorded data from the Case Study-2nd Event group is shown in Figure 6-3 as a graphic table of the gathered summary results from each student's "Combined S3D Depth Budget Graphic Surveys" (Figure 5-3). This summarised combined data for the group's depth observations is also represented in the form of a "top-down" view of an S3D film screening.

Figure 6-3

Combined S3D Depth Budget Graphic Surveys (Case Study-2nd Event) for "Pina" (Wenders, 2011)

Results for: **"Pina"**	Distance behind the screen			Distance in front of screen			
Student:	*S3D reached large distances behind the screen*	*S3D reached moderate distance behind the screen*	*S3D reached a short distance behind the screen*	*S3D reached a short distance in front of the screen*	*S3D reached moderate distance in front of the screen*	*S3D reached a large distance in front of the screen*	*Rating of what extent S3D became a part of the story:*
# 1		•		•			**1**
# 2	•			•			**1**
# 3		•		•			**1**
# 4		•		•			**1**
# 5		•		•			**2**
# 6	•			•			**1**
# 7	•			•			**1**
# 8	•			•			**1**
# 9	•			•			**1**
# 10	•			•			**1**



1= Seamless integration with the story
2= Not very obvious but somewhat noticeable S3D
3= Quite noticeable S3D
4= Very obvious S3D and distracting from the story
5= The S3D is broken and is unwatchable

Note. Case Study-2nd Event - Combined results from each of ten participant's observations in the S3D Depth Budget Graphic Survey, and their reading of 'Story Integration' using the codes at the bottom of the figure, after the screening of "Pina" (Wenders, 2011)

The orange arrow in this image indicates the amount of negative parallax space usage observed by all Case Study-2nd Event students as an average, and the blue arrow indicates the amount of positive parallax space usage observed by all Case Study-2nd Event students as an average. On the bottom of the "Combined S3D Depth Budget Graphic Survey" (Figure 6-3), there is also a listing of the summarised overall "S3D & Story Integration" ratings (Figure 6-3) for each of the students in the group.

The same Likert Survey from the 1st Event was also implemented in this 2nd Event for the triangulation of results. The graphical layout of the above Likert questions, descriptors, and numeric values as used for each of the three events in this Case Study are shown in the two example images from the 1st Event in the previous chapter (Figures 5-4, and 5-5).

6.3.1.1 Case Study-2nd Event - Depth Model Learning Results "Pina" (Wenders, 2011)

"Pina" (Wenders, 2011) data and analysis is presented here with the following structure:

- Depth model observations, including points that may have come out of group discussions.
- Survey analysis of each of the S3D Depth characteristic and Likert surveys.
- Summary of the S3D depth model learning results.

The S3D Depth Budget Graphic Survey data for "Pina" (Wenders, 2011) as shown in Figure 6-3 suggests that very little depth space on or just in front of the cinema screen, was observed by the research participants who viewed this film. Some indication was also given by the observers that objects appeared generally forward of the screen and also a good way behind the screen rather than near the screen. When comparing this depth usage observation with the coded 'S3D integration with story' descriptor choices, it appears that nine observers indicated "Seamless integration with the story" as well as one only "Not very obvious but somewhat noticeable S3D" descriptors. Given the "S3D and Story Integration" code for "Pina" (Wenders, 2011) was recorded as an average of 1.1 (Figure 6-3), most of the 2nd Event discussion group participants clearly identified this S3D film as high achieving when it comes to the S3D integration with story.

Wenders has concentrated on applying the S3D in a way that is unlike most S3D films at that time. As noted by student #1 and student #2 from the subsequent "Pina" (Wenders, 2011) screening discussion group: "This is nothing like any of the other 3D films we've seen" (Case Study-2nd Event, student #1). "I can't work out whether the S3D in this film is a breakthrough in

3D movies or it's because the dance numbers are in a different kind of setting than other 3D movies" (Case Study-2nd Event, student #2).

The fact that a number of the S3D dance sequences in "Pina" (Wenders, 2011) were shot on a dark floor and dark background, on a proscenium arch stage, and because the camera is on-stage with the dancers, it makes this S3D film an unusual one in this regard. This did not necessarily sit comfortably with all participant observers as evidenced by these discussion group comments; "...the background wasn't at all interesting - mostly black background in some sequences - and so the dancer's movements were the only point to the 3D" (Case Study-2nd Event, student #3).

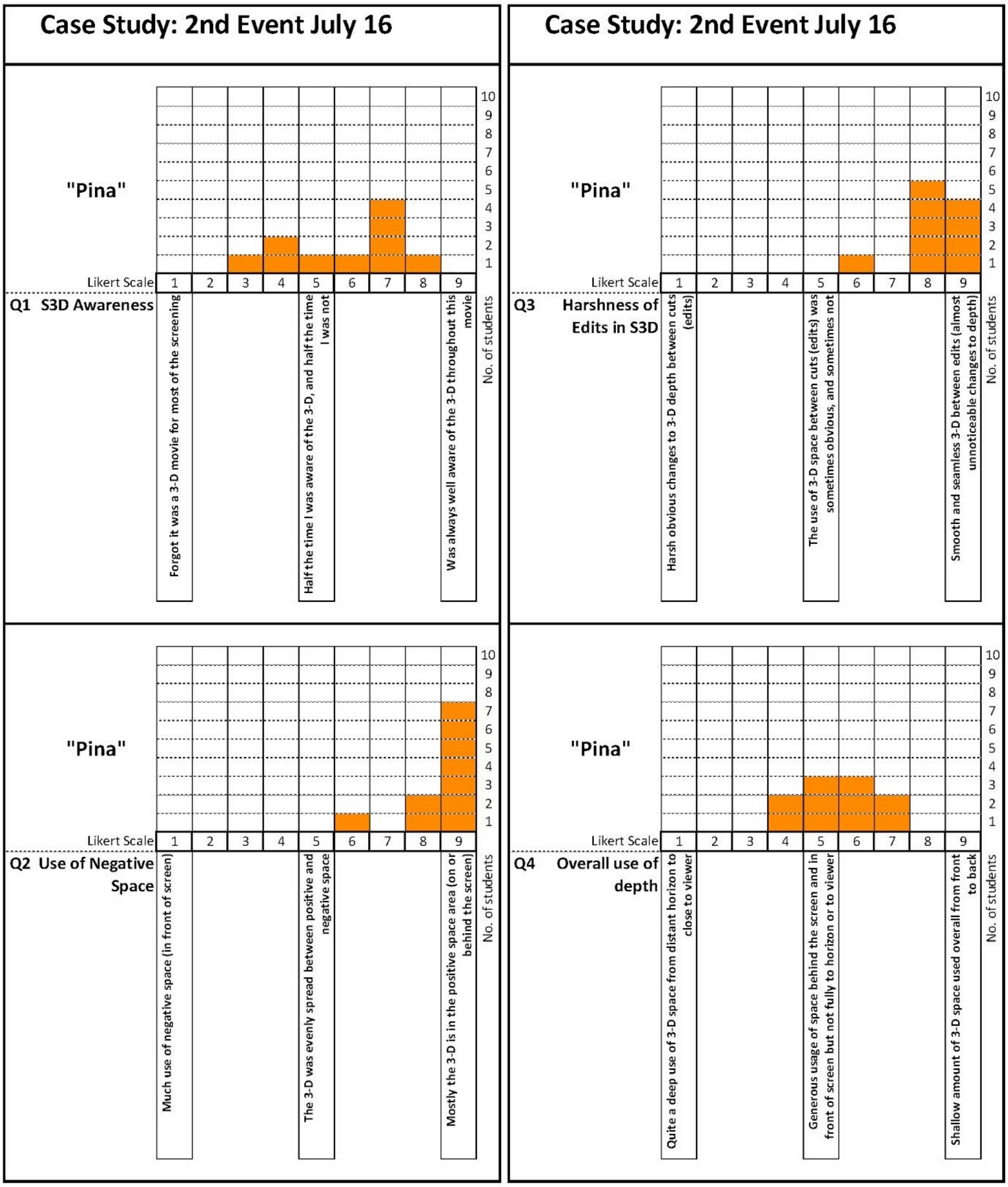
A change in dynamic that is rarely seen in S3D movies where a person (in this case a dancer) moves back and forward within the camera frame but in the 3-D depth direction, with no comparative objects from which to anchor the depth itself. Some of these such movements created the dance stage as if it were a live performance and the viewer was not only in the audience, but was up front of the stage with the dancers. Some observers recognised this specific S3D experience within this film, with the fact that the dancers within their choreographed pieces moved in and around the S3D space in such a heightened fashion; "It was smoothly done but because there were only moving bodies to look at on a black stage it pinpointed the 3D more" (Case Study-2nd Event, student #4). "This film seemed to be really concentrating on the use of space in the form of dance. [It] is trying to include the use of the depth dimension as a major part of this film…" (Case Study-2nd Event, student #6).

Overall, character (dancer) placement in the depth space was noted in the group discussion as being an important aspect to this S3D application. The Depth Budget Graphic Survey feedback (Figure 6-3) indicated very little negative parallax space was utilised in "Pina" (Wenders, 2011) and quite a lot of positive parallax space was used. For this film it appears from this survey that most participants recognised that the significant S3D depth placement very much supported the storytelling aspect of this film.

Interestingly, "Pina" (Wenders, 2011) is a film that straddles the documentary aspect of filmmaking as well as being a formalist artistic piece. This is because it is primarily a film of dance as well as dance pieces being a homage to the dance's choreographer/creator. In this regard the S3D results from the research participants showed that successful application of S3D in a more realist environment (the more documentary-style aspect of this film) still elicits a very strong and positive response in S3D. If there was any doubt about S3D being successfully used in a realistic and life-like environment, as well as in a formalist creative environment, then these research results inform that.

Figure 6-4

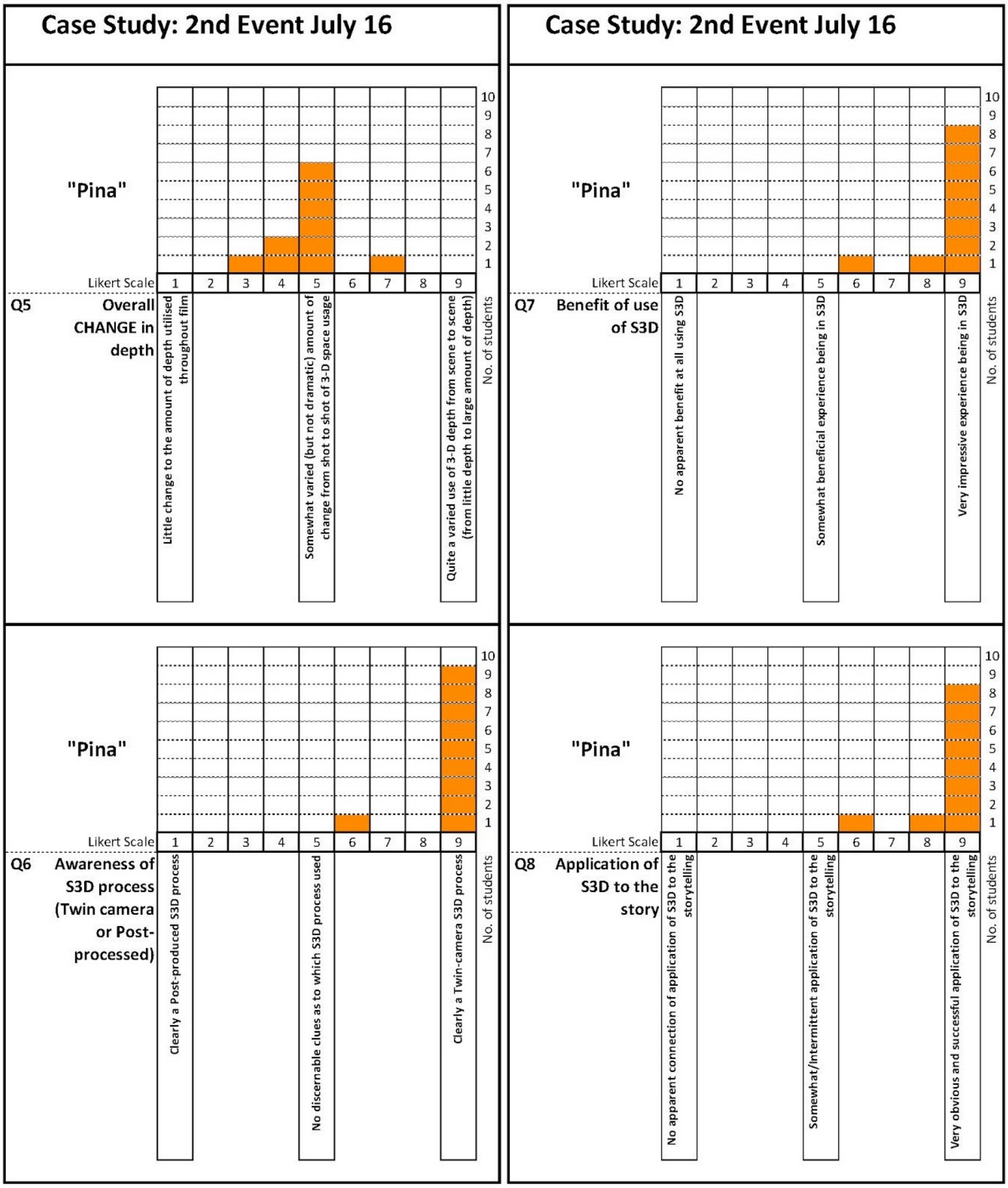
Bar Graph Compilation (Case Study-2nd Event) Likert Surveys Q1-Q4 for "Pina" (Wenders, 2011)



Note. Compilation of ten participant's results in Case Study-2nd Event surveys of Q1-Q4 for "Pina" (Wenders, 2011)

Figure 6-5

Bar Graph Compilation (Case Study-2nd Event) Likert Surveys Q5-Q8 for "Pina" (Wenders, 2011)



Note. Compilation of ten participant's results in Case Study-2nd Event surveys of Q5-Q8 for "Pina" (Wenders, 2011)

The Likert surveys for this Case Study-2nd Event group are reproduced here in the form of bar graphs of the combined group's individual surveys (Figures 6-4 and 6-5) and the following data was extrapolated from these. In Question 1 of the Likert survey for "Pina" (Wenders, 2011) which drew the group's opinion on the overall awareness of the S3D whilst viewing the film, quite a differing set of opinions are shown. The opinion was greater at the '7' out of '9' mark on the Likert scale best described as 'somewhat aware of the S3D throughout the screening'. It was however spread from '3' to '8' on the Likert scale relatively evenly, indicating that possibly a cohesion with the group discussion opinions matched this Likert survey question in the following way. As Wim Wenders' S3D film was observed to be quite dependent on the S3D being a major part of the dance routines in this movie, this in turn is reflected as high S3D awareness. This suggests an interesting aspect to a potential model of S3D for future S3D production, in that possibly self-awareness of S3D may not be a negative trait in good S3D production. The broad spread in these Question 1 responses might also suggest that because the S3D in this film was used specifically to accentuate the dancing, that maybe the observers had varying interpretations as to the awareness of S3D in this case. It is possible that some of these participants interpreted the 'obvious' S3D as being a significant part of the cinematographic telling of the 'story' to accentuate the dance choreography rather than just being overly used S3D gimmickry.

The 'Use of negative space' aspect in Question 2 was noted by most observers in the 2nd Event group as the depth space being placed mostly in the positive parallax space rather than very much negative parallax space usage. The S3D Depth Budget Graphic surveys for this film (Figure 6-3) also substantiated this characteristic. The overall 'Use of depth' question in Question 4 hovered around the middle of the Likert scale with 'generous use of space behind and in front of the screen but not to the horizon'. So even though there was little space used in front of the screen participants indicated quite a lot of the 3-D space was utilised in this film.

The change in use of depth in Question 5 was shown as a 'somewhat varied but not dramatic' amount of change in use of depth. This again fits with this film's unusual usage of S3D where changes in the use of the 3-D became more an element of the cinematographic style, and more 3-D used for different dancers/performances than others. It was also noted that less 3-D was used when the film's story went off-stage rather than when the dancers were on-stage. Question 6 had an overwhelming group opinion that it was not in any way a post-converted S3D process due to the high quality and yet still varied S3D throughout the film, showing no sign of the negative attributes often associated with post-converted S3D films. Question 7 and 8 unilaterally pointed at the high benefit of the S3D in this film and its application to the film's story.

6.3.1.2 Case Study-2nd Event - Summary Depth Model Learning Results "Pina" (Wenders, 2011)

In the triangulation of the Likert surveys, with the group discussions, and the S3D Depth Budget Graphic Surveys, the significant and unusual aspects of the use of S3D in this film "Pina" (Wenders, 2011) can be summarised as follows:

Table 6-2

"Pina" (Wenders, 2011) Case Study-2nd Event Depth Model Summary Results

No.	*Depth model characteristic description*
1	High awareness of the application of S3D by the viewer can be used as a part of the grammar of the story (i.e. as a part of the cinematographic style) rather than it being considered "too much".
2	Dark backgrounds with high contrast characters (or protagonists) can utilise S3D depth space simply by the space they inhabit, and not necessarily by having any relationship to any surroundings.
3	Use of simple character movement within an S3D space without influence of any surroundings can be utilised for story.

So, this combined data from the 2nd Event participants reflected that the Wenders 3-D example used 3-D depth as an advocate for use of a strong depth presence without it necessarily falling into the gimmick category. It showed too that the tasteful use of depth space with simple and dark backgrounds can also be significantly utilised without it becoming an overpowering use of S3D. Combining this with the more common attributes this film shares with other influential S3D films for this research, the use of little negative parallax and quite substantial use of positive parallax places this film as a significant feeder for potential S3D grammar model characteristics.

6.3.1.3 Case Study-2nd Event - Depth Model Learning Results "Journey to the Centre of the Earth"

"Journey to the Centre of the Earth" (Brevig, 2008) data and analysis is presented here with the following structure:

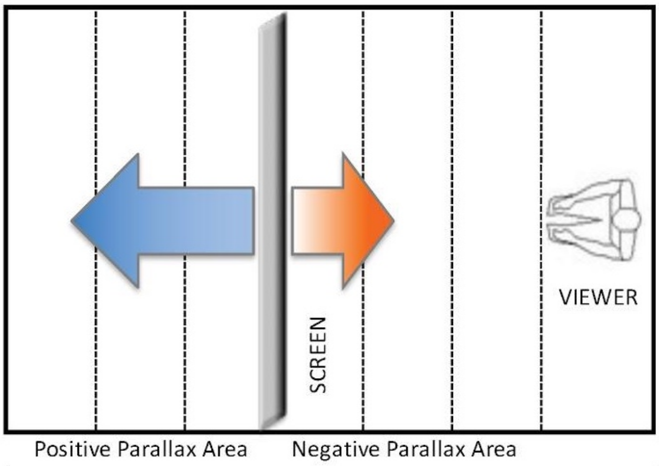
- Depth model observations, including points that may have come out of group discussions.
- Survey analysis of each of the S3D Depth characteristic and Likert surveys.
- Summary of the S3D depth model learning results.

Figure 6-6

Combined S3D Depth Budget Graphic Surveys (Case Study-2nd Event) for "Journey to the Center of the Earth" (Brevig, 2008)

Results for: **"Journey to the Center of the Earth"**

	Distance behind the screen			Distance in front of screen			
Student:	*S3D reached large distances behind the screen*	*S3D reached moderate distance behind the screen*	*S3D reached a short distance behind the screen*	*S3D reached a short distance in front of the screen*	*S3D reached moderate distance in front of the screen*	*S3D reached a large distance in front of the screen*	*Rating of what extent S3D became a part of the story:*
# 1		•				•	4
# 2		•				•	3
# 3		•				•	3
# 4		•		•			1
# 5		•		•			2
# 6		•		•			2
# 7		•		•			2
# 8	•			•			1
# 9	•			•			1
# 10	•			•			1



1= Seamless integration with the story
2= Not very obvious but somewhat noticeable S3D
3= Quite noticeable S3D
4= Very obvious S3D and distracting from the story
5= The S3D is broken and is unwatchable

Note. Case Study-2nd Event - Combined results from each of ten participant's observations in the S3D Depth Budget Graphic Survey, and their reading of 'Story Integration' using the codes at the bottom of the figure, after the screening of "Journey to the Center of the Earth" (Brevig, 2008)

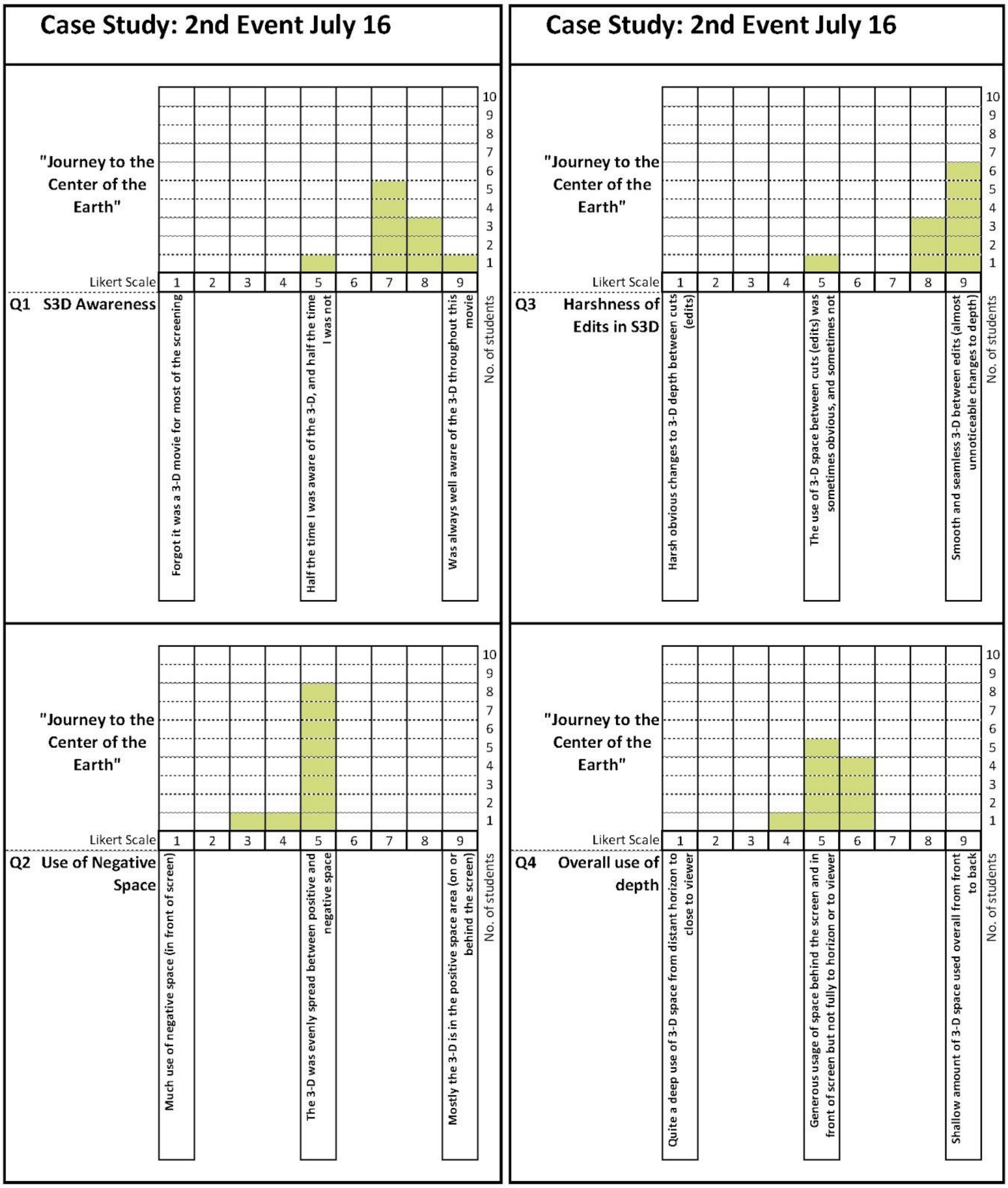
“Journey to the Centre of the Earth” (Brevig, 2008) was the next S3D film sequence screened for the 2nd Event group. This film was used as a S3D film selection in the 1st Event screenings, as it is in the 3rd Event screenings also. It is the only film title that stretched across three different Events. The comparison of all three results of this film’s S3D attributes and application will be discussed after these individual Event chapters. In this second screening of “Journey to the Centre of the Earth” (Brevig, 2008) the consensus of the group’s reading of the S3D in this film was shown as a combination of two surveys and after screening group discussions.

The survey results from the “Combined S3D Depth Budget Graphic Survey” (Figure 6-6) found a mix of perceptions of how much negative parallax space was used. Here, 30% of respondents noted a very close placement of 3-D objects between the projection screen and the viewer, whilst 70% of respondents saw only a slight usage of this same space. This might possibly be due to the consideration of some titillating S3D shots used toward the beginning of the film to ‘sell’ the film as a 3-D film, and this could have then been construed as indicative of the use of this space throughout the film. The 70% of respondents who indicated observing only a slight usage of this negative parallax space may well have dismissed these shots as being non-indicative of most of the film’s use of this depth space. The use of positive parallax space behind the screen hovered between medium distances and longer distances. Again, most of this film is set in underground caves that traditionally would be expected to not reach great distances behind the filmed drama. In this film some quite expansive scenes like ocean’s and distant horizons are also a part of the story, and so their inclusion may well be reflected in this “Combined S3D Depth Budget Graphic Survey” figure (Figure 6-6).

The average rating of the “S3D and Story Integration” code (Figure 6-6) for this film is ‘2’, however this ranged between ‘1’ and ‘4’ before being averaged. From this it is clear that the 2nd Event observers saw the S3D application in this movie as being between two somewhat different perceptions being ‘Not very obvious but somewhat noticeable S3D’, and ‘Seamless integration with story’. Again, this disparity between the two descriptors may be as a result of the inclusion, or non-inclusion by the observers, of the early ‘in-your-face’ S3D shots as mentioned, and whether they were deemed by the participants to be a part of a fair observation. “Overall there was pretty good 3-D, but there were protruding 3-D shots, then normal 3-D shots, then painful [broken] ones. The odd 3-D shots were a distraction from the good ones” (Case Study-2nd Event, student #1). “Literally painful shots made it obvious that some 3D shots didn’t work. Some shots in the caves looked good and didn’t hurt - but because some worked and some didn’t it is difficult to put this film in a “good” 3D category” (Case Study-2nd Event, student #1).

Figure 6-7

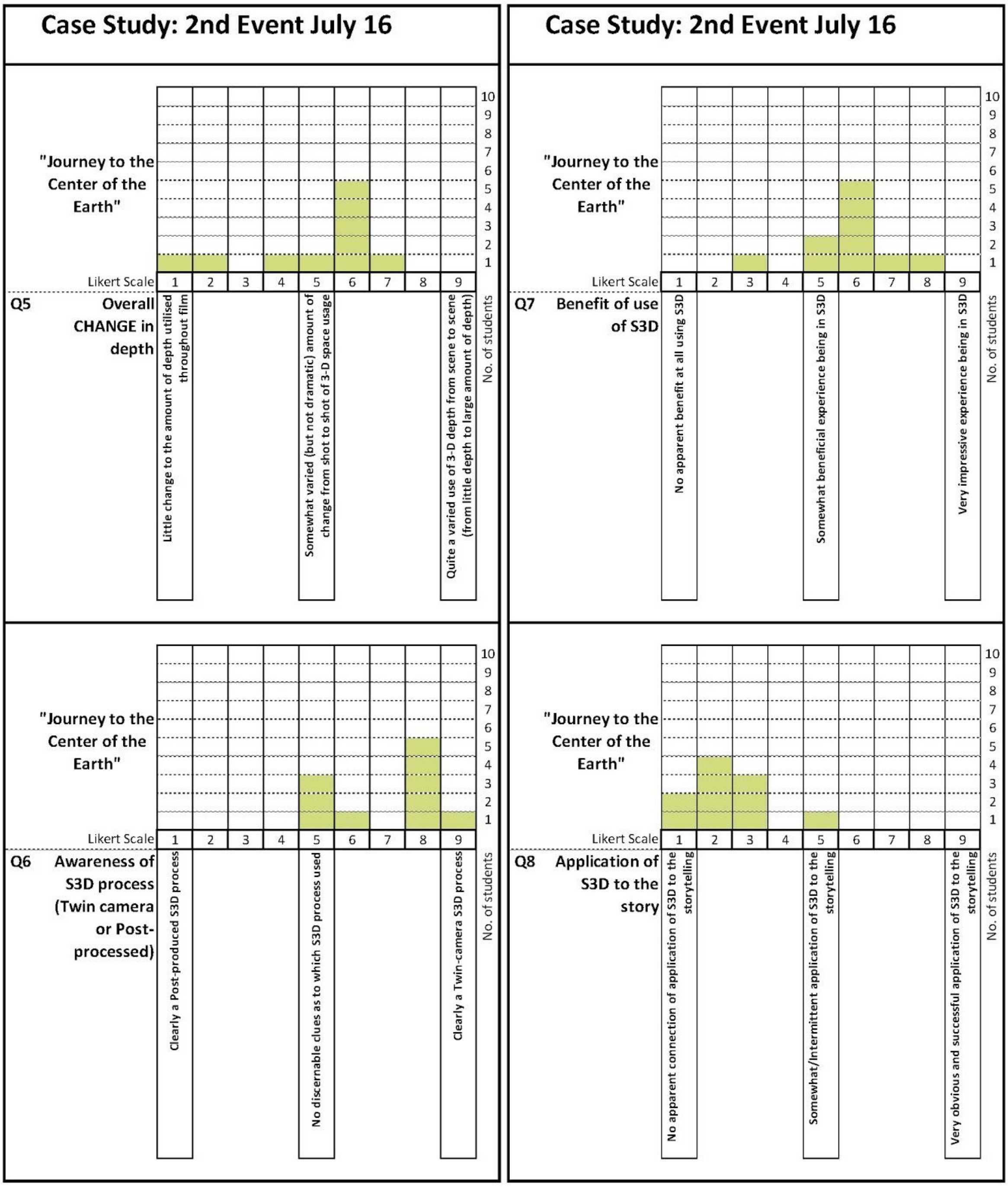
Bar Graph Compilation (Case Study-2nd Event) Likert Surveys Q1-Q4 for "Journey to the Center of the Earth" (Brevig, 2008)



Note. Compilation of ten participant's results in Case Study-2nd Event surveys of Q1-Q4 for "Journey to the Center of the Earth" (Brevig, 2008)

Figure 6-8

Bar Graph Compilation (Case Study-2nd Event) Likert Surveys Q5-Q8 for "Journey to the Center of the Earth" (Brevig, 2008)



Note. Compilation of ten participant's results in Case Study-2nd Event surveys of Q5-Q8 for "Journey to the Center of the Earth" (Brevig, 2008)

From this evidence, it is noted that with the presence of some of these irregular S3D shots, a dilution of the overall S3D effect has occurred. As such, this film did not reach the levels of finer S3D application that it could have. It is also evidence however, that a substantial amount of this film did employ S3D techniques that garnered higher praise. “Interior cave shots with limited positive and negative space enabled the presence of 3D and was not very obvious and was quite effective” (Case Study-2nd Event, student #4).

As the participants did in the 1st Event observation, these 2nd Event participants also noted that the closer distanced backgrounds in this film lent themselves well to the S3D optimum depth usage of S3D. It was acknowledged by the group that such S3D aspects had conventionally been considered advantageous, where closer backgrounds came with the nature of the location and the premise of this story. In this instance, underground caves are for the most part understood to likely not require larger distances from the screen plane (where the main characters are likely to be placed), to the most distant object in each shot.

One participant noted that in a high action “chase” scene involving the main characters in a runaway coal car, that the S3D was employed to heighten the fast pace and action of this scene. In raising this observation, a rarely noted aspect of S3D is recognised being the capability of S3D to embellish the tension of the scene along with the editing. “...The 3-D seemed to combine with the editing for added suspense in the coal car [chase] scene to heighten tension” (Case Study-2nd Event, student #6).

A single participant also noted specifically that telephoto lens shots in S3D, (where long focal lengths give a ‘zoomed in’ look), did not work in “Journey to the Centre of the Earth” (Brevig, 2008). “Some good 3D in parts but some 3D didn’t work at all. Telephoto shots looked bad in 3D” (Case Study-2nd Event, student #1).

Two observers recognised inferior S3D elements in computer generated particle effects that detracted from the S3D visuals: “...some 3-D special effect foreground rain and dust ... appeared fake in some shots” (Case Study-2nd Event, student #4).

The combined 2nd Event Likert results for the S3D film “Journey to the Center of the Earth” (Brevig, 2008) are shown in Figure 6-7 and 6-8, and later in this study we will see that a comparison between three different Event groups has been possible. “Journey to the Center of the Earth” (Brevig, 2008) was one of only a few films that were screened in this study to all three Event groups in April 2016, July 2016, and April 2017. In such a case a comparison of all questions posed in the Likert surveys are able to be compared with all three groups over the period of course deliveries and subsequent screenings. By combining the Likert survey data results from each student in each of the groups that viewed the films, an S3D model with common features began to emerge.

In Question 1 of the 2nd Event Likert survey for "Journey to the Center of the Earth" (Brevig, 2008), a predominant perception of 'S3D awareness' whilst watching this S3D film was that for most of the time there was a viewer 'Awareness of the S3D', with the average being '7' on the Likert scale. In regards to Question 2 of this Likert survey, as far as the utilisation of the 3-D space between the viewer and the screen (the negative parallax) and the 3-D space utilised behind the screen (the positive parallax), all of the respondents noted that the 3-D was spread evenly both in front of the screen and behind the screen (see Figure 6-7).

In Question 4 a distinct range around the mid-Likert scale mark of '5' was indicated by the 2nd Event participants in how much the 'Overall use of depth' changed throughout the film. This area around '5' is described in the Likert scale as a "Generous usage of space behind the screen and in front of the screen but not fully to horizon or to viewer".

In question 6 of the combined Likert surveys in regard to the "Awareness of S3D Process (Twin camera or post-processed)", the group participants recognition of "Journey to the Center of the Earth" (Brevig, 2008) as being made with the higher quality of a twin-camera S3D origination rather than the lesser quality post-produced process of S3D, was mixed. 40% of participants thought this film could have been made via either process, with 60% believing it was a twin-camera S3D process.

With Question 7 an observation is asked of the participants as to whether the film itself has actually benefited from the inclusion of S3D. For "Journey to the Center of the Earth" (Brevig, 2008) the 2nd Event participants indicated that the S3D was halfway between a "Somewhat beneficial experience" and a "Very impressive experience. Question 8 deals specifically with whether in this film, the application of S3D had actually helped to tell the story. The results for this 2nd Event group leaned significantly toward "no apparent connection of S3D to the storytelling" with all participants between "somewhat/ intermittent application of S3D to story" and "no apparent connection of S3D to the storytelling".

6.3.1.4 Case Study-2nd Event - Summary Depth Model Learning Results "Journey to the Centre of the Earth" (Brevig, 2008)

When triangulating the Likert surveys with the 2nd Event group discussions, and then the S3D Depth Budget Graphic Surveys, regarding the use of S3D in the film "Journey to the Center of the Earth" (Brevig, 2008), the results when combined were summarised as follows:

Table 6-3

"Journey to the Centre of the Earth" (Brevig, 2008) Case Study-2nd Event Depth Model Summary Results

No.	*Depth model characteristic description*
1	Some gratuitous S3D shots (in-your-face) distract from otherwise predominantly well-executed S3D shots.
2	Smart employment of S3D can be used to heighten tension in fast action scenes where required.
3	Close backgrounds alleviate the risk of difficult or broken S3D shots.
4	Added CGI particle effects in S3D can look jarring.

6.3.1.5 Case Study-2nd Event - Depth Model Learning Results "Hugo" (Scorsese, 2011)

"Hugo" (Scorsese, 2011) data and analysis is presented here with the same mixed method structure:

- Depth model observations, including points that may have come out of group discussions.
- Survey analysis of each of the S3D Depth characteristic and Likert surveys.
- Summary of the S3D depth model learning results.

"Hugo" (Scorsese, 2011) was the next S3D film screened to the 2nd Event group of participants. The Case Study-2nd Event group for this film had all student participants in attendance and the film sequence was viewed on a medium cinema-sized projector screen.

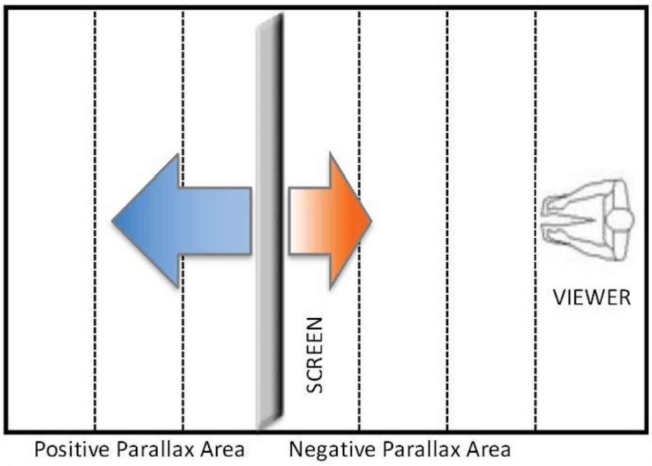
From the "Combined S3D Depth Budget Graphic Survey" for this film (Figure 6-9) it is clear that all the survey participants but one saw very subtle use of foreground S3D depth space usage (between the viewer and the screen). However, there was quite a mix of opinions by the participants on the amount of positive parallax used in this film. This area of S3D depth from the projection screen to the horizon is illustrated graphically in Figure 6-9 and varies significantly from short distances behind the screen observed, to S3D to distant backgrounds being identified.

Figure 6-9

Combined S3D Depth Budget Graphic Surveys (Case Study-2nd Event) for "Hugo" (Scorsese, 2011)

Results for: **"Hugo"**

Student:	Distance behind the screen: S3D reached large distances behind the screen	S3D reached moderate distance behind the screen	S3D reached a short distance behind the screen	Distance in front of screen: S3D reached a short distance in front of the screen	S3D reached moderate distance in front of the screen	S3D reached a large distance in front of the screen	Rating of what extent S3D became a part of the story:
# 1		•		•			2
# 2	•			•			2
# 3	•			•			2
# 4			•	•			1
# 5		•		•			2
# 6	•			•			1
# 7		•		•			1
# 8	•			•			3
# 9	•				•		1.5
# 10	•			•			1



1= Seamless integration with the story
2= Not very obvious but somewhat noticeable S3D
3= Quite noticeable S3D
4= Very obvious S3D and distracting from the story
5= The S3D is broken and is unwatchable

Note. Case Study-2nd Event - Combined results from each of ten participant's observations in the S3D Depth Budget Graphic Survey, and their reading of 'Story Integration' using the codes at the bottom of the figure, after the screening of "Hugo" (Scorsese, 2011)

The average 'S3D and Story Integration' code rating for the Case Study-2nd Event observations of "Hugo" (Scorsese, 2011), resulted in a mean value of "1.7" from the participants, which when rounded to the nearest unit is "2". A "2" on the "S3D and Story Integration" table (Table 6-1) is a value whose descriptor is "Not very obvious but somewhat noticeable S3D". As far as the S3D being integrated with the story it appears from this that the S3D was integrated well with the story but was not completely involved in purely telling the story.

The group discussions also pointed to purposeful use of S3D but not particularly for the story, with comments such as: "Not much attention drawn to 3D after the beginning introduction to a lot of 3D" (Case Study-2nd Event, student #2), and "3D seemed to fill out the movie rather than being seen to tell the story" (Case Study-2nd Event, student #4).

Other discussion points described Scorsese's "Hugo" (2011) to be detailed in production design but was not particularly drawing attention to the S3D. "The opening scene was full of 3D. Introduction to elaborate [production] design seemed like the 3-D was a part of it [the production design]" (Case Study-2nd Event, student #1). "This film doesn't look like other Scorsese films. It looks like a sideshow but the 3D isn't really used like a sideshow" (Case Study-2nd Event, student #2), and, "seems that narrow focus [depth of field] is playing a bigger part in S3D depth [characteristics]. S3D is becoming another depth tool like shadows, focus, and perspective" (Case Study-2nd Event, student #1).

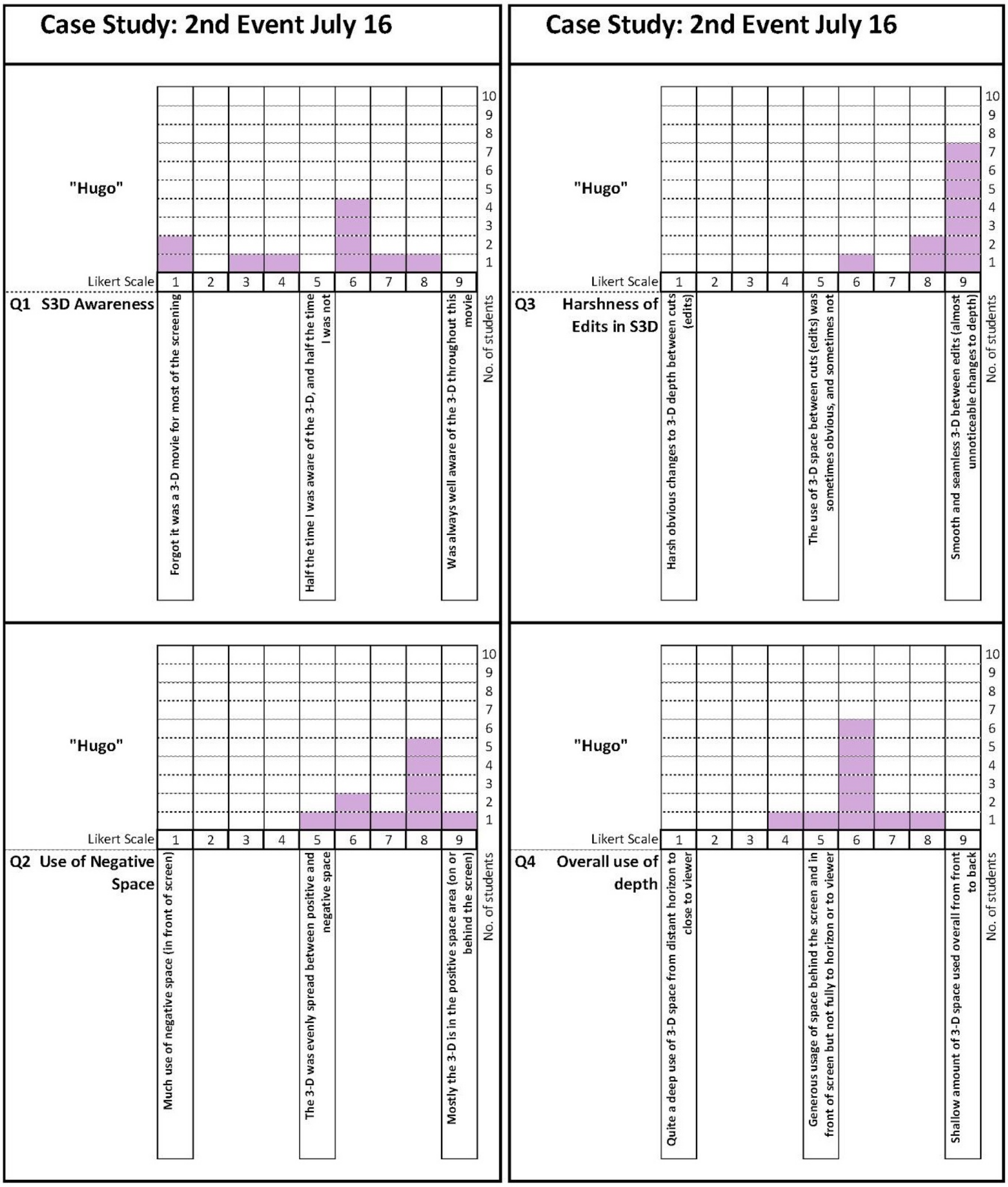
The Likert scale survey responses as reflected in the combined bar graph images (Figures 6-10 and 6-11) show the observations of the participants with the following results:

Question 1 on 'S3D Awareness' is spread quite thinly from Likert scale of 1 being "Forgot it was a 3-D movie…" to right up to Likert scale number of '8' immediately before "Was always well aware of the 3-D throughout the movie…" (see Figure 6-10).

An unusual spread like this suggests that some participants were watching the Stereoscopic 3-D specifically throughout the film, whilst others saw the S3D as inherently a part of the visual story. Either way it proposes that the S3D is significant in this film. Question 2 deals with the amount of negative space used in this film (the depth space between the screen and the viewer).

Figure 6-10

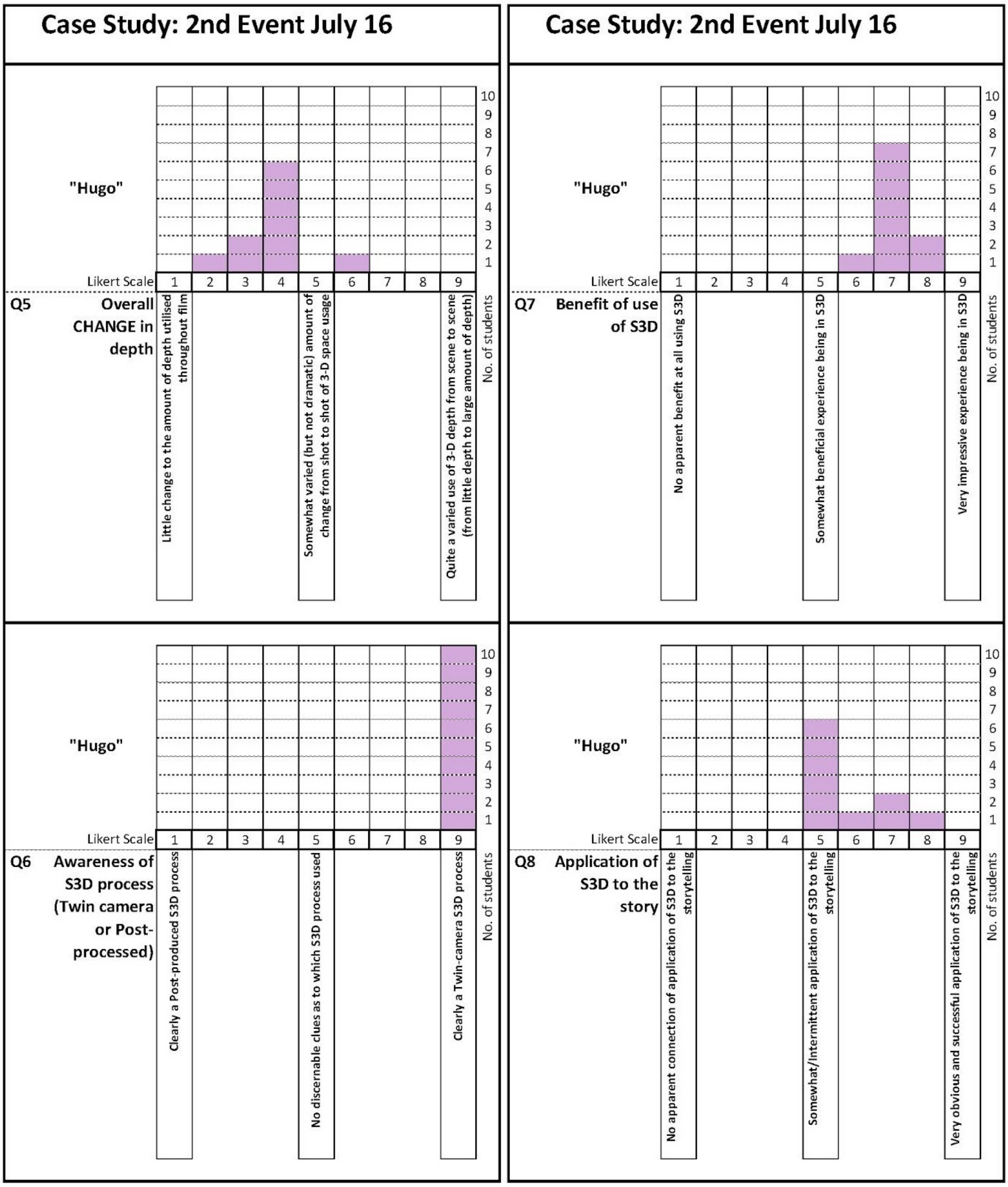
Bar Graph Compilation (Case Study-2nd Event) Likert Surveys Q1-Q4 for "Hugo" (Scorsese, 2011)



Note. Compilation of ten participant's results in Case Study-2nd Event surveys of Q1-Q4 for "Hugo" (Scorsese, 2011)

Figure 6-11

Bar Graph Compilation (Case Study-2nd Event) Likert Surveys Q5-Q8 for "Hugo" (Scorsese, 2011)



Note. Compilation of ten participant's results in Case Study-2nd Event surveys of Q5-Q8 for "Hugo" (Scorsese, 2011)

The data from the surveys shows an even spread of positive and negative parallax space used with a peak in the graphs near the “Mostly the 3-D was in the positive space” area. From this there is a recognition of mostly use of positive space with some negative space used intermittently. ‘Overall use of depth’ in Question 4 peaks near the Likert middle ground of ‘6’ with “Generous usage of space behind the screen and in front of the screen…”. ‘Overall change in depth’ peaks at Likert ‘4’ being a somewhat varied change in depth. This goes hand in hand with the overall observations that this film has significant S3D for the viewer to see, but not to any extreme extents. Question 7 relating to ‘Benefit of use of S3D’ peaks at Likert ‘7’ being between a ‘Somewhat beneficial experience in S3D’ and a ‘Very impressive experience being in S3D’.

Interestingly the “Application of S3D to the story” in question 8 peaks in the middle with a measure of “Somewhat/intermittent application of S3D to the storytelling”. Such a reading might indicate that for all of the S3D included in this film, it is not necessarily used for directly furthering the story. Even though 30% of respondents did allocate more of the S3D for furthering story, in this survey it is more a middle ground peak.

6.3.1.6 Case Study-2nd Event - Summary of Depth Model Learning Results “Hugo” (Scorsese, 2011)

Scorsese’s “Hugo” (2011) uses much S3D, but from triangulation of the three sources of data the participants responses helped to distil the following points from the research into this summary table:

Table 6-4

“Hugo” (Scorsese, 2011) Case Study-2nd Event Depth Model Summary Results

No.	*Depth model characteristic description*
1	A film with much detail in texture and colour through cinematography and production design can combine with embellished S3D without the S3D being conspicuous.
2	Regular use of slightly narrow depth of field shots expands the depth sense of the S3D along with standard 2D Depth Cues.
3	Limit use of negative and positive depth extremes.
4	Mostly positive space used for S3D depth.
5	Story setting, content, and scale can have a large effect on how well received the S3D implementation can be. Locations and setting should be considered a major influence on the amount and type of S3D is designed and instituted.

6.3.1.7 Case Study-2nd Event - Depth Model Learning Results "The Martian" (Scott, 2015)

"The Martian" (Scott, 2015) data and analysis is presented here with the following structure:

- Depth model observations, including points that may have come out of group discussions.
- Survey analysis of each of the S3D Depth characteristic and Likert surveys.
- Summary of the S3D depth model learning results.

Ridley Scott's "The Martian" (Scott, 2015) is another science-fiction genre S3D film that was also screened in the 1st Event "Intro to S3D" course screenings. As it was made in 2015, "The Martian" (Scott, 2015) was made with the potential benefit of several years of Hollywood's evolution of S3D filmmaking trials and errors. Ridley Scott, like Wim Wenders, has a history with traditional filmmaking although Scott has a more commercial catalogue of films that he has directed than Wenders. Science-fiction is also a genre that Scott is not new at and so "The Martian" (Scott, 2015) should be familiar territory for him to create S3D in, and he had already directed another S3D science-fiction film in 2012 being "Prometheus" (Scott, 2012).

The 'S3D and Story Integration' numeric survey for "The Martian" (Scott, 2015) as part of the Combined S3D Depth Budget Graphic Survey for this film (Figure 6-12) sees the average numeric score for this is to be "1.4". The most positive descriptor of 'S3D and Story Integration' to match this average numeric score shows that most respondents observed this film to have near "Seamless integration with the story", and this is near the highest accolade within this survey summary.

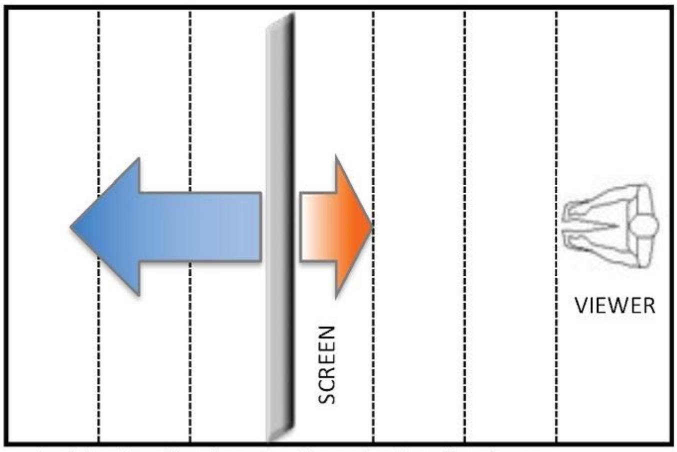
The 2nd Event discussion group for "The Martian" (Scott, 2015) centred around the smoothness of the S3D with no aberrant or "broken" S3D; "Didn't notice the 3-D very much at all" (Case Study-2nd Event, student #4). "It [the 3-D] was easier on the eye for some reason. I expected the 3-D to be more jarring in an inhospitable environment [Mars]" (Case Study-2nd Event, student #3). "A set amount of 3D was used. Not lots of it. It was used purposefully. Not much negative space used" (Case Study-2nd Event, student #2).

Figure 6-12

Combined S3D Depth Budget Graphic Surveys (Case Study-2nd Event) for "The Martian" (Scott, 2015)

Results for: **"The Martian"**

	Distance behind the screen			Distance in front of screen			
Student:	*S3D reached large distances behind the screen*	*S3D reached moderate distance behind the screen*	*S3D reached a short distance behind the screen*	*S3D reached a short distance in front of the screen*	*S3D reached moderate distance in front of the screen*	*S3D reached a large distance in front of the screen*	*Rating of what extent S3D became a part of the story:*
# 1		•		•			**1**
# 2	•			•			**2**
# 3	•			•			**1**
# 4		•		•			**1**
# 5	•			•			**2**
# 6		•		•			**2**
# 7	•			•			**2**
# 8	•			•			**1**
# 9	•			•			**1**
# 10	•			•			**1**



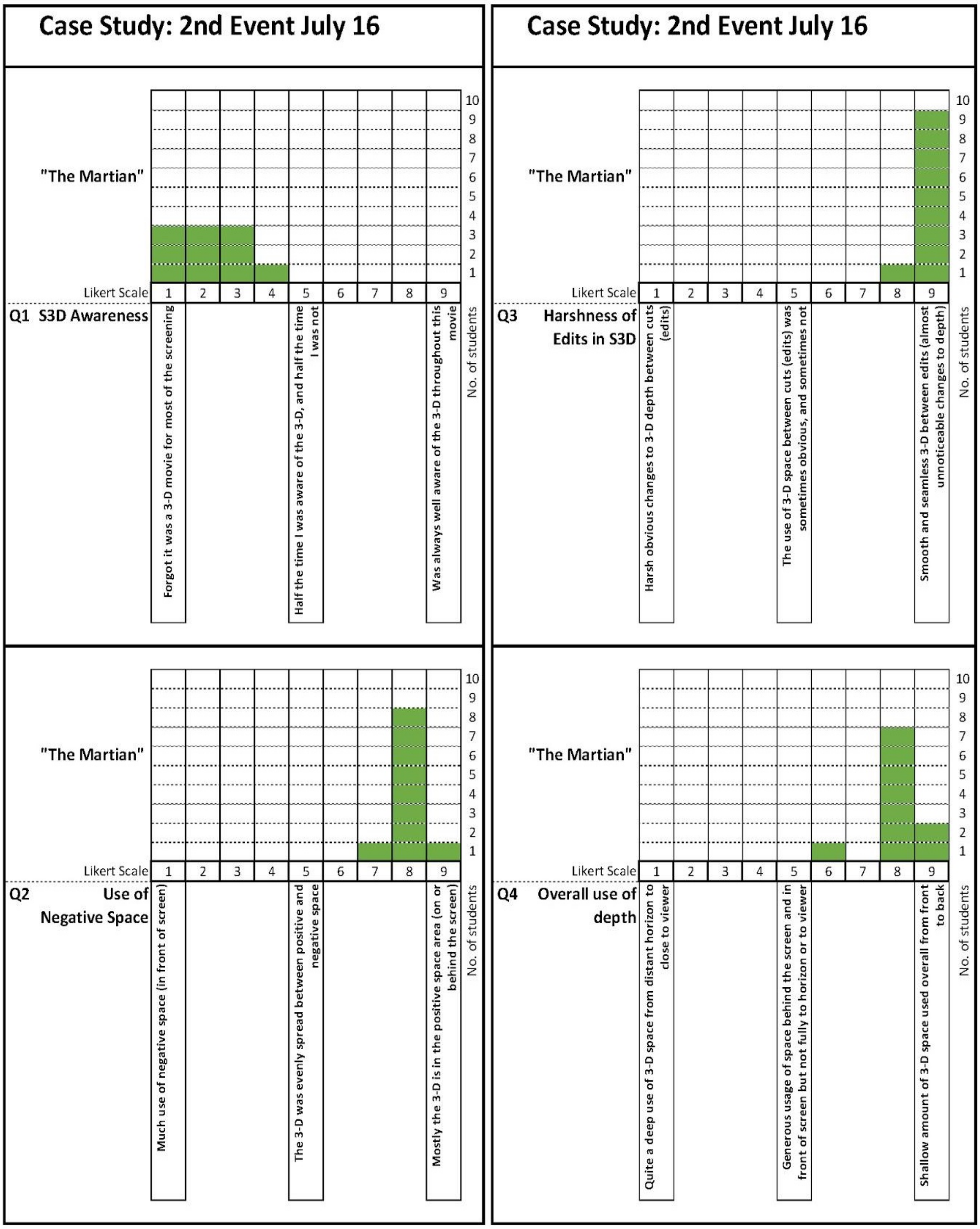
Positive Parallax Area   Negative Parallax Area

1= Seamless integration with the story
2= Not very obvious but somewhat noticeable S3D
3= Quite noticeable S3D
4= Very obvious S3D and distracting from the story
5= The S3D is broken and is unwatchable

Note. Case Study-2nd Event - Combined results from each of ten participant's observations in the S3D Depth Budget Graphic Survey, and their reading of 'Story Integration' using the codes at the bottom of the figure, after the screening of "The Martian" (Scott, 2015)

Figure 6-13

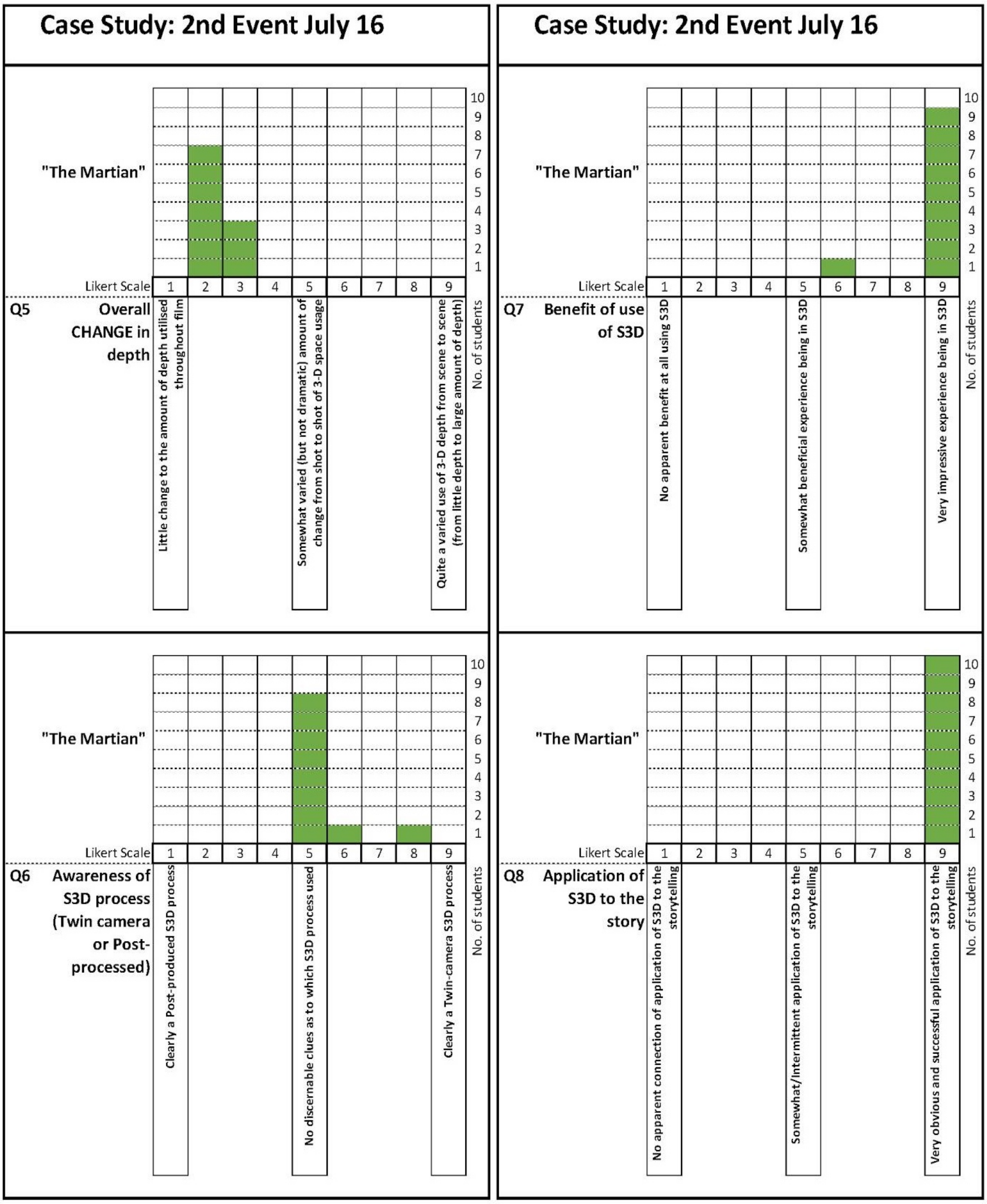
Bar Graph Compilation (Case Study-2nd Event) Likert Surveys Q1-Q4 for "The Martian" (Scott, 2015)



Note. Compilation of ten participant's results in Case Study-2nd Event surveys of Q1-Q4 for "The Martian" (Scott, 2015)

Figure 6-14

Bar Graph Compilation (Case Study-2nd Event) Likert Surveys Q5-Q8 for "The Martian" (Scott, 2015)



Note. Compilation of ten participant's results in Case Study-2nd Event surveys of Q5-Q8 for "The Martian" (Scott, 2015)

A clear observation by the 2nd Event group was the noticeability of the 3-D particularly in the interior scenes. "The Martian" (Scott, 2015) is a film about a lone astronaut stranded on Mars with only his small hut and his all-terrain vehicle between him and the desolate planet. Within these two extremes most of the story happens, and these 2nd Event research participants observed a distinct difference of S3D use between the two; "Exteriors and interiors contrasted with each other with the 3D usage. Interiors had a more "enclosed" feeling with exteriors more open" (Case Study-2nd Event, student #7). "3-D is a weird idea for a film about solitude. The extra 'space' of 3-D is exaggerating his loneliness" (Case Study-2nd Event, student #5). "...Mostly changes in 3-D when moving from enclosed interiors to outdoor exteriors" (Case Study-2nd Event, student #1).

A simple change in the amount of S3D used in interior scenes when contrasted with the amount of S3D used in the exterior scenes suggests a significant application of S3D to story. From the discussion, some students viewed this change as a highlight of the central character's plight of being alone and at risk. Some variation appeared in the above comments as to where the extra S3D was used. Some noticed it as more S3D being applied for exteriors and less for interiors, however a number of participants saw more S3D applied for interiors than exteriors, so highlighting the astronaut's loneliness by adding more "space"; "Variations [of S3D] from inside to outside shots, but the interiors seemed to have more "depth" than the exteriors for some reason" (Case Study-2nd Event, student #2). "[It's the] first film I've seen where the 3-D builds on the story. It improved the film by adding to the astronaut's aloneness" (Case Study-2nd Event, student #4). "Scenes with Matt Damon wearing a helmet or being enclosed used the 3-D. Some out of focus background shots made the 3-D stand-out [depth of field]" (Case Study-2nd Event, student #6).

The survey results from the "Case Study-2nd Event" Likert survey (Figure 6-13) found that there was very little spread on any of these Likert graphs with sometimes nine and ten respondents all selecting the same Likert scale descriptor. Question 1 however still had some spread but all were within four Likert scale numbers of the "Forgot it was a 3-D movie for most of the screening" Likert scale of '1'. 90% of respondents chose the Likert score of '9' for the 'Use of negative space' question. This indicated that 'Mostly the 3-D is in the positive space' for nine out of ten observers. Question 4 being the 'Overall use of depth' question, had 90% of participants choose "A shallow amount if 3-D space was used overall" at or near the corresponding Likert scale number of '9'. Question 5 indicated that there was little observed change in depth in "The Martian" (Scott, 2015) with 100% of respondents within three Likert scale numbers of "Little change to the amount of depth utilised".

A middle-ground on the Likert scale was averaged as to whether it was a twin-camera or post-converted production. The descriptor for this mid-ground is "No discernible clues as to which S3D process used" and is possibly due to a number of astronaut helmet interface shots used in the movie that by their nature had the effect of a layered S3D foreground depth. This could possibly be construed by the participants as the layered look that some post-converted S3D films had. 'Benefit of use of S3D' and 'Application of S3D to the story' was almost 100% for both of these translating to 'Very impressive experience…' and "Very obvious and successful application of S3D to the storytelling" respectively. Many of these Likert survey results point to a model for this film of S3D used for mostly close proximity scenes which was for most of this film's settings (being interiors of cabins, RV vehicles, inside astronaut helmets, and interplanetary spacecraft. Some vast exteriors being landscapes on Mars did not seem to affect the respondent's observations of generally short depth and largely non-changing use of S3D depth.

6.3.1.8 Case Study-2nd Event - Summary Depth Model Learning Results "The Martian" (Scott, 2015)

The triangulated data sources in this 2nd Event resulted in the highlighting of some differences of opinion, as well as some agreeances, in the discussion sessions, but there were also a lot of similar observations drawn between the group discussion and the surveys. "Gravity" (Cuarón, 2013) is another S3D film that was used in more than one Event's screening, being in the 1st Event's sessions as well. Being also a space/science-fiction genre film there was another opportunity to compare not only the different group's responses to S3D elements, but in some cases such as this, a direct comparison was possible of the S3D in the same film.

Table 6-5

"The Martian" (Scott, 2015) Case Study-2nd Event Depth Model Summary Results

No.	*Depth model characteristic description*
1	Varying the characteristics of the S3D to heighten story by doing opposite of what would be expected of the S3D to do. For instance, a room that feels small will seem smaller if the S3D has more depth. This contrasts by doing the opposite of what would be expected.
2	Distant horizons that include foreground objects/characters can still work in S3D without resulting in painful S3D shots. "The Martian" (Scott, 2015) is proof that technical camera arrangement and S3D specifications can be arranged in order to accommodate.
3	Little use of the negative space in front of the projection screen brings less awareness of the presence of the 3-D.
4	Science-fiction genre makes the S3D less overt by the fact that the experience is usually already out of a normal human experience.
5	Adding intermittent negative space usage to an otherwise mostly positive parallax S3D space usage makes a clear grammar point in a story.
6	A slightly narrow depth of field helps the S3D application.

6.3.1.9 Case Study-2nd Event - Depth Model Learning Results "Gravity" (Cuarón, 2013)

"Gravity" (Cuarón, 2013) data and analysis is presented here with the following structure:

- Depth model observations, including points that may have come out of group discussions.
- Survey analysis of each of the S3D Depth characteristic and Likert surveys.
- Summary of the S3D depth model learning results.

From the "Combined S3D Depth Budget Graphic Survey" for this film (Figure 6-15) it is clear that 100% of the survey participants saw only subtle use of foreground S3D depth space usage (between the viewer and the screen). A slight variation between observers for the positive parallax area of S3D depth behind the screen and to the horizon from mid to distant usage of this area of S3D space was also evident in Figure 6-15.

The 2nd Event group discussion on "Gravity" (Cuarón, 2013) began with wide acknowledgement that the group viewing of this film on a large projection screen in a cinema-sized Auditorium suited the subject matter of this film very well. The group went on to also acknowledge that the relatively subtle application of S3D in this film in relation to this subject matter also suited the story as well as the large size of the screening itself. "[The 3-D] completely suited the setting of this film [being space]. It wasn't overdone either. Maybe because with deep space you might expect heaps of 3-D. The 3-D was there but not too much" (Case Study-2nd Event, student #3). As far as the 2nd Event discussion group's observations of the use of S3D in this film, the division between the S3D use external of the spacecraft and its use inside the spacecraft, was observed to not be very large for a science-fiction film whose external environment is infinitely big by its nature, compared to the interiors of spacecraft which are customarily quite small: "...compared with the 3-D outside the shuttle which also looked good. [There was] almost the same amount of 3-D in both inside and outside" (Case Study-2nd Event, student #4).

The minimal use of S3D in "Gravity" (Cuarón, 2013) garnered positive responses from the research group participants, primarily based on their expectation of large-scale use of S3D in a film whose premise has large scale settings; "[it was] not particularly evident 3D and didn't draw attention to itself for the most part except for one or two shots in the negative space" (Case Study-2nd Event, student #2). "[The 3-D] wasn't overdone though, even though it could have been overdone with such a large planetary setting" (Case Study-2nd Event, student #2). "Not as much [S3D depth] used as it could have used for a 'space' movie" (Case Study-2nd Event, student #7). A sense of the effect of the use of S3D in relation to the character's journey is mentioned several times by the research participants in this 2nd Event, showing the beginning of the awareness of the relationship of S3D to the portrayal of aspects of the character's story: "Sandra Bullock's character was going through grieving over child loss I think and the 3-D seemed to expand this feeling of being lost in space" (Case Study-2nd Event, student #2). "Inside the closed spaces in this movie the depth was there but it didn't draw attention to itself. I was more interested in the character being saved than in the 3-D" (Case Study-2nd Event, student #5).

For this observer (Case Study-2nd Event, student #5) to say "…I was more interested in the character being saved…" must point to the positive effect that all aspects of the film, including the S3D, had on the portrayal of the story. The discussion group overall was generally impressed with the application of S3D in "Gravity" (Cuarón, 2013) on a number of specific counts. The modest use of S3D for such a large-scale story premise, the even amount of 3-D used on exteriors as well as interiors given that subject matter scale, and the fact that there were few gratuitous 3-D shots for the wow-factor market. The average 'S3D and Story Integration' code rating for the Case Study-2nd Event observations of "Gravity" (Cuarón, 2013), resulted in the highest value possible of "1" from every participant. A "1" on the "S3D and Story Integration" table (Table 6-1) is a value whose descriptor is "Seamless integration with the story" (see Figure 6-15).

The Likert survey data for the "Gravity" (Cuarón, 2013) screening in this 2nd Event revealed the following results. 'S3D Awareness' in Question 1 scored 90% of respondents "Forgot it was a 3-D movie most of the screening" on or near Likert scale '1'. The 'Use of negative space' survey question peaked at or near the "Mostly the 3-D is in the positive space area…". Question 4 on 'Overall use of depth' indicated a middle ground between a "deep" use of space and "generous but not fully utilising the space (which also matches the Depth Budget Graphic Survey result in this regard). The 'Overall change in depth' (Question 5) figure sits between "little change to the amount of depth" and "Somewhat varied (but not a dramatic amount) of change from shot to shot".

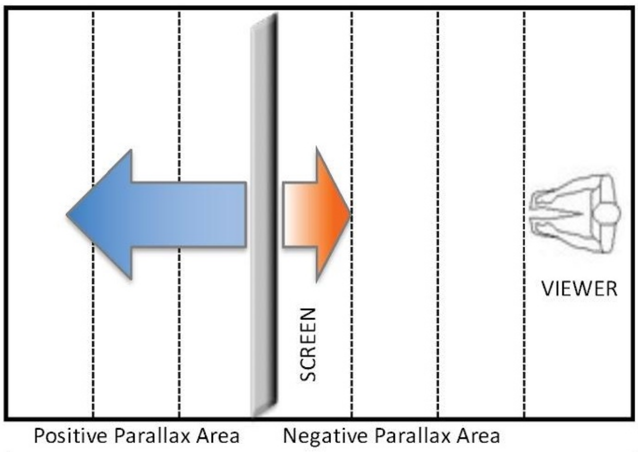
This seems to be a somewhat different result from the same group's discussion responses. Here the impression of depth change was significant between outside the spacecraft and inside the spacecraft. This could however be attributed to the "sense" of the participants that the S3D outside of the spacecraft "felt" different from inside the spacecraft due to the opposites of scale between the two, but the actual amount of S3D depth was technically quite similar to each other. The "Awareness of twin-camera or post-converted" question is poignant because "Gravity" (Cuarón, 2013) was in fact a post-converted S3D production, but due to the large amount of CGI work and also refined S3D production techniques, most of the 2nd Event participants observed there to be "No discernible clue as to which S3D process used".

Figure 6-15

Combined S3D Depth Budget Graphic Surveys (Case Study-2nd Event) for "Gravity" (Cuarón, 2013)

Results for:
"Gravity"

Student:	Distance behind the screen			Distance in front of screen			Rating of what extent S3D became a part of the story:
	S3D reached large distances behind the screen	*S3D reached moderate distance behind the screen*	*S3D reached a short distance behind the screen*	*S3D reached a short distance in front of the screen*	*S3D reached moderate distance in front of the screen*	*S3D reached a large distance in front of the screen*	
# 1		•		•			**1**
# 2	•			•			**1**
# 3	•			•			**1**
# 4		•		•			**1**
# 5		•		•			**1**
# 6	•			•			**1**
# 7		•		•			**1**
# 8	•			•			**1**
# 9		•		•			**1**
# 10	•			•			**1**

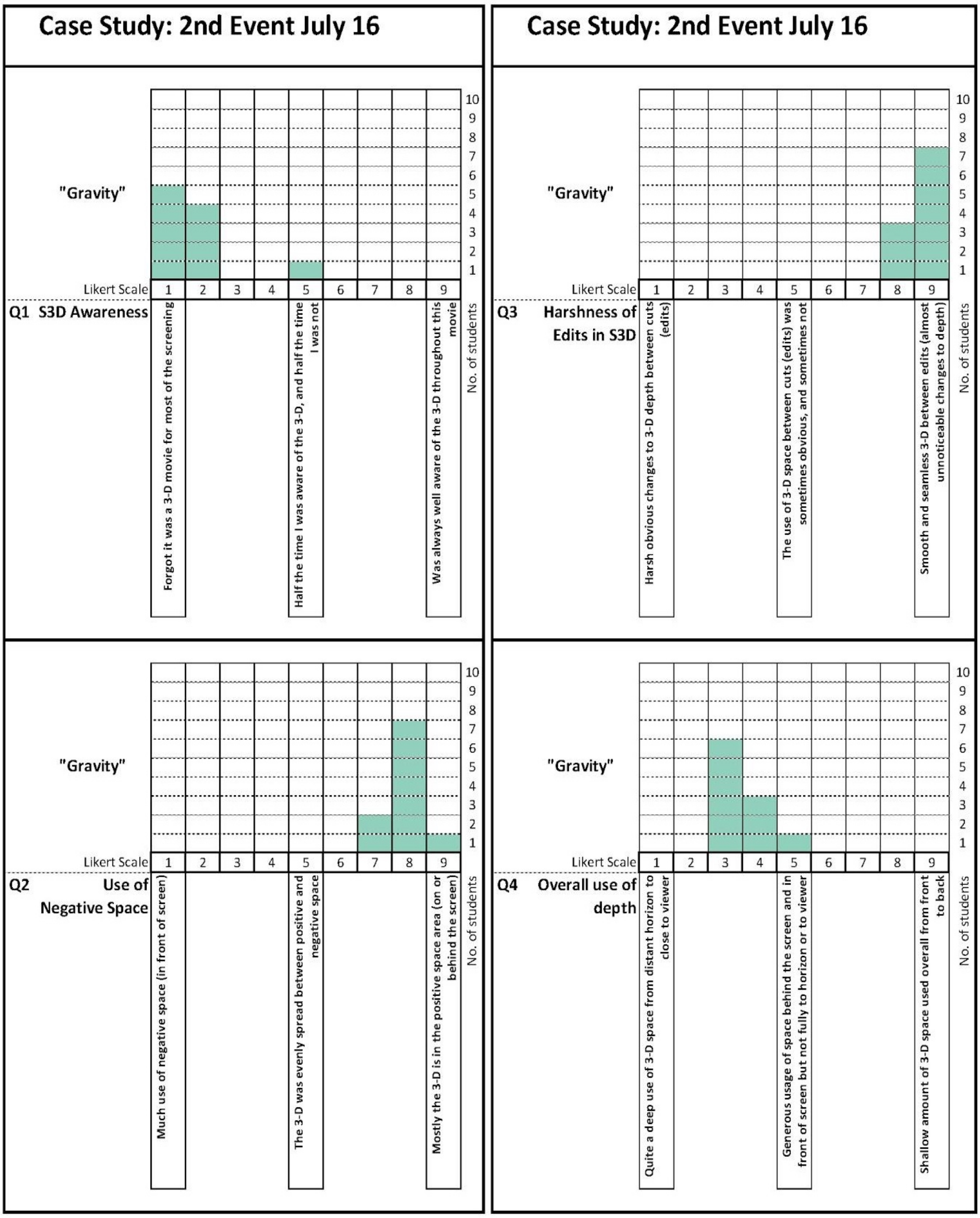


1= Seamless integration with the story
2= Not very obvious but somewhat noticeable S3D
3= Quite noticeable S3D
4= Very obvious S3D and distracting from the story
5= The S3D is broken and is unwatchable

Note. Case Study-2nd Event - Combined results from each of ten participant's observations in the S3D Depth Budget Graphic Survey, and their reading of 'Story Integration' using the codes at the bottom of the figure, after the screening of "Gravity" (Cuarón, 2013)

Figure 6-16

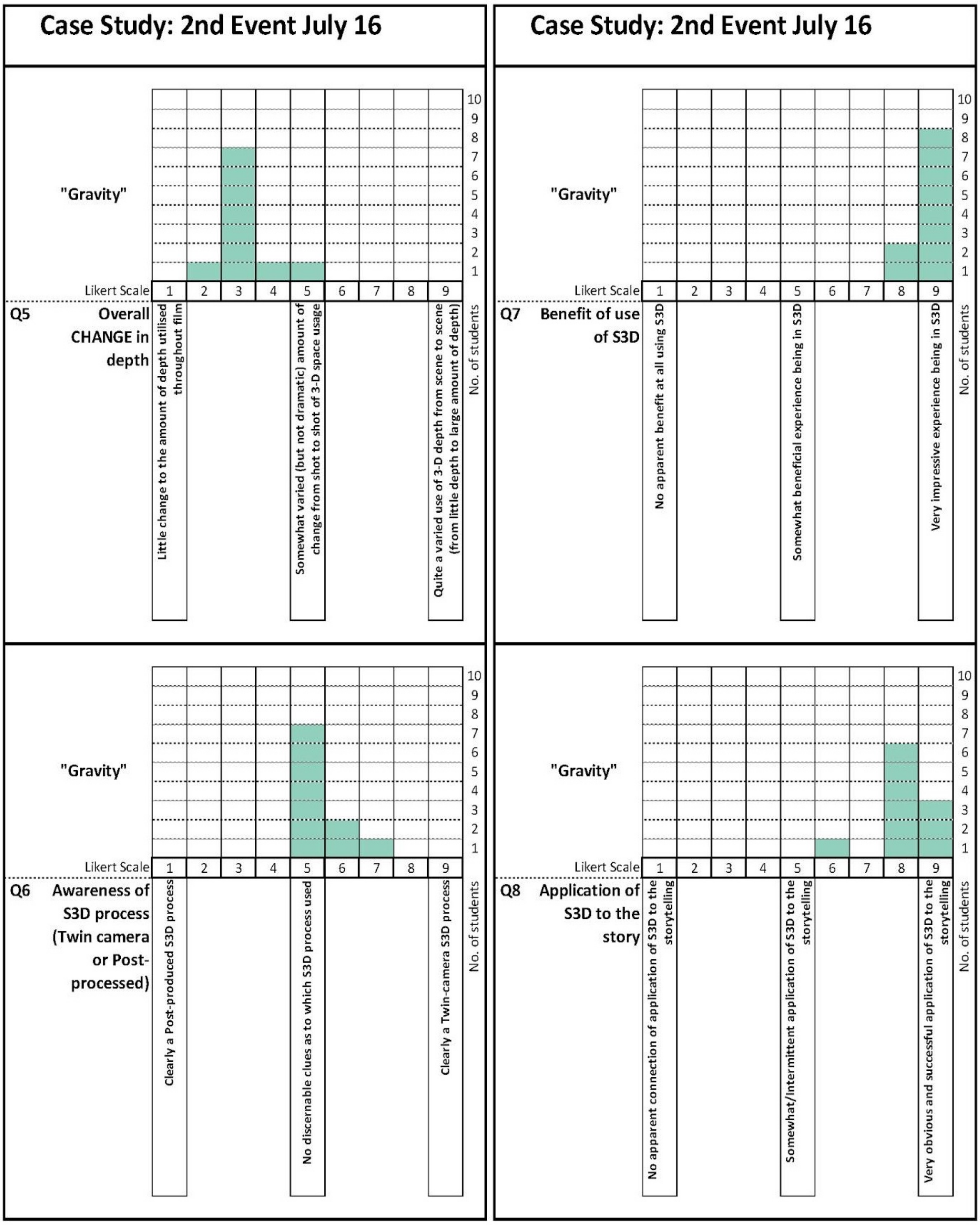
Bar Graph Compilation (Case Study-2nd Event) Likert Surveys Q1-Q4 for "Gravity" (Cuarón, 2013)



Note. Compilation of ten participant's results in Case Study-2nd Event surveys of Q1-Q4 for "Gravity" (Cuarón, 2013)

Figure 6-17

Bar Graph Compilation (Case Study-2nd Event) Likert Surveys Q5-Q8 for "Gravity" (Cuarón, 2013)



Note. Compilation of ten participant's results in Case Study-2nd Event surveys of Q5-Q8 for "Gravity" (Cuarón, 2013)

6.3.1.10 Case Study-2nd Event - Summary Depth Model Learning Results "Gravity" (Cuarón, 2013)

"Gravity" (Cuarón, 2013) in this 2nd Event screening and discussion provided data that started to clarify for this 2nd Event group some of the more common characteristics of S3D that works consistently:

Table 6-6

"Sanctum" (Grierson, 2011) Case Study-2nd Event Depth Model Summary Results

No.	*Depth model characteristic description*
1	Large scale locations/settings do not necessarily require large S3D results to match.
2	S3D depth placement mostly behind the projection screen (positive parallax area) works well.
3	Post-converted S3D process does not necessarily come with negative attributes with careful planning and refined S3D camera setup geometry.
4	Extreme distances from very close up to universe horizon is possible with CGI backgrounds.
5	Changes in S3D depth from interiors to exteriors or one situation to another is a useful way of embedding story.

6.3.1.11 Case Study-2nd Event - Depth Model Learning Results "Conan the Barbarian" (Nispel, 2011)

"Conan the Barbarian" (Nispel, 2011) data and analysis is presented here with the following structure:

- Depth model observations, including points that may have come out of group discussions.
- Survey analysis of each of the S3D Depth characteristic and Likert surveys.
- Summary of the S3D depth model learning results.

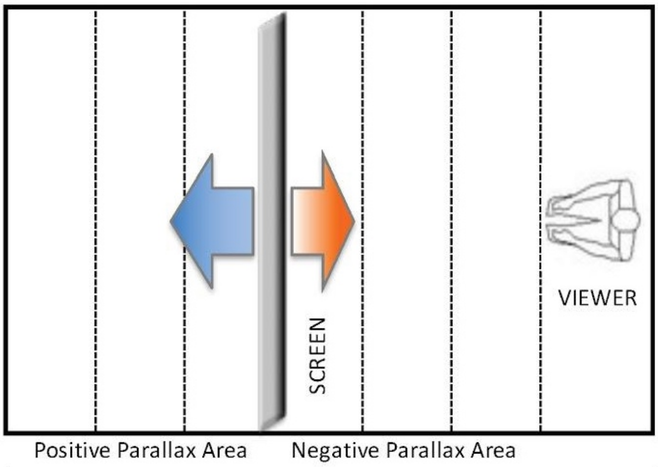
"Conan the Barbarian" (Nispel, 2011) is a sword and sorcery sub-genre film whose genre characteristics usually entail villagers, hand-forged weapons, and male dominated societal themes. This 2011 S3D film differs from some of the other S3D films chosen for screening in this 2nd Event group by presenting as person-to-person drama and close-range fight scenes. This differs from spacecraft, space vistas, and extremes of distances in the locations seen in the screening list of S3D films for this group so far. This version of "Conan the Barbarian" is creatively photographed with high resolution imagery, and has detailed and textured production design elements such as animal skin abode furnishings, and wooden and metallic implements. It also has many CGI backgrounds and uses much side light and backlight in its creative lighting.

Figure 6-18

Combined S3D Depth Budget Graphic Surveys (Case Study-2nd Event) for "Conan the Barbarian" (Nispel, 2011)

Results for: **"Conan the Barbarian"**

	Distance behind the screen			Distance in front of screen			
Student:	*S3D reached large distances behind the screen*	*S3D reached moderate distance behind the screen*	*S3D reached a short distance behind the screen*	*S3D reached a short distance in front of the screen*	*S3D reached moderate distance in front of the screen*	*S3D reached a large distance in front of the screen*	*Rating of what extent S3D became a part of the story:*
# 1			•	•			3
# 2			•	•			4
# 3			•	•			3
# 4			•	•			1
# 5			•	•			4
# 6			•	•			3
# 7			•	•			3
# 8			•	•			3
# 9			•	•			3
# 10		•		•			2

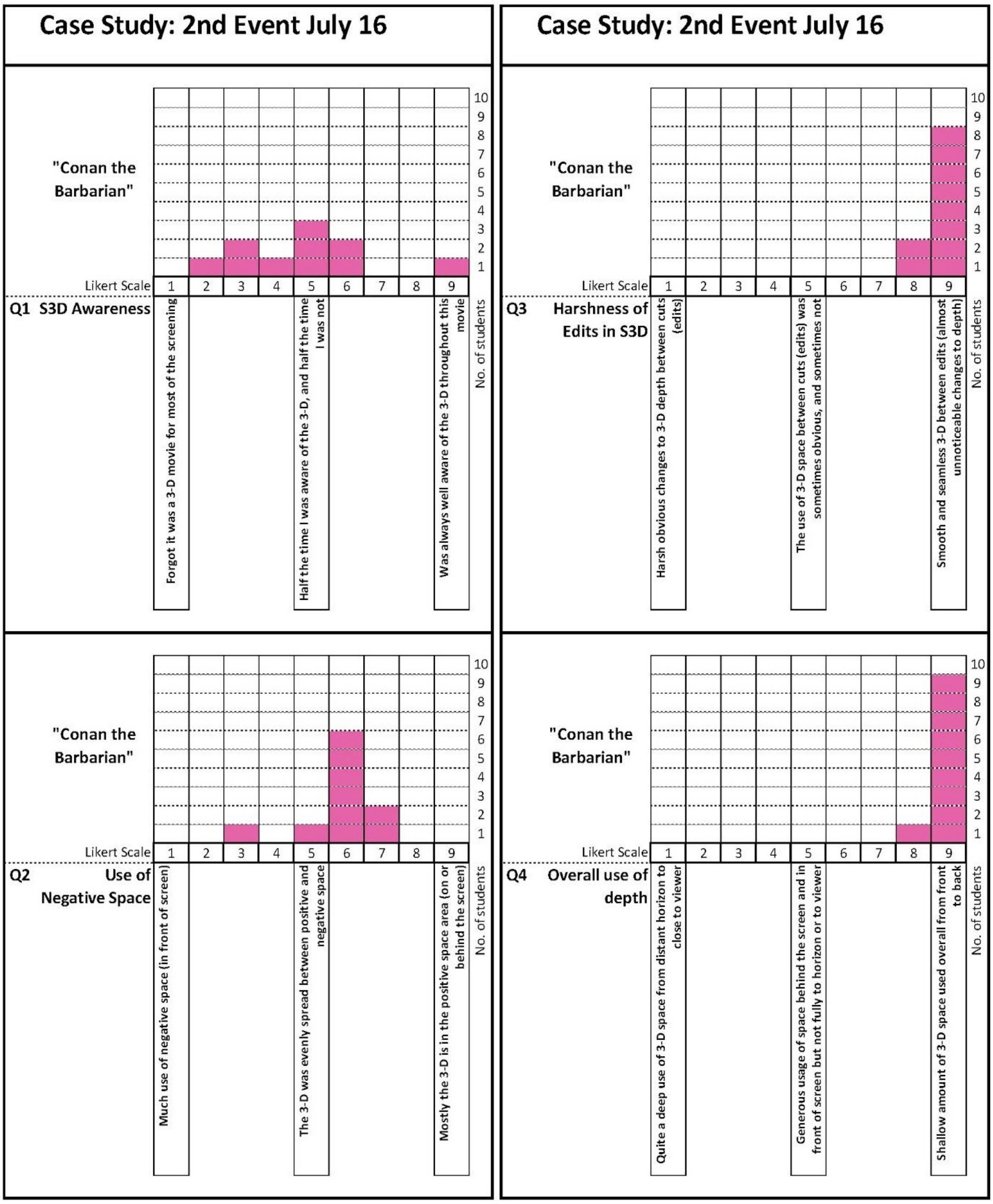


1= Seamless integration with the story
2= Not very obvious but somewhat noticeable S3D
3= Quite noticeable S3D
4= Very obvious S3D and distracting from the story
5= The S3D is broken and is unwatchable

Note. Case Study-2nd Event - Combined results from each of ten participant's observations in the S3D Depth Budget Graphic Survey, and their reading of 'Story Integration' using the codes at the bottom of the figure, after the screening of "Conan the Barbarian" (Nispel, 2011)

Figure 6-19

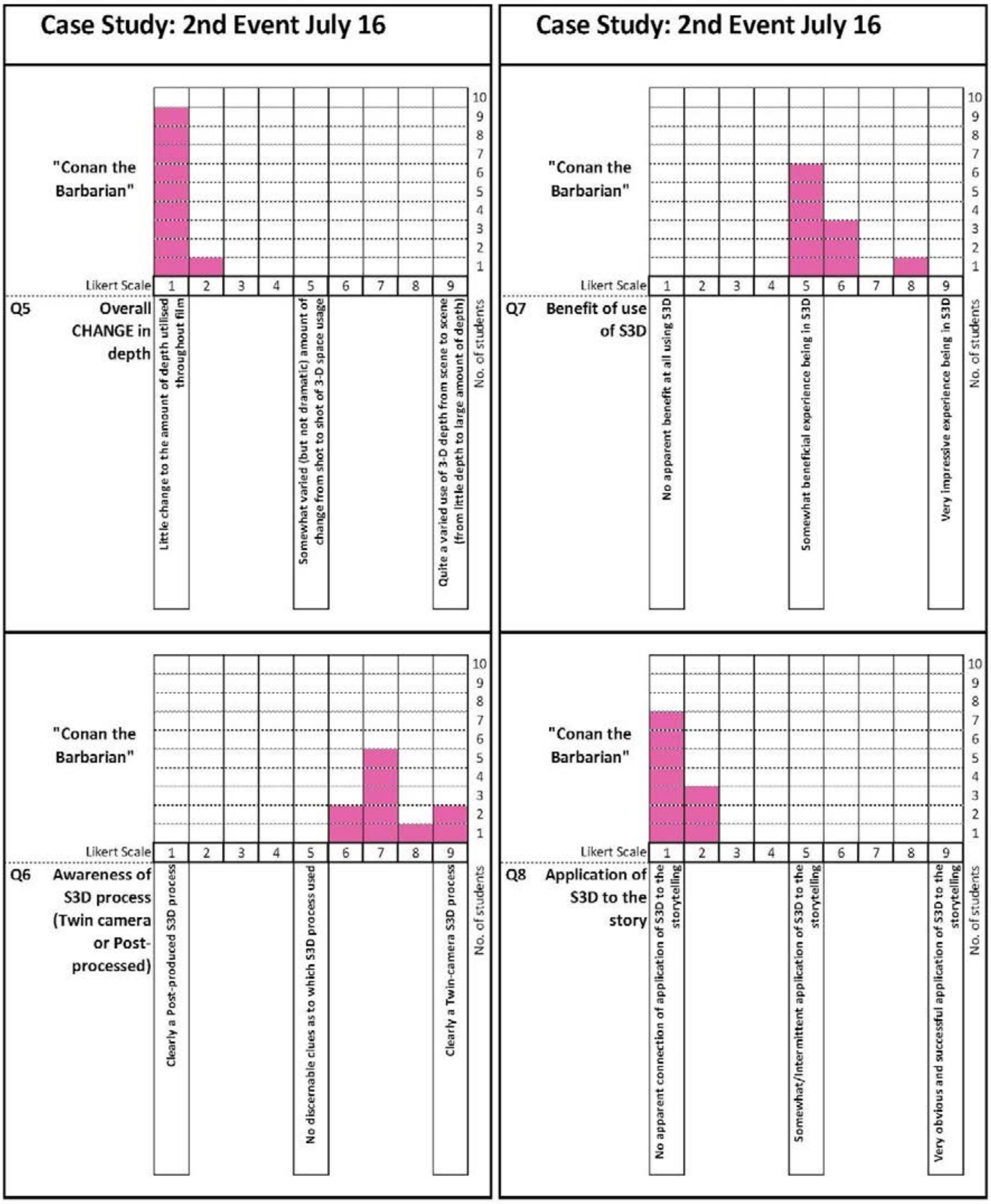
Bar Graph Compilation (Case Study-2nd Event) Likert Surveys Q1-Q4 for "Conan the Barbarian" (Nispel, 2011)



Note. Compilation of ten participant's results in Case Study-2nd Event surveys of Q1-Q4 for "Conan the Barbarian" (Nispel, 2011)

Figure 6-20

Bar Graph Compilation (Case Study-2nd Event) Likert Surveys Q5-Q8 for "Conan the Barbarian" (Nispel, 2011)



Note. Compilation of ten participant's results in Case Study-2nd Event surveys of Q5-Q8 for "Conan the Barbarian" (Nispel, 2011)

From the "Combined S3D Depth Budget Graphic Survey" for this film (Figure 6-18) it is shown that almost 100% of the survey participants saw only very little S3D positive or negative space utilised in this film. There is shown here a consistently observed minimum of S3D space usage in this S3D film. Possibly as a result of this, the 'S3D and Story Integration' code average rating for this film is '2.9' which rounds to '3'. The "S3D and Story Integration" value descriptor of '3' is "Quite noticeable S3D" (see Figure 6-18).

The 2nd Event discussion group was quick to point out that the S3D did not appear to waiver throughout the whole film and stayed within a very short distance either side of the projection screen. It soon became clear to the group that their observation of an unchanging S3D characteristic such as this became more of a cinematographic feature than a 3-D addition. "From the beginning of the film the 3D was the same in each shot. It still worked, but there was no change in the 3D from shot to shot in telling the story" (Case Study-2nd Event, student #1).

Two observers pointed out that the short depth corridor around the projection screen in this film added an unwavering space to the settings like the village and other locations. It therefore added an element of a characteristic style to the film rather than an element of Stereoscopic 3-D. "Even though the 3D was the same throughout it seemed to work as a style for the film. It's almost like the constant layout of the 3D gave the film an anchor for the story" (Case Study-2nd Event, student #1). "The 3D was stagnant. No variation at all. It then became a part of the cinematography 'look' rather than its own expression" (Case Study-2nd Event, student #2).

The Likert surveys for "Conan the Barbarian" (Nispel, 2011) had a surprising result for Question 1 "S3D Awareness" where opinions were spread across seven of the Likert scale possibilities. This means that opinions ranged from 'almost forgot it was a 3-D movie' through to "Was always well aware of the 3-d throughout this movie". It is plausible that observers could leave the S3D to being an element of the cinematography and discount its value in the 3-D realm, just as they could also be continually aware of the S3D and the fact that it did not vary for the story. Question 2's 'Use of negative space' unsurprisingly reflected this film's narrow strip of S3D either side of the screen plane (projection screen). Question 4's "Overall use of depth' also was at Likert '9' indicating least use of depth possible on this scale. Similarly, the least amount of 'Overall change in depth' was indicated in Question 5. The 'Awareness of S3D process' at Question 6 was spread thinner here with a leaning on the Likert scale toward non-post-converted process impressions by the research participants. A "Somewhat beneficial experience being in S3D" was the peak in the middle Likert ground for "Conan the Barbarian" (Nispel, 2011) and minimal 'Application of S3D to the story" is unsurprisingly at a minimum on this survey.

6.3.1.12 Case Study-2nd Event - Summary Depth Model Learning Results "Conan the Barbarian" (Nispel, 2011)

This sword and sorcery genre film, was unusual in having very little change in the application of the S3D to a point where it became more of a cinematographic effect than a tool to add more S3D character to the film. The narrow band of Stereoscopic 3-D used throughout this film (either side of the cinema screen) became more of a lens characteristic than an application of 3-D. As such, there is no detriment to the image when it is being seen in this way, somewhat more as a 'look' of the lens, in fact, this could justifiably be considered a legitimate use of S3D in the realms of this study. So, conceivably, by leaving the S3D characteristics unchanged throughout a film becomes an overall look to the whole film and not necessarily an uncreative application of S3D.

Here are the summarised elements that were taken from this 2nd Event group's reactions to the screenings of this film:

Table 6-7

"Conan the Barbarian" (Nispel, 2011) Case Study-2nd Event Depth Model Summary Results

No.	*Depth model characteristic description*
1	Little change in S3D design and structure creates more of a photographic lens attribute rather than any additions to story or character arcs.
2	A short distance of positive parallax and also short distance of negative parallax either side of the projection plane creates a characteristic look for the film like production design element or cinematographic element.
3	Implementation of 2D Depth Cues when done well can produce improved S3D results.
4	Highly textured surfaces and backgrounds add to the characteristic look of the S3D.

6.3.2 Case Study-2nd Event - Curriculum Resource Learning Results

After this second delivery of the "Intro to S3D" five-week course in July 2016, feedback on the course and the course's delivery itself was sourced from the 2nd Event participants via a survey completed after the course finished. Feedback also came from observations made by the researcher during the class delivery sessions. Feedback and observations were recorded by the researcher throughout the "Intro to S3D" course sessions, and were fed by discussions from throughout the class sessions that reflected the students' experience in the course. Feedback was also sought from education professionals (instructional designers) who work with current learning management systems. Once again, this July 2016 Case Study-2nd Event course delivery used a slide deck presentation format in a predominantly face-to-face environment. Attendance was 100% for all participants for all sessions except for one student who could not attend one session (session 4). The collected feedback from the surveys for the S3D Grammar model as a learning resource aspect of this research was based on a set of questions that directly addressed the content of the course delivery. This gathered survey data was also strengthened by discussion and interview feedback that indirectly helped determine refinements to the content and structure of the course delivery, by way of the student's own perceptions. The "S3D Coursework Survey" questions specifically included on this Case Study-2nd Event group's survey feedback were as shown in Table 6-8. The responses from the Case Study-2nd Event group to these questions regarding the S3D Coursework Survey feedback are organised in the following table (Table 6-9).

Table 6-8

S3D Coursework Survey Question List

Question No.	*S3D Coursework Survey Question*
Q.1	With the "Intro to S3D" course structured in 5 parts: 1. Brief History of Stereoscopic 3-D 2. S3D Theory (How It Works) 3. S3D Screening and Discussion 4. S3D Techniques & Benchmarks 5. S3D Storyboarding & S3D Into the Future were there any of these sectors that you consider to be instrumental in your understanding of the potential of S3D to help tell the story?
Q.2	With your prerequisite understanding of the physics of how a film is made (i.e. aspects of cinematography, or sound design, or production design that inform a film's "story"), how has your consideration of Stereoscopic 3-D's effect on story changed from when you started this "Intro to S3D" course?
Q.3	After viewing the listed S3D films as a component of the "Intro to S3D" course, were there any particular S3D films that provided any "aha" moments for you regarding application to story? If so can you identify which moments or scenes specifically made an impression on you as to S3D's impact on telling the story?
Q.4	Did such identifying moments get discussed in your class amongst the "Intro to S3D" course's students?
Q.5	Which aspects of the "Intro to S3D" course do you think worked well in your learning?
Q.6	Which aspects of the course could be improved upon and why?
Q.7	Could any of the 5 sectors be elaborated upon in the coursework for clearer learning?
Q.8	Are there any of the 5 sectors in the coursework that you think should be reduced for any reason?

Table 6-9

Question 1 from S3D Coursework Survey

Q.1	With the "Intro to S3D" course structured in 5 parts: 1. Brief History of Stereoscopic 3-D 2. S3D Theory (How It Works) 3. S3D Screening and Discussion 4. S3D Techniques & Benchmarks 5. S3D Storyboarding & S3D Into the Future were there any of these sectors that you consider to be instrumental in your understanding of the potential of S3D to help tell the story?

Table 6-10

Question 1 Responses from Case Study-2nd Event S3D Coursework Survey

Student No.	*Student comment*
Student #1:	*The first half of the course had biggest learning curve. 3D film watching and chats after had most teaching.*
Student #2:	*I am more interested in the use of 3D in films than how to do it so screenings were most instrumental for my learning. Basics of the theory are needed for this but discussions with classmates shed a lot of light.*
Student #3:	*Learnt so much. Probably learnt more from talking to the teacher about what S3D films work well and why than from the course itself.*
Student #4:	*The theoretical part of S3D is best part for my understanding. The unusual techniques that make 53D work differently from normal films is interesting to apply to films we watched.*
Student #5:	*Seeing a lot of films.* *Talking about the 3D with the teacher and the group.*
Student #6:	*Watching 3D film clips that use the 3D for telling story in S3D Screening week and every time.*
Student #7:	*The Theory section and the advanced techniques section was most important especially with watching more S3D.*
Student #8:	*The screenings had the most influence but only when talked about with class.*
Student #9:	*Theory session combined with all of the screenings had the most impact. Also 'how 3D works' demonstration with 3D glasses in class*
Student #10:	*The screenings and the theoretical stuff together.*

Analysis of the submitted responses to this Coursework Survey begins here. Question 1 responses in the Case Study-2nd Event Survey (Table 6-10) showed an improvement over the 1st Event group's responses to the heavy content load of the S3D Theory. The delivery for the 2nd Event had much of the S3D Theory given as online viewable S3D screenings using anaglyph (red/blue) glasses. There were also articles on S3D historical timelines that were read by students between the 2nd Event F2F sessions. The responses from the 2nd Event participants indicated that the areas that provided the most benefit were the S3D screenings in class, the discussions in class, and also the importance of the S3D Theory (without stating that it was too heavy this time). The benefit of discussion between the facilitator and the students after the screenings came up once again for this Case Study-2nd Event group. No mention of the S3D Theory being difficult indicates the improvement in this area since the 1st Event course. The ongoing success of the "live" 3-D demonstration during the theoretical session was mentioned by one respondent as an "instrumental" aspect to the learning. An important technical advancement to the 1st Event's "live" S3D demonstration was enabled in this 2nd Event. Using the same previsualisation program that was used to create the CGI model for showing S3D changes on screen, an adaptation of a later version of this previsualisation program enabled a much higher quality S3D "live" experience to be demonstrated to the class. As proposed this was in the form of a 'polarised' S3D viewing experience with live adjustments of virtual camera settings on screen. This dispensed with the anaglyph (red/blue glasses) version of this same teaching technique which had served its purpose well in the 1st Event. This much purer method created the same high quality S3D viewing experience as the best of the S3D film screenings did, as happened each week as a part of the "Intro to S3D" coursework screenings. A 2D representation of a screenshot of this demonstration image is shown in Figure 6-21.

Figure 6-21

Adjustable Polarised S3D Image

Note. Detail screenshot of adjustable polarised S3D image as shown on the S3D projector screen for use from the 2nd Event course onward. Image used by permission of the author.

Table 6-11

Question 2 from S3D Coursework Survey

Q.2	With your prerequisite understanding of the physics of how a film is made (i.e. aspects of cinematography, or sound design, or production design that inform a film's "story"), how has your consideration of Stereoscopic 3-D's effect on story changed from when you started this "Intro to S3D" course?

Table 6-12

Question 2 Responses from Case Study-2nd Event S3D Coursework Survey

Number of respondents	Level of influence S3D has on story:
1	"...I think that S3D has only a **slight** influence on story when compared to the sound design, production design, etc. effect on story…"
8	"...I think that S3D has roughly the **same** amount of influence on story when compared to the sound design, production design, etc. effect on story…"
1	"...I think that S3D has significantly **more** influence on story than the influence of sound design, production design, etc. on story…"

Table 6-13

Question 2A from S3D Coursework Survey

Q.2A	With your prerequisite understanding of the physics of how a film is made (i.e. aspects of cinematography, or sound design, or production design that inform a film's "story"), how has your consideration of Stereoscopic 3-D's effect on story changed from when you started this "Intro to S3D" course?

Table 6-14

Question 2A Responses from Case Study-2nd Event S3D Coursework Survey

Number of respondents	Whether my opinion on how much effect S3D has on story HAS CHANGED since doing this "Intro to S3D" coursework:
5	"My opinion on how much effect S3D has on story HAS CHANGED since doing this "Intro to S3D" coursework"
5	"My opinion on how much effect S3D has on story HAS NOT CHANGED since doing this "Intro to S3D" coursework"

Here are the results from the surveys for the Question 2 section, where participants added comments if they wished as to whether their view on S3D's effect on story had changed since beginning the "Intro to S3D" course:

Table 6-15

Question 2 Comments from Case Study-2nd Event S3D Coursework Survey

Student No.	*Student comment*
Student #1:	*There's more scope for 3D on story than I thought before Dave's course.* *Many films we watched had a lot to do with the story being influenced by 3D.*
Student #2:	*Didn't realize 3D could be more than a spectacle until I saw Pina and The Martian. Maybe Hollywood should stop making 3D films that are only for spectacle and only make smart 3D films.*
Student #3:	*S3D should have the same influence on a film same as photography and other areas.*
Student #4:	*There is better 3D in films than aren't well known. It should be time for more 3D to be better used in movies.*
Student #5:	*I expected 3D use in storyline to be what this 3D course to be about.*
Student #6:	*It has changed a lot. I know you can use 3D for showing more than scary stuff.*
Student #7:	*Changed what I thought 3D can do.*
Student #8:	*I knew 3D could help story that's why I did this course. I'm surprised that there isn't more 3D films that do it well.*
Student #9:	*More opportunity to use 3D rather than poking in the face.*
Student #10:	*3D needs work.*

This set of responses to Question 2 indicates that approximately 50% of respondents were previously unaware of the potential for S3D to affect the storytelling. For these participants to come to this realisation means that one of the significant goals of this research was to inform undergraduate film students of this S3D storytelling potential, and how to attain it, was working.

Question 3 on the survey asked whether there were any particular S3D films that provided any "aha" moments regarding application to story? This question was designed by the researcher to find if any particular applications of S3D had been recognised by the participants as breaking away from the more common practice of just using 3-D for wow-factor shots.

Table 6-16

Question 3 from S3D Coursework Survey

Q.3	After viewing the listed S3D films as a component of the "Intro to S3D" course, were there any particular S3D films that provided any "aha" moments for you regarding application to story? If so can you identify which moments or scenes specifically made an impression on you as to S3D's impact on telling the story?

Table 6-17

Question 3 Responses from Case Study-2nd Event S3D Coursework Survey

Student No.	*Student comment*
Student #1:	*Pina used 3D as a part of the dancers staging. Felt like I was on stage with the dancers. Also, Conan the 'Barbarian because it used 3D for only a bit of depth around the action.*
Student #2:	*First dance scene in Pina. Using that stage.*
Student #3:	*When I realised that I forgot about the 3D in The Martian that was aha moment. Needed the 3D but didn't notice it after a while.*
Student #4:	*Gravity, Pina, and The Martian have great 3D. Did not know 3D could look that good. Conan Barbarian used 3D better with small amount of 3D only.*
Student #5:	*Aha moment 1 - Hugo - a lot of 3D but used as a part of the scenery.* *Aha moment 2 - The Martian - when the 3D used to show the astronaut's predicament.*
Student #6:	*Pina with the dancing sequences best 3D I have seen.*
Student #7:	*First scene in Gravity. Interior scenes from The Martian.*
Student #8:	*Conan the Barbarian had great 3D but it didn't really add to the story. It was limited use and it made the movie look good without distracting.*
Student #9:	*Surprised by Conan the Barbarian it used the 3D as part of the photographic style. Not for obvious arrows and stuff.*
Student #10:	*The Martian inside his cabin on Mars where the 3D made his small room feel big* *Conan the Barbarian with restrained 3D.*

From this Question 3 summary, most of these 2nd Event films had a strong moment reflected in the course participants. “Pina” (Wenders, 2011) and “The Martian” (Scott, 2015) particularly had significant effects on the participants. The extraordinary S3D work in “Pina” (Wenders, 2011) with these comments created a benchmark of sorts with its use of stage space for character movement within; “...best 3-D I have ever seen…” (Case Study-2nd Event, Coursework Survey, student #6). “...I didn’t know that 3-D could look that good…” (Case Study-2nd Event, Coursework Survey, student #4).

“Conan the Barbarian” (Nispel, 2011) was cited as a film that a lot was learned from in this 2nd Event coursework survey. This can be interpreted as; appropriate learning can happen with films that may not be held up as the best proponents of the field. “Conan the Barbarian” (Nispel, 2011) was mentioned by 40% of participants as having beneficial S3D aspects to their learning. Reasons for this were mentioned as being the positive use of S3D as a photographic effect, and also for the unchanging parameters of S3D becoming a part of the design of the film. “Hugo” (Scorsese, 2011), “The Martian” (Scott, 2015) and “Gravity” (Cuarón, 2013) are all mentioned as films that presented important aspects of S3D to individuals in this group. This is a positive reflection on the choice of films made for this course’s screening list. None of the feedback from this 2nd Event course delivery reflected significant issues with the course. Similar feedback to the 1st Event’s feedback came up again starting with no changes required, then wishes for advanced sessions of S3D for the future, inclusion of online content, as well as a wish to have access to more S3D films to watch. “No changes needed” (Case Study-2nd Event Course Survey, student #5). “An online version would be good” (Case Study-2nd Event Course Survey, student #5). In response to a question about what could be improved in the coursework some suggested again that the course could be longer (i.e. with additional sessions), and at least one respondent suggested that the course be eventually made a part of formal qualifications in their Bachelor of Film degree. Discussions during class again mentioned the different experience of S3D when viewed on significantly higher quality S3D platforms. The potential for S3D viewing becoming more widespread on platforms as familiar as YouTube, was making flipped classroom opportunities more easily accessed. All that was required for much S3D screening content at home between F2F classes were anaglyph (red/blue) glasses that were already distributed to all students in this coursework. It still became clear that a superior experience was likely to be had by students of the eventual “Introduction to Stereoscopic 3-D” course, who had access to polarised S3D viewing. A recommendation that enrolling students have access to such high-quality viewing was not a requirement, just a recommendation if they were to have a clearer understanding of the potential of S3D. If anaglyph viewing was all that could be accessed by students between the face-to-face sessions then this would still be beneficial, just not as strong a set of visuals in regard to the best learning of the topic itself.

Table 6-18

Question 5 from S3D Coursework Survey

Q.5	Which aspects of the "Intro to S3D" course do you think worked well in your learning?

Table 6-19

Question 5 Responses from Case Study-2nd Event S3D Coursework Survey

Student No.	*Student comment*
Student #1:	*Great theatre for seeing 3D.* *Easy to learn when the 3D looks this good.*
Student #2:	*Can't tell if one part is better than another.*
Student #3:	*All of it but mostly watching the films.*
Student #4:	*Learning how eye vision works for 3D. Watching films in 3D during and after class.*
Student #5:	*S3D Theory and techniques for good use.*
Student #6:	*Discussion with the teacher.*
Student #7:	*All of it worked.*
Student #8:	*That my opinion counted for a lot in what 3D is good.*
Student #9:	*All of the course.*
Student #10:	*Every one of the 3D films and talking about them.*

Table 6-20

Question 6 from S3D Coursework Survey

Q.6	Which aspects of the course could be improved upon and why?

Table 6-21

Question 6 Responses from Case Study-2nd Event S3D Coursework Survey

Student No.	*Student comment*
Student #1:	*Be a part of a formal degree?*
Student #2:	*Watch more 3D films. Can we watch one each day between classes?*
Student #3:	*Make it part of the official film course.*
Student #4:	*An advanced 3D course after this one?*
Student #5:	*Nothing comes to mind.*
Student #6:	*More films to watch.*
Student #7:	*None.*
Student #8:	*A more advanced course to follow up?* *An online version would be good.*
Student #9:	*More time for more films.*
Student #10:	*I'd like to see more 3D cameras.*

Table 6-22

Question 7 from S3D Coursework Survey

Q.7	Could any of the 5 sectors be elaborated upon in the coursework for clearer learning? If so, please describe:

Table 6-23

Question 7 Responses from Case Study-2nd Event S3D Coursework Survey

Student No.	*Student comment*
Student #1:	*Maybe having real 3D cameras for us to play with.*
Student #2:	*Wish it were a longer course with a 3D practical filming inclusion. There was no mention of editing for 3D, would like to know more about that*
Student #3:	*More S3D viewings more often*
Student #4:	*Supply a list of 3D films that are as good as The Martian and Gravity.*
Student #5:	*More screening sessions maybe.*
Student #6:	*Each sector to have an online place for revision.*
Student #7:	*None.*
Student #8:	*Online part would help me.*
Student #9:	*Can't think of any.*
Student #10:	*Having real cameras to adjust for the 3D effect.*

Table 6-24

Question 8 from S3D Coursework Survey

Q.8	Are there any of the 5 sectors in the coursework that you think should be reduced for any reason? Please describe:

Table 6-25

Question 8 Responses from Case Study-2nd Event S3D Coursework Survey

Student No.	*Student comment*
Student #1:	*No reduction.*
Student #2:	*Coursework should be bigger not smaller.*
Student #3:	*No.*
Student #4:	*Increase content.*
Student #5:	*Nothing comes to mind.*
Student #6:	*No.*
Student #7:	*No.*
Student #8:	*No.*
Student #9:	*No.*
Student #10:	*No.*

The sequence screening order of the S3D films in this second delivery of the "Intro to S3D" coursework reflected a cross section of 3-D films that had reasonably successful cinema runs financially as well as with some critical acclaim. Once again there was a blend of S3D films with science-fiction, fantasy, and drama, with a more recent year of release with an average year of 2011. As previously mentioned, a level of 3-D evolution would be expected from earlier 3-D releases and so this put most of this Event's S3D films on a more even pitch for this research. For the next iteration of the five-week course work there were different students enrolled, and the S3D film sequence titles were not exactly the same as the 1st Event's film listing.

Some film screening titles were the same as those in the 1st Event, and made for interesting evaluations across all Events, but different film titles between the three Events also broadened the data gathered and distilled the understanding and the reading of the S3D regardless of the S3D film itself. By using the same process but using a different set of S3D film titles for screening, a single case study model will still be in effect. The eventual cross-reference of feedback of the similar deliveries of the coursework using S3D feature films as a model, strengthened the potential of a depth budget model using a broader range of S3D characteristics in a different range of S3D film titles.

6.4 Case Study-2nd Event Conclusions

Conclusions from this case study on the two primary aspects of this research are listed below. First, the result of the observations for an appropriate Depth Model is tabled here, followed by the summary observations from the data gathered to inform a refined curriculum resource. It is important to note that the resulting analysis that informed the evolving S3D depth grammar model from the first of the two aims of this research, became an evolving part of the second aim being the building of an S3D Curriculum resource. Where the refinements of the S3D grammar model started to change from the 1st Event's results, these informed an update to the Curriculum content of the next iteration of the S3D coursework.

6.4.1 Depth Model Conclusions from Case Study-2nd Event

By combining the results from the Depth Model feedback, surveys, and group discussions a series of refined S3D characteristics continued to emerge as expected. Unsurprisingly some of these S3D characteristics coincided with those that had already been recognised in the 1st Event depth model conclusions. Here are the distilled 2nd Event points from the data collected:

1. S3D combines well with texture and colour as an embellishment to cinematography and production design elements for a "look", not just for Stereoscopic 3-D depth placement.
2. Simple or dark environments with little distraction allow a character to move within an S3D space for its own manipulation of S3D space.
3. Gratuitous shots are a distraction.
4. Smart employment of S3D can be used to heighten tension in fast action scenes.
5. CGI particle effects for "added" depth (usually in foreground) can look out of place.
6. Regular use of slightly narrow depth of field shots expands the depth sense of the S3D along with standard 2D Depth Cues (i.e. Chiaroscuro, motion parallax).
7. Minimise negative and positive depth extremes.
8. Locations and setting (story, setting, scale) should be considered a major influence on the amount and type of S3D is designed and instituted.
9. Playing with expectations such as, larger S3D depths for smaller spaces and smaller S3D depths for larger spaces can manipulate otherwise obvious characteristics.
10. Careful technical S3D production can cover extremes of distances without 'breaking' the S3D (i.e. CGI is not the only method of shooting large distances/panoramas).
11. Genre specific stories can make S3D usage seem less overt by the fact that the genre-based experience is usually already out of a normal human experience.
12. Adding intermittent negative space to an otherwise mostly positive parallax S3D space usage can make a clear grammar point in a story.
13. Mostly positive parallax area usage is less distracting from story than use of negative parallax space.
14. Changes in S3D depth from interiors to exteriors or one situation to another is a useful way of embedding story.

In consideration of the Depth Model analysis from this 2nd Event group, the discussions and survey results were added to the specific characteristics from all the Case Study Events in this research to help define an S3D model for future S3D production. By looking at the 2nd Event's grammar model results alongside structuralist and formalist film theories, the depth model attributes once again compliment the storytelling techniques in the same way that they were understood by the film theorists who refined these theories in the 20th century (Buckland, 2004). Once again there shows an easy transition from traditional 2D storytelling using structuralist/formalist film theory to the implementation of S3D when it comes to creatively enhancing a film's story. The manipulation of the film image, to project a more enhanced story being told, works here because there are no distinctions between 2D and S3D imagery being manipulated. In this 2nd Event a good example of such structuralist/formalist theory at work is in the film "Gravity" (Cuarón, 2013). Here the claustrophobic personal spaces of the astronauts contrast with the enormous expanses of space just outside their spacesuits. Such artistic embellishment using S3D once again easily draws upon structuralist/formalist film theory principles to boost the cinematic perception of the story. Another aspect uncovered in this 2nd Event is from the research study of the film "Pina" (Wenders, 2011), where a move toward a more realist implementation of S3D drew very positive responses from the participants. Rather than there being any semblance of S3D being modelled for better story implementation in one form or the other (documentary style or drama/fiction style), this Event's results pointed to the fact that such applications were not necessarily mutually exclusive.

6.4.2 Curriculum Resource Conclusions from Case Study-2nd Event

The following discussions and survey results data from the Case Study-2nd Event delivery refined the application of S3D characteristics within the coursework in regard to the structuralist and formalist frameworks.

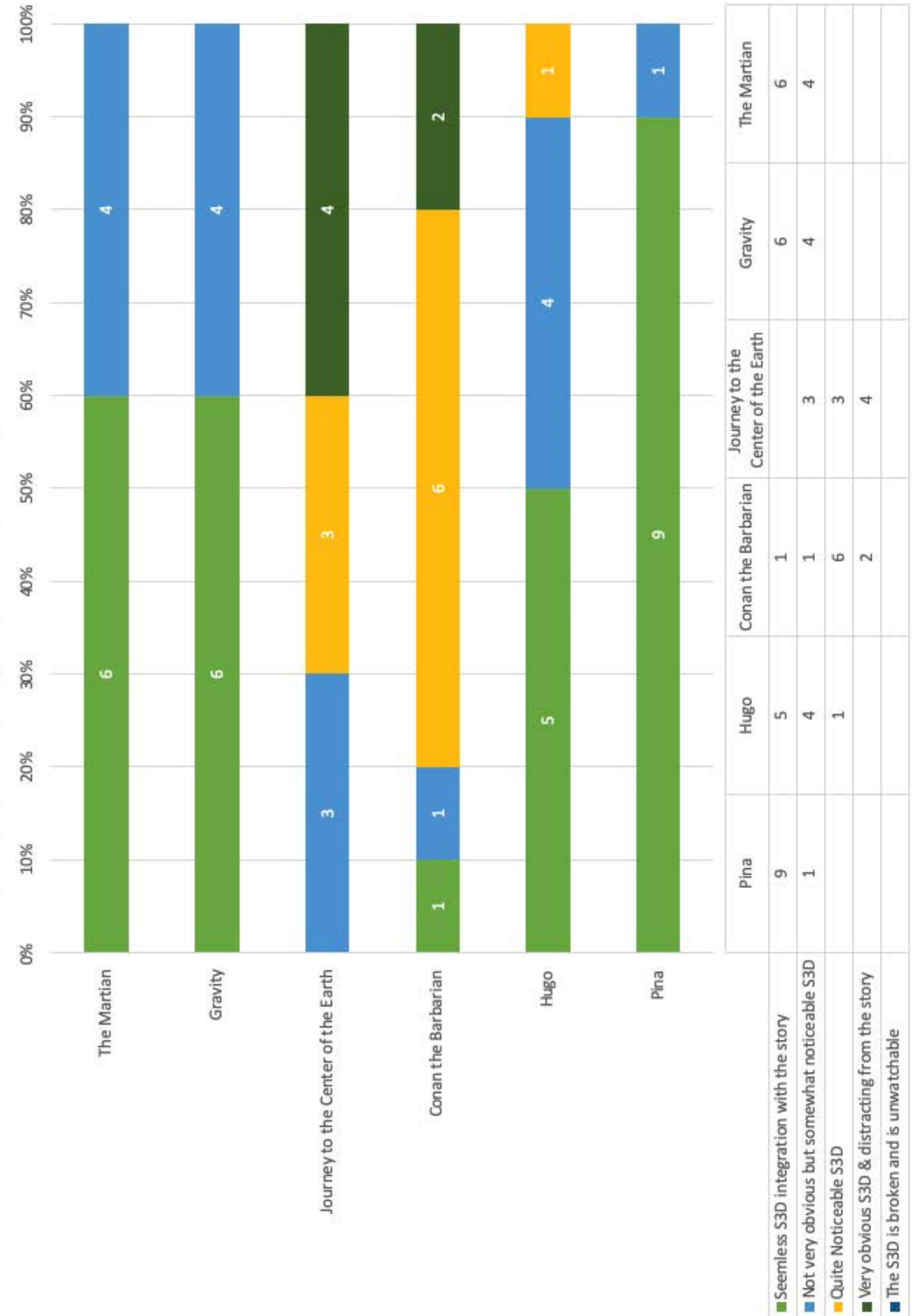
1. Content has already been moved from face-to-face delivery to be accessible to students to watch/read prior to sessions. More of the content-heavy "S3D Theory" to now be made flipped classroom study between face-to-face classes.
2. More discussion group work so that group merging of opinions and readings happens during S3D screenings as well as in face-to-face classes.
3. Make arrangements to allow more S3D screenings between set classes.
4. For screenings, mix S3D titles that are exemplars of S3D storytelling, as well as poor examples for learning.
5. More online S3D content for class revision as well as broader scope for students who are looking for more at this early introductory course level.
6. Documentary-style/realistic S3D films can utilise smart storytelling concepts in the same way that fictional narrative concepts do too.

These concepts were added to the refinement of the Curriculum resources from the 1st Event to improve the course curriculum and industry standards in S3D learning and production. An interesting comparison can be made by looking at all of the 2nd Event results from the screenings in regard to only the "S3D and Story Integration" figures. As seen in the graph (Figure 6-22) the films that 'scored' more in the "Seamless 3-D integration with the story" were the following films:

- "The Martian" (Scott, 2015)
- "Gravity" (Cuarón, 2013)
- "Hugo" (Scorsese, 2011)
- "Pina" (Wenders, 2011)

Figure 6-22

Comparison of Case Study-2nd Event Films - S3D and Story Integration



The green areas of this graph show that these films drew very positive responses from the participants when filling out the initial survey, either during or soon after the screening. This indication shows that the almost instantaneous perception by the participants in these cases, reflected the outcomes that generally were observed after some deliberation also. Wim Wenders film “Pina” (2011) in particular found that nine out of ten survey respondents marked this film as a film with “Seamless 3-D integration with the story”. “Journey to the Center of the Earth” (Brevig, 2008) and “Conan the Barbarian” (Nispel, 2011) were two films in this same Event’s screenings that did not get many “green” responses (being “Seamless 3-D integration with the story”). These two films did however get back some of the less positive responses later after deliberation. So, it is notable that in this case, some films that had initial responses of well-executed S3D for story in fact stayed that way, whilst some films that did not reflect well initially gained back some of these positive responses, after discussion and reflection.

6.5 Reflection and Redesign of Coursework

Given the results from the 2nd Event coursework surveys and observations by the researcher, then coupling this with the 1st Event refinements to the original “Intro to S3D” structure, a new version of the course was delivered to the 3rd Event course group in April 2017.

Beginning with the sourcing of videos of S3D film trailers capable of being viewed on YouTube, a gathered collection of such videos enabled participants in the study who were “enrolled” in the 3rd Event coursework, to view S3D clips on any screen at any time. This is an important breakthrough in an otherwise difficult situation, where course participants' ability to view S3D content outside of the classroom becomes quite challenging without significant financial outlay for appropriate S3D facilities at home. At the time of this course delivery, there was a dedicated Stereoscopic 3-D channel on YouTube called “yt3d” where many S3D videos were made available to the public to be viewed. In the case of such use in the “Intro to S3D” course these videos only needed to be viewed in the anaglyph method (red/blue glasses) method, so significantly this created broader S3D accessibility to most participants of this course. The only subsequent requirement was for these course participants to have internet accessibility, and to have a pair of anaglyph glasses. These glasses were given out by the researcher during each of the “Intro to S3D” courses in order for this much wider ability to learn from watching such S3D videos outside of the teaching facility of this coursework.

Digital links to beneficial learning materials such as Stereoscopic 3-D articles on history, techniques, camera setups, etc. were emailed to all course participants in preparation for the 3rd Event delivery. This reduced the load of the "S3D Theory" session in Week 2 by having all students pre-prepared in a flipped classroom so that they were familiar with some of the S3D principles before arriving to the face-to-face session. Use of the "live" S3D controls in polarised format as instigated in 2nd Event coursework continued in this 3rd Event due to its success in the 2nd Event. In order to address the feedback from the 2nd Event research participants of the value of discussion in class, a series of break out discussion group sessions were initiated by the researcher in order to involve more of the class members' own opinions in the reading of the S3D early on in the coursework. This enabled more discussion also with the researcher with more diverse opinions and questions from the first-class sessions.

The inclusion of the positive results of S3D storytelling techniques used across documentary and fictional genres of filmmaking became a central piece to the coursework screenings and discussions. Specific note was then made of this within proceeding Event coursework instances.

7 Chapter Seven: Case Study-3rd Event

7.1 Introduction

The third delivery of the "Intro to S3D" course was done in April of 2017 and is termed "Case Study-3rd Event". The screenings for this 3rd Event course were done in two separate periods and split into two sets of film screenings. The first set of screenings were named "Case Study-3rd Event A" screening in April 2017, and the second set of screenings for this same group was titled "Case Study-3rd Event B" occurring in August of 2017. The first set of S3D films chosen for screening were "Hugo" (Scorsese, 2011), "Journey to the Center of the Earth" (Brevig, 2008), "Pina" (Wenders, 2011), "Rogue One - A Star Wars Story" (Edwards, 2016), and "Yogi Bear" (Brevig, 2010). The second set of S3D screenings were delivered to these same students in August of 2017 to increase the survey breadth of the "3rd Event" with another cross-section of S3D films. There was no additional "Intro to S3D" coursework Event associated with the 'B' screening, so it was considered as a second set of films screened to the same Event group.

The S3D film titles chosen for this second Case Study-3rd Event B series of screenings in August 2017 were; "Conan the Barbarian" (Nispel, 2011), "The Amazing Spiderman" (Webb, 2012), "Billy Lynn's Long Halftime Walk" (Lee, 2016), "The Martian (Scott, 2015), "The Adventures of Tintin" (Spielberg, 2011), and "Tron: Legacy" (Kosinski, 2010).
The Case Study-3rd Event course delivery was enhanced by the S3D Grammar model improvements as refined in the previous 1st Event and 2nd Event Curriculum Resource Results summaries.

7.2 Student Participation

7.2.1 Participation in Viewing Sessions

Participation in the screenings of this 3rd Event were spread over two separate screening session periods as described. The primary reason for the addition of this second set of screenings for the same 3rd Event group of students, was the newly made availability of latest release S3D films for a broader spectrum of examination, triangulating well with the same students who attended the 3rd Event course delivery. A number of these students had watched more S3D films in their own time after the April screenings and so by the time they were invited back to watch a second series of films they were more confident in their appraisal abilities having 'practiced' on 3-D films of their choice. The second series of films in August 2017 were watched in the same large

Auditorium (at the SAE Creative Media Institute in Chippendale, NSW in Australia) as the first April 2017 screenings. Three of these films were viewed on the Sony LED 4k monitor with the remaining films being viewed on the S3D projector on a large 5-metre-wide screen. Both forms of S3D viewing were of a similar very high standard of S3D viewing considered by some as state-of-the-art.

7.2.2 Participation in the F2F Learning Environment

Recruitment for this class was done a full year after the previous (2nd) Event, by which time a number of the SAE Creative Media Institute Bachelor of Film students (from which the pool of research volunteers had been sourced) had heard that the opportunity to learn S3D in this way was eminently possible to study. The ten-seat maximum enrolment was filled quickly after eligible students were invited to attend. Participation in this 3rd Event saw the participants experience more active course delivery with hand-eye coordination activities to teach the S3D physiological aspects of this area of film production. In the twelve months between the 2nd and 3rd Event course deliveries, the researcher had assembled an online-based repository of materials and pre-recorded content for eventual delivery of the "Intro to S3D" coursework online. Early versions of this Moodle-based content were used by the researcher in the initial classes of the 3rd Event coursework, as a trial for aspects of its eventual implementation as an online course. Such early forms of this online content included embedded links to S3D YouTube viewable clips, as well as the inclusion of previous historical article links, S3D film reviews, and appropriate news items that were of interest to the subject area. At the time of delivery of the 3rd Event this Moodle-based content was utilised as a basic flipped classroom and for blended learning only. It was not used in place of face-to-face delivery, but it would eventually be the basis for a fully online course delivery.

Arrangements had also been made for any of the 3rd Event participants to be able to access S3D viewing facilities where possible outside of the weekly course times. It was not likely that all enrolled participants would be able to take up such a screening opportunity regularly due to outside time commitments, etc. but for those who were able to avail themselves of this extra viewing option it was of course a good learning opportunity. At the location that this coursework was being delivered, by April 2017 there were three high quality screening setups for S3D and each were bookable by SAE Creative Media students if required. Over the period of the 3rd Event course delivery one student took regular advantage of this external S3D viewing opportunity, by watching a different S3D film every week for the duration of the course. So at least one student saw five more films than most others by using the facilities as offered by the researcher for added learning.

7.3 Results of Learning

The 3rd Event "Intro to S3D" course delivery feedback was again sourced by the triangulation of data collected after screenings of the following six 3-D feature films. The 3rd Event 'A' - April 2017 film listing was: "Rogue One-A Star Wars Story" (Edwards, 2016), "Pina" (Wenders, 2011), "Journey to The Centre of the Earth" (Brevig, 2008), "Hugo" (Scorsese, 2011), and "Yogi Bear" (Brevig, 2010).

One of the important checks of single case study research within the validity aspect of the collected data, is participant checks. Within this 3rd Event, a second series of screenings was made available to the same students who had taken part in the 3rd Event 'A' series of screenings. This second set of screenings was made available four months after the first set of screenings, and was termed the 3rd Event 'B' series of screenings. By using the same students who participated in the 3rd Event 'A' sittings, this meant that these research participants already had the S3D training (from the 3rd "Intro to S3D" course), and also the chance to have a period of time to assimilate with the S3D training and understanding of how S3D can support the storytelling of film. By presenting to these students their observations from their prior set of observations, these students got a chance to revisit their thoughts and their understanding of S3D, and to confirm their understanding by watching a second set of S3D films, the 3rd Event 'B' sessions.

The 3rd Event 'B' - August 2017 group film title listing was: "Conan the Barbarian" (Nispel, 2011), "The Amazing Spiderman" (Webb, 2012), "Billy Lynn's Long Halftime Walk" (Lee, 2016), "The Martian (Scott, 2015), "The Adventures of Tintin" (Spielberg, 2011), and "Tron: Legacy" (Kosinski, 2010). Both film group selections were chosen as a mix of films from those already screened to the 1st and sometimes also the 2nd Event "Intro to S3D" courses (some of these titles being common to all three courses). There are also newer S3D films that have had a semblance of notoriety in S3D circles due to some aspect of their production or reception. As per all the screenings for this research, each film was screened to the research participants in 3-D, either as the complete film or a significant portion of it, so that by concentrated viewing over a period of a few weeks, the Case Study participants could make direct comparisons between the six films' use of 3-D.

Once again, the data supplied from the "Combined S3D Depth Budget Graphic Surveys" (Figure 7-1) reflects the participant's overall impressions of each film's S3D application to storytelling. Through the 'S3D and Story Integration' codes and descriptor ratings (Figure 7-1), a reflection of the characteristics for the seamless use of S3D in storytelling and other associated

S3D characteristics, describes possible best practice in future S3D production. As with previous Events this is where the results from this project, as drawn from the combined surveys, group discussions, and interviews, will triangulate along with the 1st Event's results, and 2nd Event's results, to an S3D model that addresses this study's research questions and aims.

7.3.1 Case Study-3rd Event - Depth Model Learning Results

As in the 1st Event in April 2016 and in the 2nd Event in July 2016, the 3rd Event students participated in group discussions about the S3D screenings both during the screenings, and also as a group after each of the screenings. At the end of the 3rd Event course, students also participated in group discussions and surveys about the coursework itself. All discussions about the S3D screenings were annotated by the researcher and used as previously as one of the primary qualitative data sources for this study. The participant students for this 3rd Event also filled out data gathering surveys as a significant quantitative data source collected for this research.

7.3.1.1 Case Study-3rd Event A - Depth Model Learning Results "Rogue One-A Star Wars Story" (Edwards, 2016)

"Rogue One-A Star Wars Story" (Edwards, 2016) data and analysis is presented here with the following structure:

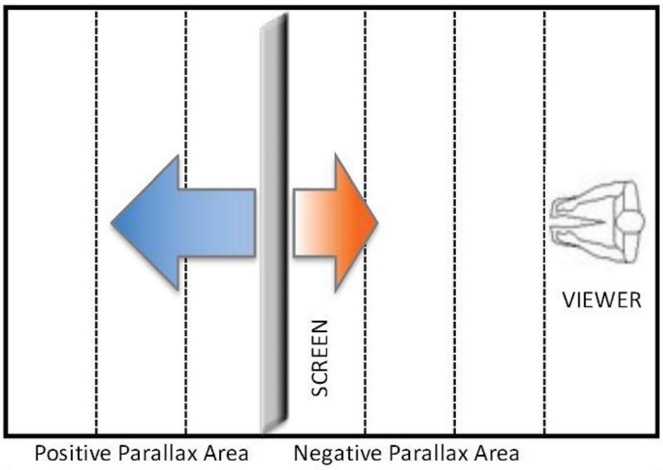
- Depth model observations, including points that may have come out of group discussions.
- Survey analysis of each of the S3D Depth characteristic and Likert surveys.
- Summary of the S3D depth model learning results.

The S3D Depth Budget Graphic Survey data for "Rogue One-A Star Wars Story" (Edwards, 2016) as shown in Figure 7-1 suggests that very little depth space on or just in front of the cinema screen was used, with a mid-ground amount of positive parallax space used behind the screen. The average rating of the "S3D and Story Integration" code (Figure 7-1) for this film is '1.1' rounded down to '1'. This film clearly gave the perception to all of the respondents who participated in this Event's survey of the S3D having a "Seamless integration with story". "Rogue One-A Star Wars Story" (Edwards, 2016) is a part of a movie franchise that usually does not have the very dark undertones that this particular film has visually and story-wise. Most of this film was shot at very close distances presumably as a directorial decision, and even in some of the exterior shots there is a sense of claustrophobia; "This whole film is very closed in. It's quite claustrophobic in lots of scenes" (Case Study-3rd Event, student #9).

Figure 7-1

Combined S3D Depth Budget Graphic Surveys (Case Study-3rd Event) for "Rogue One-A Star Wars Story" (Edwards, 2016)

	Distance behind the screen			Distance in front of screen			
Results for: **"Rogue One-A Star Wars Story"** Student:	*S3D reached large distances behind the screen*	*S3D reached moderate distance behind the screen*	*S3D reached a short distance behind the screen*	*S3D reached a short distance in front of the screen*	*S3D reached moderate distance in front of the screen*	*S3D reached a large distance in front of the screen*	*Rating of what extent S3D became a part of the story:*
# 1		•		•			**1**
# 2		•		•			**1**
# 3		•		•			**1**
# 4		•		•			**2**
# 5		•			•		**1**
# 6		•		•			**1**
# 7		•		•			**1**
# 8			•	•			**1**
# 9		•		•			**1**
# 10		•		•			**1**



Positive Parallax Area   Negative Parallax Area

1= Seamless integration with the story

2= Not very obvious but somewhat noticeable S3D

3= Quite noticeable S3D

4= Very obvious S3D and distracting from the story

5= The S3D is broken and is unwatchable

Note. Case Study-3rd Event - Combined results from each of ten participant's observations in the S3D Depth Budget Graphic Survey, and their reading of 'Story Integration' using the codes at the bottom of the figure, after the screening of "Rogue One-A Star Wars Story" (Edwards, 2016)

The S3D in this film gave back some of the space that the claustrophobia took away; "The use of 3-D was not pronounced during this viewing. Some shots had a distinct depth distance though that didn't feel like 3-D showing off" (Case Study-3rd Event, student #3).

Narrow depth of field shots in dark settings kept lit characters in a depth space that was subtle but effective; "This film was the most immersive of all the films so far so I forgot I was watching 3-D. Slight depth of field blurriness used in a number of shots along with the grey tones combined with the 3-D for clear depth definition to these shots. Subtle 3-D within this film's excellent cinematography" (Case Study-3rd Event, student #5).

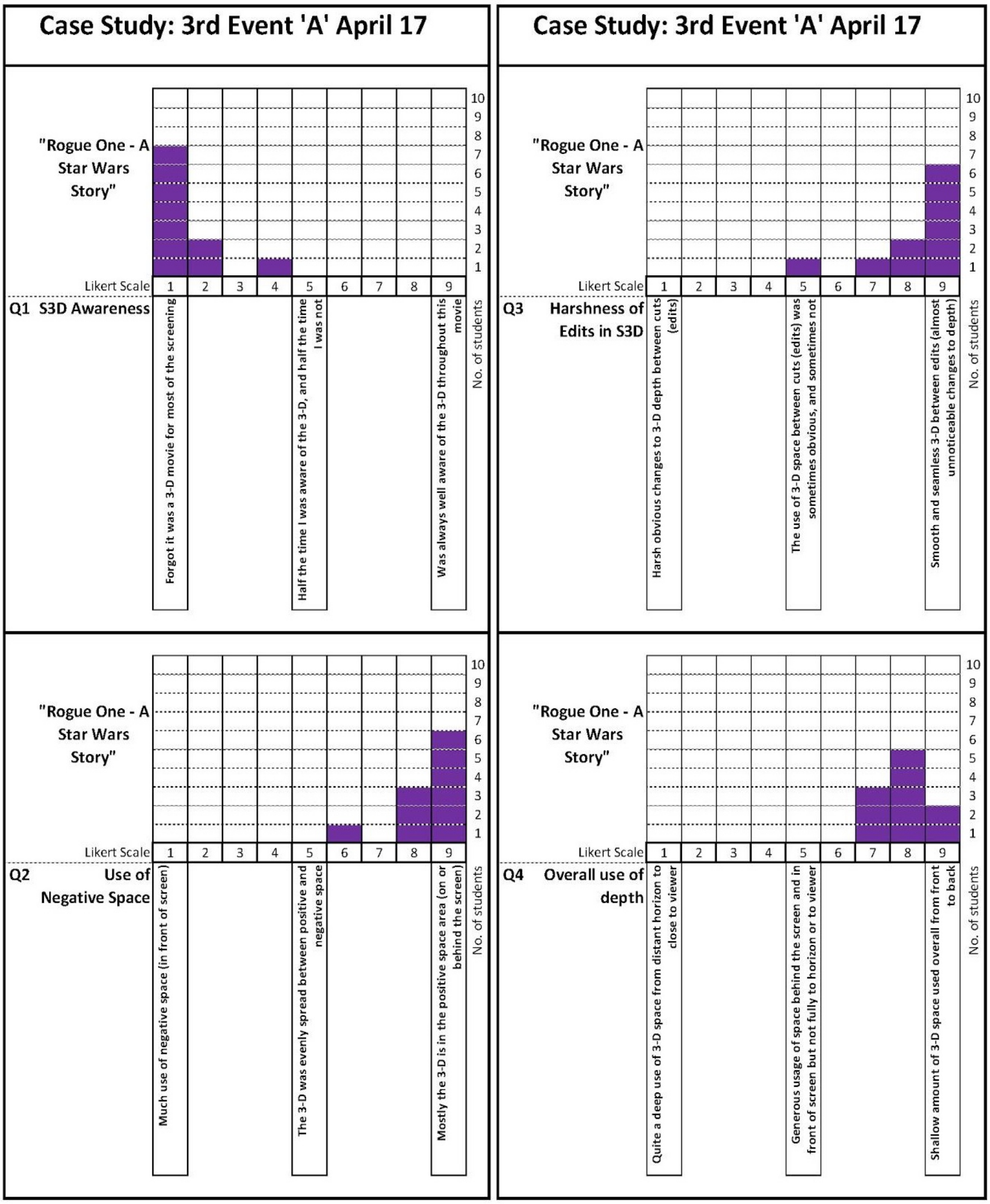
A class experiment was done during the screening of "Rogue One-A Star Wars Story" (Edwards, 2016) where a comparison was made between the 2D viewing of this film and the 3-D viewing of it. Simply by lifting off the viewer's 3-D eyewear whilst viewing this S3D film, a simple depth comparison was able to be made in order to see how much effect 3-D has on a film's image at any given time. This is possible with any 3-D movie, but the resultant blurry character edges when viewing a 3-D movie in this way (i.e. by not using the 3-D eyewear), usually makes it unwatchable.

In the case of "Rogue One-A Star Wars Story" (Edwards, 2016) however, being quite a dark movie, the blurred edges were less pronounced. In this case, the comparison between the 2D version and the 3-D version was easily accomplished, and is a good comparison. Whilst looking at it in 3-D, there was clearly a very distinct set of distances between the main characters in one specific scene, that is not obvious in the 2D version.

At the 72 minute 32 second mark of this movie, a dialogue scene between two characters in this film looks to be a simple affair, but in 3-D it shows a circle of darkly clad characters as support for this character's predicament at that time marker. In 2D it is a blur of meaningless dark background, but in 3-D it is a radiused circle of slightly out of focus and darkly clothed people who are showing their support of this main character. The 2D only viewers would be unlikely to know what they are missing, but the 3-D viewers are seeing a whole different social dynamic in this particular scene, that is emblematic of this research thesis. This moment in "Rogue One-A Star Wars Story" (Edwards, 2016) is the clearest argument for the concept of utilisation of S3D in storytelling.

Figure 7-2

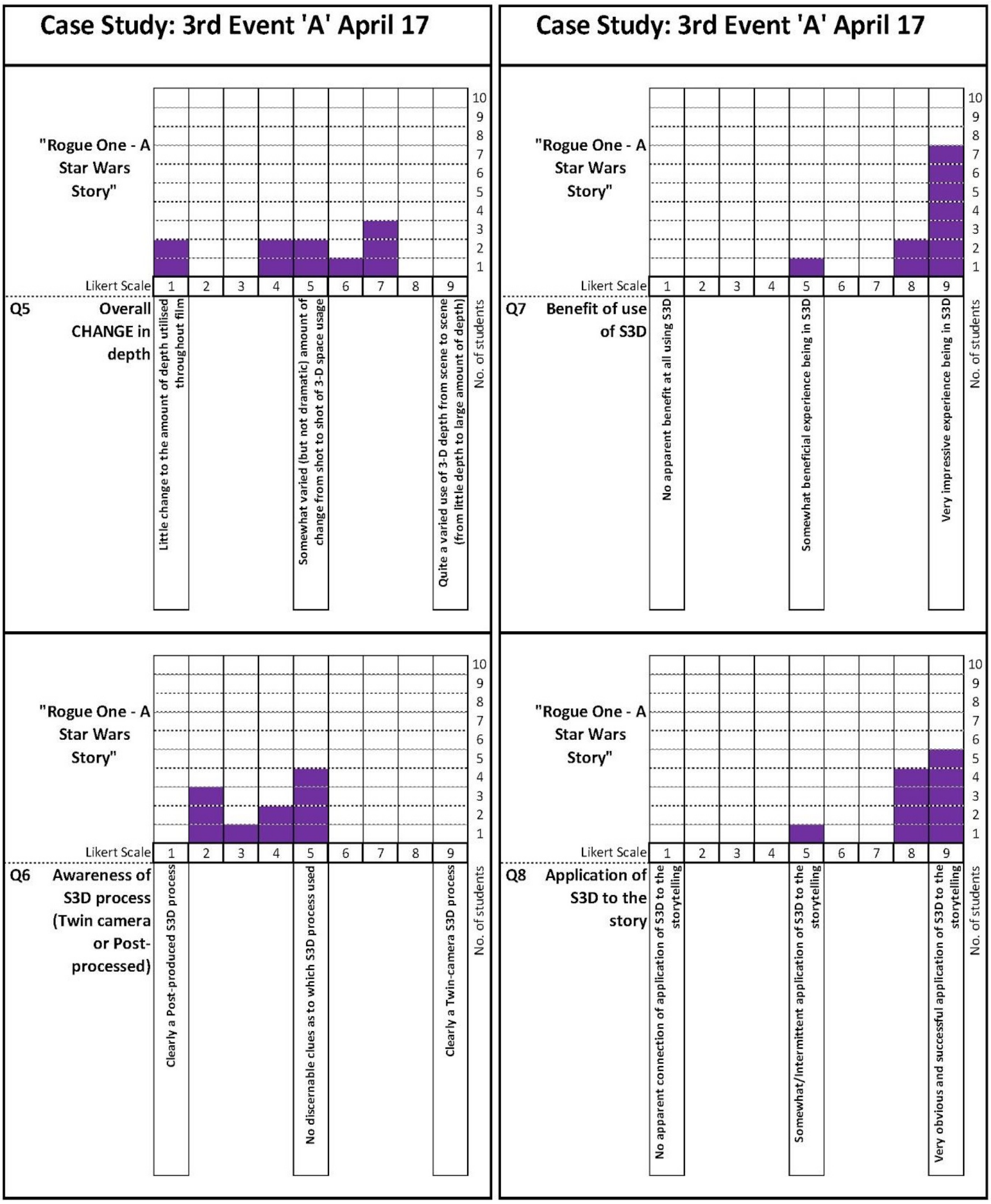
Bar Graph Compilation (Case Study-3rd Event) Likert Surveys Q1-Q4 for "Rogue One-A Star Wars Story" (Edwards, 2016)



Note. Compilation of ten participant's results in Case Study-3rd Event surveys of Q1-Q4 for "Rogue One-A Star Wars Story" (Edwards, 2016)

Figure 7-3

Bar Graph Compilation (Case Study-3rd Event) Likert Surveys Q5-Q8 for "Rogue One-A Star Wars Story" (Edwards, 2016)



Note. Compilation of ten participant's results in Case Study-3rd Event surveys of Q5-Q8 for "Rogue One-A Star Wars Story" (Edwards, 2016)

"The colours of this movie were heavily in the dark grey area. Backgrounds were dark and murky at times, with bright edge light on characters the only thing to bring them out from the murkiness. The 3-D seems to be a more important part of the cinematography than [in] other films in these screenings. The 3-D is used to create distances between characters" (Case Study-3rd Event, student #5).

"The great cinematography in this film is lifted by the 3-D mainly because of these dark props, dressings, and textures" (Case Study-3rd Event, student #6).

S3D Awareness for "Rogue One-A Star Wars Story" (Edwards, 2016) was observed to be very much on the "Forgot it was a 3-D movie for most of the screening" side of the Likert scale. Use of negative space between the screen and the viewer was perceived to be mostly on the high side of the Likert scale in these surveys, with the descriptor of "Mostly the 3-D is in the positive space area…". This is the same result for 'Overall use of depth' in Question 4. 'A shallow amount of 3-D used overall from front to back' for this 'Overall use of depth' sees all participants mark this in the '7', '8', and '9' region. For an S3D film that had most observers indicate a narrow overall use of depth in this Likert survey, the same participants marked this as a medium use of positive parallax in the graphic survey done during or immediately after the screening. The reason for this discrepancy may be the fact that the discussion forum after the screening had centred around "Rogue One-A Star Wars Story" (Edwards, 2016) having dark backgrounds and surroundings, which upon reflection may have had observers shorten their positive parallax distance estimation. Question 5 "Overall change in depth' observation was spread widely for this film, from "Little change" to a "varied use of 3-D depth".

Such a wide variation may again be a result of the dark backgrounds of this film consequently making depth estimations more unquantifiable than those with brightly lit backgrounds. 'Benefit of use of S3D' was heavily weighted toward "Very impressive experience being in S3D" with 90% of viewers on the highest two Likert scales. A broader observation in regard to whether this was a two-camera process of a post-converted process in Question 6 showed all were between "No discernible clues as to which S3D process used" and "Clearly a post-produced process". This indicates that some characteristics of a post-converted S3D film were observed at some point by all participants. In fact, this film used a post-conversion S3D process yet despite tradition, where a post-converted process was often believed to be inferior to a twin-camera process, this S3D film garnered great praise overall from the participant team in both surveys and also group discussion. As far as "Application of S3D to the story", again 90% of observers placed "Rogue One-A Star Wars Story" (Edwards, 2016) in the category of "...very successful application of S3D to the storytelling" with '9's and '10's on the Likert scale.

7.3.1.2 Case Study-3rd Event A - Summary of Depth Model Learning Results "Rogue One-A Star Wars Story" (Edwards, 2016)

"Rogue One-A Star Wars Story" (Edwards, 2016) uses S3D sparingly, but from the data readings it was found that a positive response from the research participants resulted. Here is the summary of positive attributes for the S3D of "Rogue One-A Star Wars Story" (Edwards, 2016):

Table 7-1

"Rogue One-A Star Wars Story" (Edwards, 2016) Case Study-3rd Event Depth Model Summary Results

No.	*Depth model characteristic description*
1	Dark backgrounds and very close surroundings boosts the S3D effect.
2	Regular use of slightly narrow depth of field shots expands the depth sense of the S3D along with standard 2D Depth Cues.
3	A variable but still narrow amount of positive and negative parallax space usage works well
4	Mostly positive space used for S3D depth.
5	Very few gratuitous S3D shots coming out-of-the-screen. Creates a more subtle integration of S3D.

7.3.1.3 Case Study-3rd Event A - Depth Model Learning Results "Pina" (Wenders, 2011)

"Pina" (Wenders, 2011) data and analysis is presented here with the following structure:

- Depth model observations, including points that may have come out of group discussions.
- Survey analysis of each of the S3D Depth characteristic and Likert surveys.
- Summary of the S3D depth model learning results.

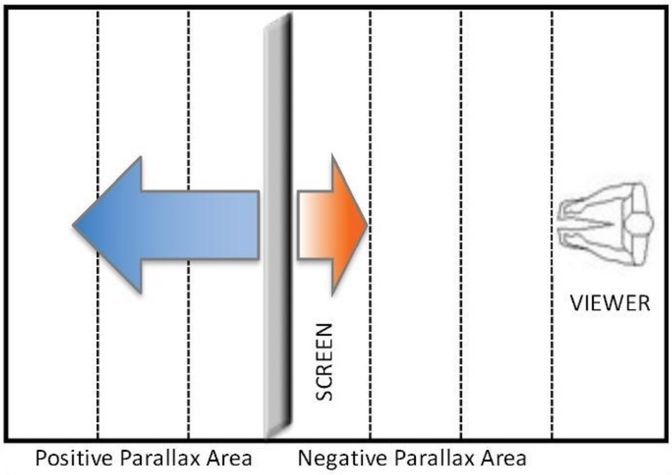
The "Combined S3D Depth Budget Graphic Survey" data for "Pina" (Wenders, 2011) for this 3rd Event suggests that very little depth space on or just in front of the cinema screen, was observed by the research participants who viewed this film. A medium amount of S3D space was observed behind the screen by these observers also. "Seamless integration with the story" was the average descriptor for the "S3D and Story Integration" code for this film with the average recorded at "1.2" (Figure 7-4). Therefore, all 3rd Event discussion group participants clearly identify this S3D film as high achieving when it comes to the S3D integration with story. For this screening of "Pina" (Wenders, 2011) the dark backgrounds and proscenium arch-styled stage setting were first talking points in the 3rd Event class discussion group. "Quite distinct 3-D. [The] Dance sequence depended on the 3-D for the forward movement in the dance. Up-front but apt application of 3-D" (Case Study-3rd Event, student #1).

Figure 7-4

Combined S3D Depth Budget Graphic Surveys (Case Study-3rd Event) for "Pina" (Wenders, 2011)

Results for: **"Pina"**

Student:	Distance behind the screen: S3D reached large distances behind the screen	S3D reached moderate distance behind the screen	S3D reached a short distance behind the screen	Distance in front of screen: S3D reached a short distance in front of the screen	S3D reached moderate distance in front of the screen	S3D reached a large distance in front of the screen	Rating of what extent S3D became a part of the story:
# 1		•		•			1
# 2		•		•			1
# 3		•		•			1
# 4		•		•			2
# 5	•			•			2
# 6		•		•			1
# 7		•		•			1
# 8		•		•			1
# 9		•		•			1
# 10	•			•			1

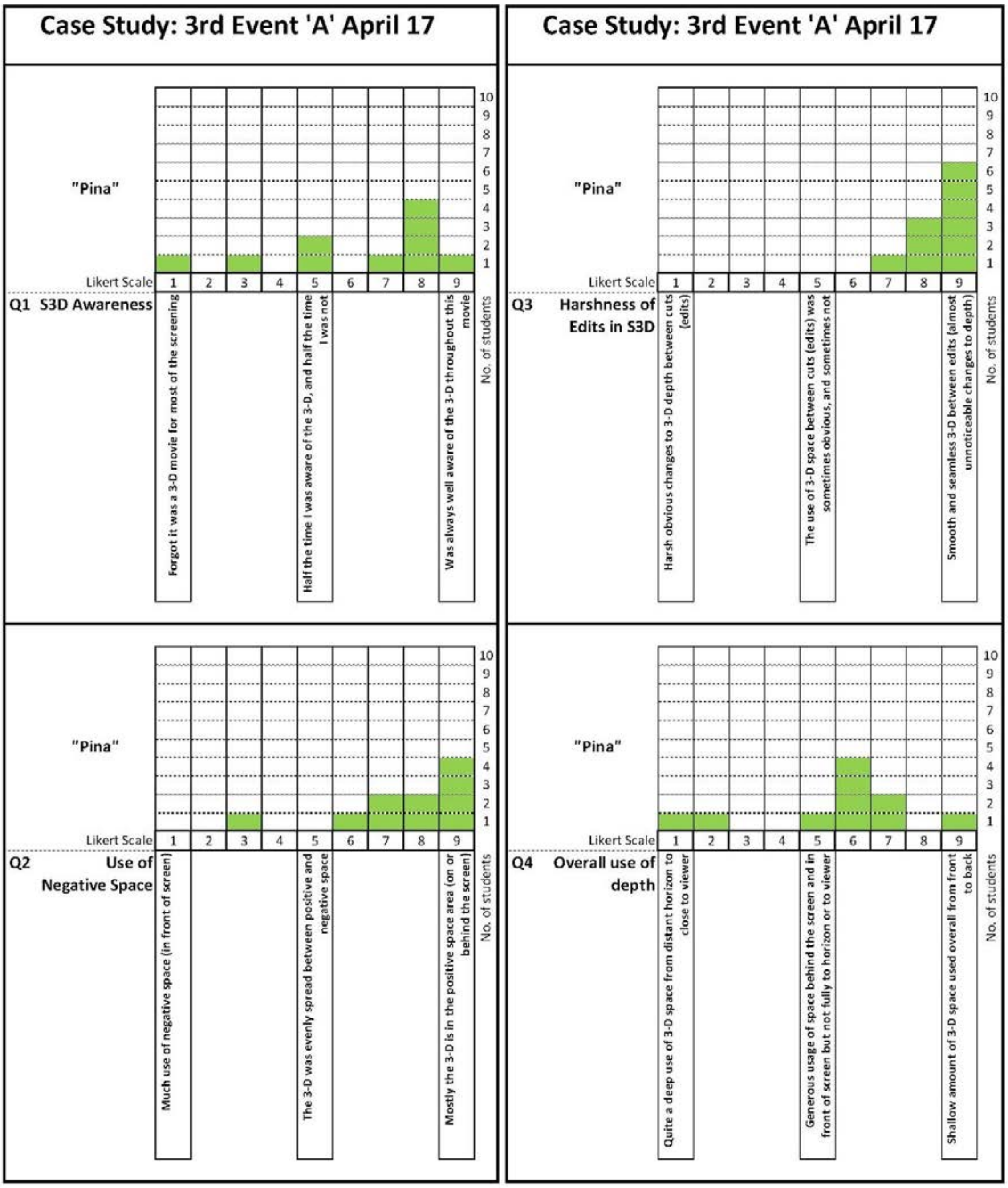


1= Seamless integration with the story
2= Not very obvious but somewhat noticeable S3D
3= Quite noticeable S3D
4= Very obvious S3D and distracting from the story
5= The S3D is broken and is unwatchable

Note. Case Study-3rd Event - Combined results from each of ten participant's observations in the S3D Depth Budget Graphic Survey, and their reading of 'Story Integration' using the codes at the bottom of the figure, after the screening of "Pina" (Wenders, 2011)

Figure 7-5

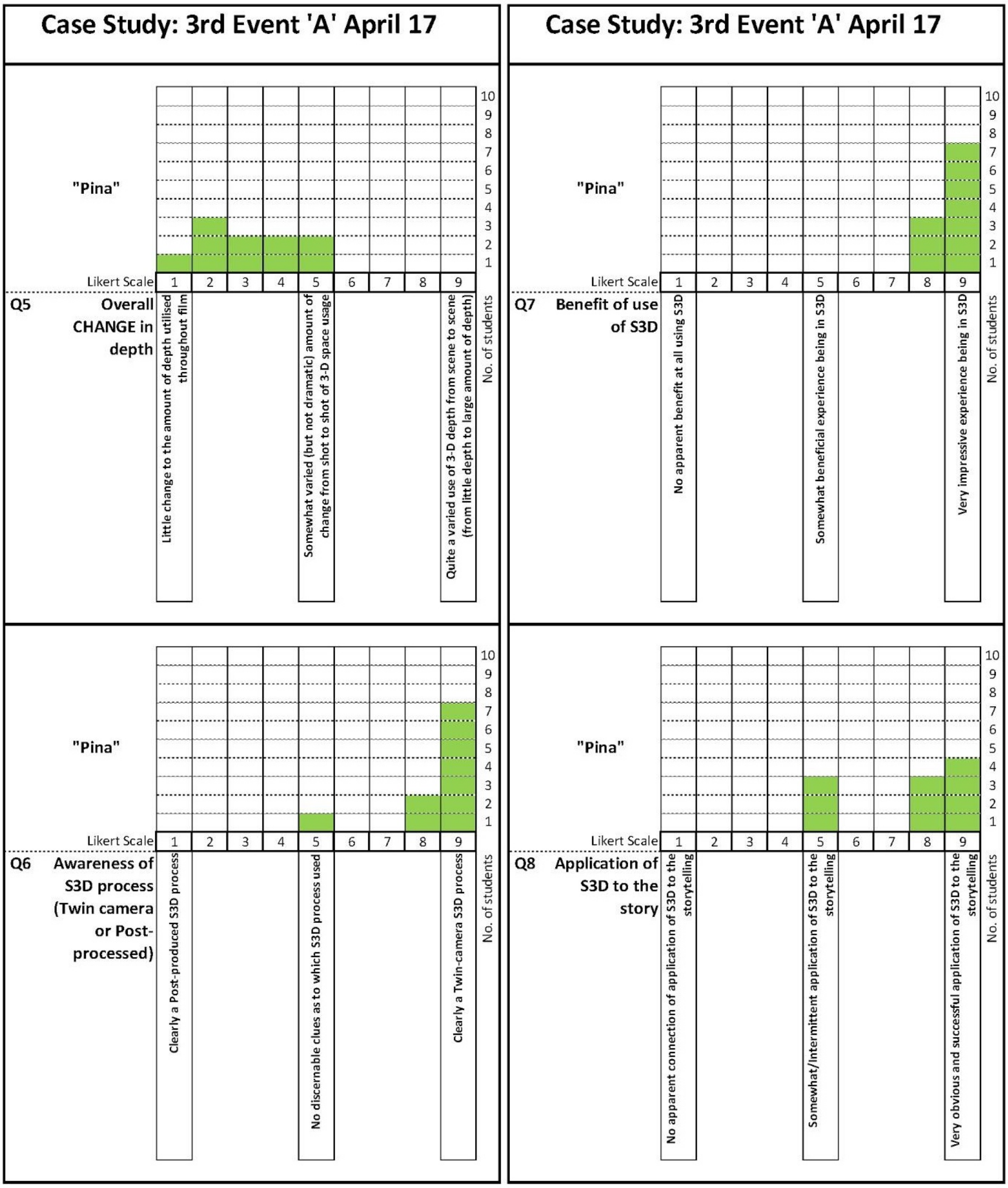
Bar Graph Compilation (Case Study-3rd Event) Likert Surveys Q1-Q4 for "Pina" (Wenders, 2011)



Note. Compilation of ten participant's results in Case Study-3rd Event surveys of Q1-Q4 for "Pina" (Wenders, 2011)

Figure 7-6

Bar Graph Compilation (Case Study-3rd Event) Likert Surveys Q5-Q8 for "Pina" (Wenders, 2011)



Note. Compilation of ten participant's results in Case Study-3rd Event surveys of Q5-Q8 for "Pina" (Wenders, 2011)

“This looked like a stage performance with the depth of the stage being the 3-D depth” (Case Study-3rd Event, student #2). “A lot of black backgrounds made the dancers pop off the 3-D screen. Dancers wearing orange costumes moving on a black background made the 3-D a part of the stage” (Case Study-3rd Event, student #3).

Another point raised in the group discussion was the fact that movement within the camera frame was enhanced, without much movement of the camera itself though. A sense of the camera being more observer than dancer was noted;

> “Completely added a sense of movement in a film about movement, but not much movement of the camera. Brightly costumed dancers on a dark background meant the 3D was up-front. Not really about story though, as the film wasn’t really a story driven film” (Case Study-3rd Event, student #5).

“The camera didn’t move like the real dancers. It was more of a spectator” (Case Study-3rd Event, student #6).

‘S3D awareness” was spread right across the Likert scale from ‘1’ to ‘9’ in the first question, similarly to the 2nd Event screening of this same film. Again, this could be attributable to the unusual premise of having the S3D be about dance on a stage, where some observers might have been either fully aware of the S3D in this unusual S3D circumstance, or unaware of it as it could be considered a part of the dance. Mostly the S3D was in the positive space, and somewhere between ‘a generous use of space’ behind the screen, and a shallow amount of 3-D space used. This could be attributed to the mostly black background removing the usual S3D reference (being the surroundings), from which the S3D is measured (visually). ‘Benefit of use’ is recorded as high with 100% of observers selecting the top two Likert scales (being on or near “Very impressive experience being in S3D”).

There was a mix of results for ‘Application of S3D to the story’, with 30% of respondents choosing midway at Likert number of ‘5’ with “Somewhat/intermittent application of S3D to the story’, and 70% indicating Likert scale number ‘9’ with ’Very obvious and successful application of S3D to the storytelling”. There is a possibility that “Pina” (Wenders, 2011) was not being seen as a “story” movie but was seen as somewhat of a documentary/art piece, in which case application to story may have seemed redundant.

7.3.1.4 Case Study-3rd Event A - Summary of Depth Model Learning Results "Pina" (Wenders, 2011)

Data from this 3rd Event screening of "Pina" (Wenders, 2011) highlights the following summarised S3D characteristics:

Table 7-2

"Pina" (Wenders, 2011) Case Study-3rd Event Depth Model Summary Results

No.	*Depth model characteristic description*
1	Black backgrounds help with the S3D effect but mindful of lack of reference.
2	Contrasting bright objects/characters on dark backgrounds helps S3D.
3	A variable but still narrow amount of positive and negative parallax space usage works well.
4	Mostly positive space used for S3D depth.
5	Very few gratuitous S3D shots coming out-of-the-screen. Creates a more subtle integration of S3D.
6	S3D camera movement is smooth and slow. Retaining a stable base.

7.3.1.5 Case Study-3rd Event A - Depth Model Learning Results "Journey to the Center of the Earth" (Brevig, 2008)

"Journey to the Center of the Earth" (Brevig, 2008) data and analysis is presented here with the following structure:

- Depth model observations, including points that may have come out of group discussions.
- Survey analysis of each of the S3D Depth characteristic and Likert surveys.
- Summary of the S3D depth model learning results.

The S3D Depth Budget Graphic Survey data (Figure 7-7) for "Journey to the Center of the Earth" (Brevig, 2008) shows the 3rd Event group's individual rating of what extent "the S3D became a part of the story". The average score for this is '3.3' which relates closest to the code descriptor "Quite noticeable" and "Very obvious S3D and distracting from the story".

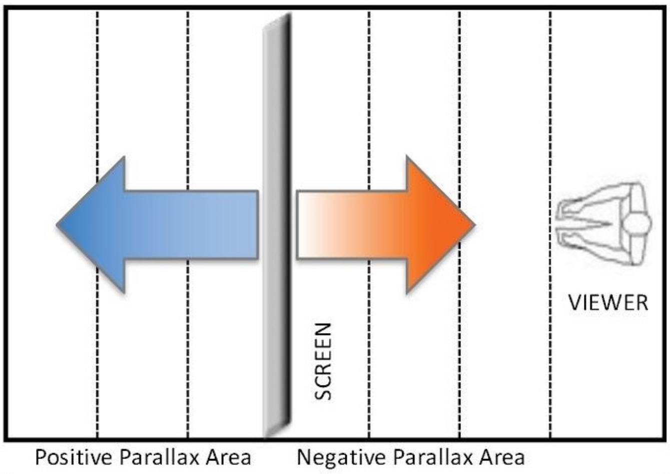
This overall impression by the 3rd Event group may well be because of the high number of 'broken' S3D shots that technically were inaccurate in their construction in the early stages of this movie. Such distracting shots can influence the overall impression of a movie, and in this case a number of positive attributes were recognised later in the film that mitigate some of these lower value scores in the "S3D and Story Integration" grid (Figure 7-7).

Figure 7-7

Combined S3D Depth Budget Graphic Surveys (Case Study-3rd Event) for "Journey to the Center of the Earth" (Brevig, 2008)

Results for: **"Journey to the Center of the Earth"**

	Distance behind the screen			Distance in front of screen			
Student:	*S3D reached large distances behind the screen*	*S3D reached moderate distance behind the screen*	*S3D reached a short distance behind the screen*	*S3D reached a short distance in front of the screen*	*S3D reached moderate distance in front of the screen*	*S3D reached a large distance in front of the screen*	*Rating of what extent S3D became a part of the story:*
# 1		•				•	**4**
# 2		•				•	**4**
# 3	•				•		**4**
# 4		•			•		**4**
# 5		•			•		**3**
# 6	•			•			**3**
# 7		•			•		**3**
# 8		•			•		**2**
# 9	•				•		**3**
# 10		•			•		**3**

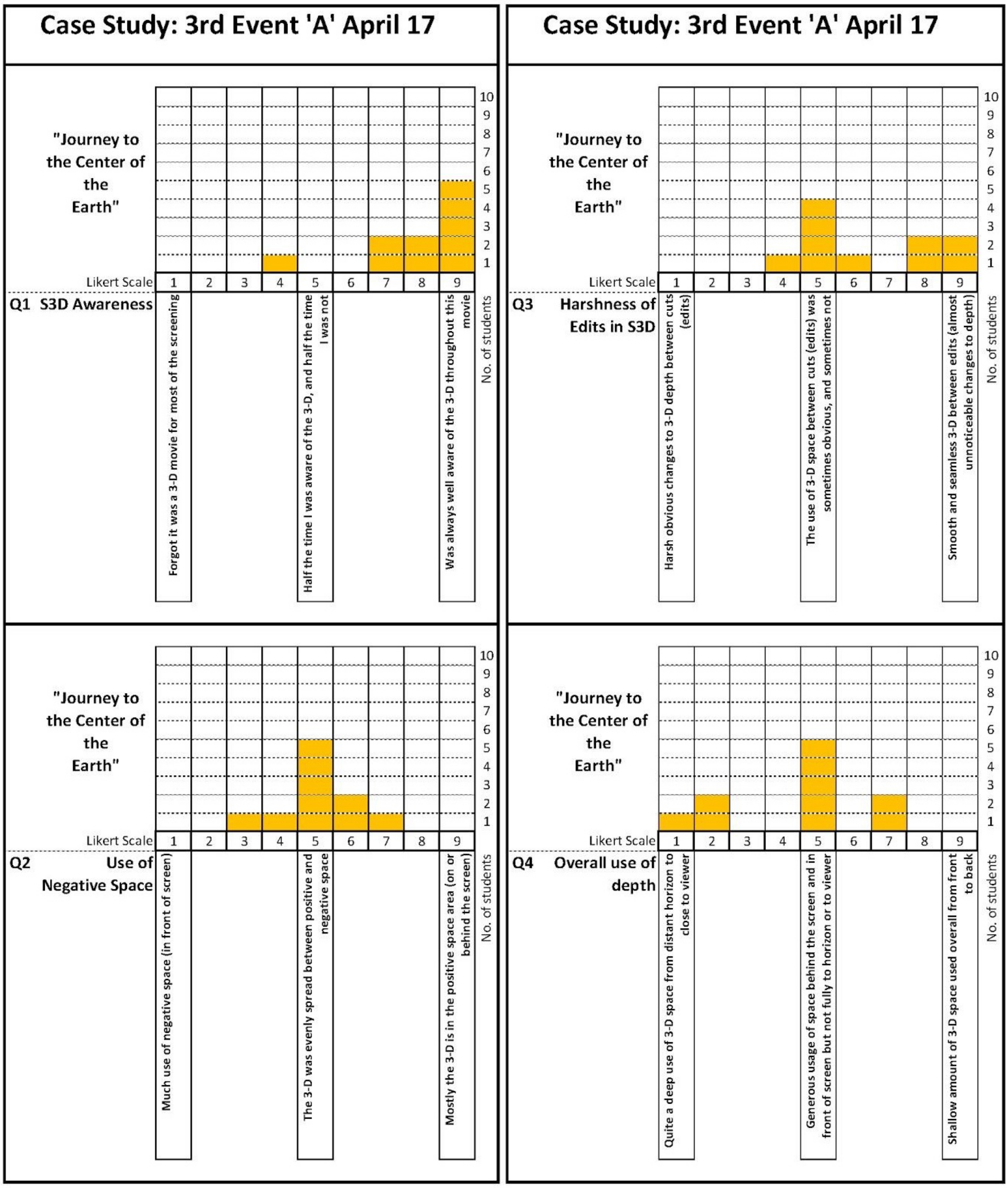


1= Seamless integration with the story
2= Not very obvious but somewhat noticeable S3D
3= Quite noticeable S3D
4= Very obvious S3D and distracting from the story
5= The S3D is broken and is unwatchable

Note. Case Study-3rd Event - Combined results from each of ten participant's observations in the S3D Depth Budget Graphic Survey, and their reading of 'Story Integration' using the codes at the bottom of the figure, after the screening of "Journey to the Center of the Earth" (Brevig, 2008)

Figure 7-8

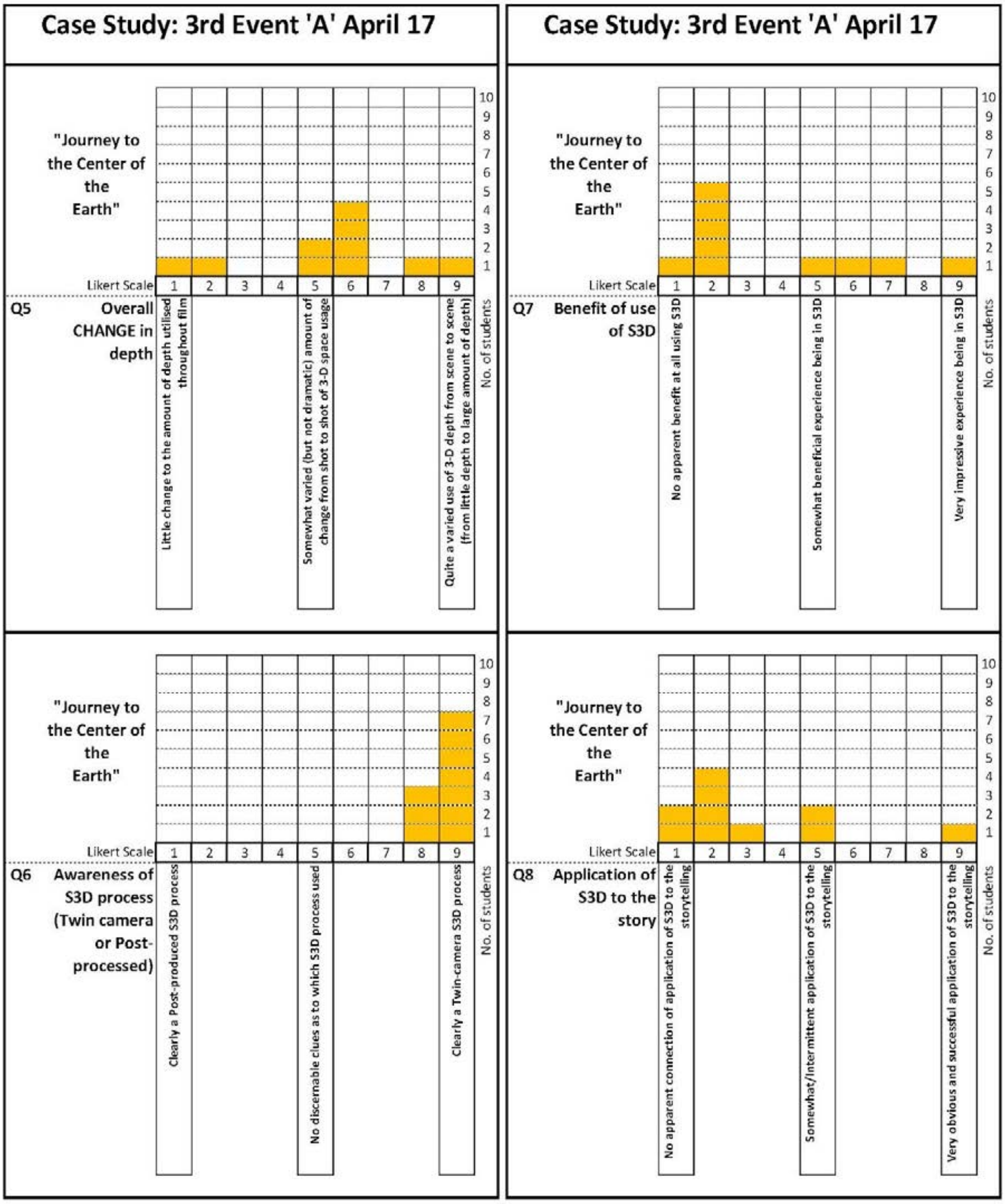
Bar Graph Compilation (Case Study-3rd Event) Likert Surveys Q1-Q4 for "Journey to the Center of the Earth" (Brevig, 2008)



Note. Compilation of ten participant's results in Case Study-3rd Event surveys of Q1-Q4 for "Journey to the Center of the Earth" (Brevig, 2008)

Figure 7-9

Bar Graph Compilation (Case Study-3rd Event) Likert Surveys Q5-Q8 for "Journey to the Center of the Earth" (Brevig, 2008)



Note. Compilation of ten participant's results in Case Study-3rd Event surveys of Q5-Q8 for "Journey to the Center of the Earth" (Brevig, 2008)

Some S3D shots were observed to reach very close to the viewer in the S3D Depth Budget Graphic Survey with 70% of observers placing the negative parallax usage at a significant level. The positive parallax space usage was also at a significant level but not shown here at extreme levels.

Student #1 from the 3rd Event group noticed that telephoto lens shots in this film did not work well in S3D. "Quite noticeable 3-D, some flattened scenes didn't look good (telephoto shots). One or two 'out of the screen' shots were spectacular but obviously for 3-D show off" (Case Study-3rd Event, student #6).

The 3rd Event group were a lot more responsive to the fact that "Journey to the Center of the Earth" (Brevig, 2008) seemed to be more about playing up the S3D as a feature unto itself, and being much less about any interest in supporting the story. Despite there being some worthy scenes where the S3D was used for good story effect in "Journey to the Center of the Earth" (Brevig, 2008), according to the participant group there were few of them compared to other films in the screening list for this research. "A lot of positive and negative parallax was used. To the point where it seemed to make the movie a 3-D showpiece rather than a film that used 3-D for better effect" (Case Study-3rd Event, student #2). "Seems like an early version of 3-D film with something to prove. [The producers] needed to show it is a 3D movie by using big 3-D tricks. Too much positive and negative parallax to be subtle" (Case Study-3rd Event, student #3).

> "[The filmmakers] didn't use it for the story particularly. Mostly wow factor 3-D elements and not identifiably adding to the story. This simple movie story (aimed at children presumably) wasn't really going to benefit from 3-D other than big action sequences like the roller coaster ride sequence with fast edits and 3-D things coming at you off the screen" (Case Study-3rd Event, student #4).

In the collected survey data, this 3rd Event group indicated that they were "always well aware of the 3-D throughout the movie", with all but one respondent indicating that they were within three Likert scale numerals of maximum awareness of the S3D. The peak responses for Question 2 saw the S3D being equally spread between positive and negative parallax space. "Generous usage of space behind the screen and in front of the screen" is the descriptor centred in the middle of the Likert scale where the average lies. For Question 7, 'Benefit of use of S3D' the observations of the 3rd Event group is spread greatly from '1' to '9' but still with a peak of 50% of respondents selecting near "No apparent benefit at all" using S3D. A similar result for "Application of S3D to the story" finds a broad spread with a peak of 40% near "No apparent connection of application of S3D to the storytelling". All of these Likert results match closely the “Combined S3D Depth Budget Graphic Survey” results (Figure 7-7) which has not been a common occurrence in this research. The Likert Survey results varied somewhat from the S3D Depth Budget Graphic Survey results for the 1st Event and the 2nd Event, with a number of similarities between them of course but some dissimilar readings intermittently. Such dissimilar results can be a result of previously mentioned first impression changes, and potentially the reduction in irregularities could be because the coursework has improved over the 1st, 2nd, and 3rd Events and so the observer’s skills in reading the S3D in these film screenings has improved.

7.3.1.6 Case Study-3rd Event A - Summary Depth Model Learning Results “Journey to the Center of the Earth” (Brevig, 2008)

Data from this 3rd Event screening of “Journey to the Center of the Earth” (Brevig, 2008)) highlights the following summarised S3D characteristics:

Table 7-3

“Journey to the Center of the Earth” (Brevig, 2008) Case Study-3rd Event Depth Model Summary Results

No.	*Depth model characteristic description*
1	Telephoto shots regularly present badly in S3D.
2	Extreme (or gratuitous) negative parallax S3D shots can distract viewers from the story .
3	Incorrectly set S3D camera geometry settings (i.e. interaxial distances or convergence angles) can create painful shots.

7.3.2 Case Study-3rd Event B – Depth Model Learning Results

The 3rd Event ‘A’ film titles produced a set of S3D modelling possibilities based on animations, brave creative S3D choices, genre contrasts, and new S3D productions, by once again highly respected filmmakers who were taking a turn at 3-D. The 3rd Event ‘B’ screenings garnered quite positive reactions from the research participants after a four-month break. This period of time of four months between the S3D ‘Event’ screenings found these participants had solidified their understanding, and as a result confirmed their observations when presented to them. Particularly with “The Martian” (Scott, 2015) as this film was screened again for these participants in the ‘B’ series of S3D screenings. Their understanding was much more confident with comments like:

> “A very easy film to watch again in 3-D. Much easier than a number of the [3-D] films I’ve seen. The 3-D integration with the [film’s] plot seems much more convincing now that I’ve seen lots [of 3-D films] that don’t” (Case Study-3rd Event B, student #3).

"Tron: Legacy" (Kosinski, 2010) was one of the 3rd Event 'B' screening titles that significantly used S3D to punctuate the story. Quite large depth space usage was implemented when the film's characters were inside the computer, in stark contrast with the lack of S3D depth space usage when these characters were in the real world. Such severely used S3D made bold statements about the use of 3-D to benefit story, but with these 'B' screening research participants they exhibited a stronger sense of the benefit of the use of S3D story more subtly than was used in "Tron: Legacy" (Kosinski, 2010): "Self-aware sequences of 3-D between block sequences of straight 2D [in "Tron: Legacy" (Kosinski, 2010)]. Overall very big but effective use of 3-D for story. I prefer [watching] 3-D that I'm not aware of though" (Case Study-3rd Event B, student #1).

7.3.3 Case Study-3rd Event - Curriculum Resource Learning Results

After this third delivery of the "Intro to S3D" course in April 2017, feedback on the course and the course's delivery itself was again sourced from the 3rd Event participants via a survey completed after the course finished. Feedback data was also sourced from observations made by the researcher during the class delivery sessions. This feedback and broader observations were recorded by the researcher throughout the "Intro to S3D" course sessions, and were fed by discussions from the class sessions where it reflected the students' academic experience in the course. Feedback was also sought from education professionals (instructional designers) who work with current learning management systems.

This April 2017 Case Study-3rd Event delivery had now evolved from a predominantly slide deck-based presentation to a more blended delivery where pre-class requirements of online film viewings, required readings, etc. were combined with the face-to-face delivery. Attendance was 100% for all participants for all sessions except for two students who could not attend one of the set screening sessions. Both students however, were able to catch up the missed film screenings within 24 hours of the scheduled sessions. All feedback from these two participants was taken in the presence of other students in the class who were able to participate in this extra discussion so that the two students did not have a singular discussion experience.

The collected feedback from the surveys on the Grammar model as a learning resource aspect of this research was again taken from the end-of-course written surveys that were completed by all students. Responses to the Case Study-3rd Event group questions from the S3D Coursework Survey feedback are organised in the following tables. Here are the results from the survey for Question 1:

Table 7-4

Question 1 from S3D Coursework Survey

Q.1	With the "Intro to S3D" course structured in 5 parts: 1. Brief History of Stereoscopic 3-D 2. S3D Theory (How It Works) 3. S3D Screening and Discussion 4. S3D Techniques & Benchmarks 5. S3D Storyboarding & S3D Into the Future were there any of these sectors that you consider to be instrumental in your understanding of the potential of S3D to help tell the story?

Table 7-5

Question 1 Responses from Case Study-3rd Event S3D Coursework Survey

Student No.	*Student comment*
Student #1:	*The storyboard lesson made a big difference to my understanding of the 3D placement.* *Watching the 3D films in a room of people who were also learning the 3D concepts and talking with them about how good it was or not brought all the 3D concepts together.*
Student #2:	*All of it.* *History of 3D films could come later once I knew more about how 3D works. Was boring at the beginning of the course.*
Student #3:	*Discussion during the film screenings made it easier to identify important 3D plusses and minuses. S3D Techniques and Benchmarks session worked as a good summary of 3D points so was instrumental in me knowing what to look for in the film screenings.*
Student #4:	*All classes were good.*
Student #5:	All sessions were instrumental in the learning. *1. Brief history of Stereoscopic 3-D* *This was interesting. Might be better placed later on in the 5 sessions when the 3D quality of early 3D films is understood more.* *2. S3D Theory* *Great knowledge learnt here. There is a lot at one time though. A busy session.* *3. S3D Screening and Discussion* *Fantastic. Got to see what works and doesn't for myself.* *4. S3D Techniques and Benchmarks* *Excellent overview of best 3D techniques. Best examples of 3D films* *5. S3D Storyboarding & S3D Into the Future* *3D Storyboards make it easy to design 3D in theory. VR in the future interesting.*
Student #6:	*Week 2 Theory section for learning how 3-D works best.*
Student #7:	*S3D Screenings and S3D Storyboard sectors gave best understanding of 3D.*
Student #8:	*All five areas were valuable as each other. Each needed to be there.*
Student #9:	*Screenings is where got the most understanding of 3D. Theory was not interesting until the screenings had 3D make sense.*
Student #10:	*The S3D Theory was hard to follow but made more sense after the 3D Screenings.* *The demonstration of how the 3D changes with adjustments in real time on Powerpoint made the Theory make sense instantly.*

Question 1 responses in the Case Study-3rd Event Survey (Table 7-5) showed an improvement over the 1st and 2nd Event group's responses to the heavy content load of the S3D Theory. The delivery for the 3rd Event had much of the S3D Theory available as online viewable S3D screenings using anaglyph (red/blue) glasses. There were also articles on S3D historical timelines that were made available for students between the face-to-face sessions.

Table 7-6

Question 2 from S3D Coursework Survey

Q.2	With your prerequisite understanding of the physics of how a film is made (i.e. aspects of cinematography, or sound design, or production design that inform a film's "story"), how has your consideration of Stereoscopic 3-D's effect on story changed from when you started this "Intro to S3D" course?

Table 7-7

Question 2 Responses from Case Study-3rd Event S3D Coursework Survey

Number of respondents	*Level of influence S3D has on story:*
4	"...I think that S3D has only a **slight** influence on story when compared to the sound design, production design, etc. effect on story…"
6	"...I think that S3D has roughly the **same** amount of influence on story when compared to the sound design, production design, etc. effect on story…"
0	"...I think that S3D has significantly **more** influence on story than the influence of sound design, production design, etc. on story…"

Table 7-8

Question 2A from S3D Coursework Survey

Q.2A	With your prerequisite understanding of the physics of how a film is made (i.e. aspects of cinematography, or sound design, or production design that inform a film's "story"), how has your consideration of Stereoscopic 3-D's effect on story changed from when you started this "Intro to S3D" course?

Table 7-9

Question 2A Responses from Case Study-3rd Event S3D Coursework Survey

Number of respondents	*Whether my opinion on how much effect S3D has on story HAS CHANGED since doing this "Intro to S3D" coursework:*
8	"My opinion on how much effect S3D has on story HAS CHANGED since doing this "Intro to S3D" coursework"
2	"My opinion on how much effect S3D has on story HAS NOT CHANGED since doing this "Intro to S3D" coursework"

Here are the results from the surveys for the Question 2 section, where participants added comments if they wished as to whether their view on S3D's effect on story had changed since beginning the "Intro to S3D" course:

Table 7-10

Question 2 Comments from Case Study-3rd Event S3D Coursework Survey

Student No.	*Student comment*
Student #1:	*3D can have an influence on story or not. For film storytelling using cinematography or editing works so 3D should work for story too. Many 3D films don't use the 3D for story but is fine for selling tickets to 3D movies.* *My opinion has changed since doing this course in the AMOUNT of influence 3D can has on story. Much more than I thought.*
Student #2:	*3D influence on story is possible but probably not as strong an influence as usual ways with camera, editing. I always thought 3D's effect on story was possible, just under used.*
Student #3:	*Less influence than lighting or sound.*
Student #4:	*There's no reason 3D can't be same as cinematography or art direction as part of the film's meaning. In this course I saw more 3D films that had 3D addition to the story than ever before.*
Student #5:	*Didn't understand the potential for 3D to be for anything other than thrill ride shots until I did this course.*
Student #6:	*No response.*
Student #7:	*Much more awareness now of what 3D can do to work as a part of the movie not just as an extra to the movie.* *Before this course I didn't think that 3D would work well with only a little bit of 3D used but it does work well as in Rogue One.*
Student #8:	*Some 3D films viewed had the 3D boost the plot by stretching the 3D space then reducing it where needed. This is like when cinematography choice of lights and colour grade boosts a film's plot.*
Student #9:	*3D has some impact on story but not as much as cinematography, sound, or production design yet.*
Student #10:	*Can now see that creative 3D affects story. Didn't know about it before course. Many 3D films I've never heard of.*

This set of responses to Question 2 indicates that 80% of respondents were previously unaware of the potential for S3D to affect the storytelling.

Table 7-11

Question 3 from S3D Coursework Survey

Q.3	After viewing the listed S3D films as a component of the "Intro to S3D" course, were there any particular S3D films that provided any "aha" moments for you regarding application to story? If so can you identify which moments or scenes specifically made an impression on you as to S3D's impact on telling the story?

Table 7-12

Question 3 Responses from Case Study-3rd Event S3D Coursework Survey

Student No.	*Student comment*
Student #1:	*Pina was different using the dancer's stage space for 3D distance. Rogue One for mild 3D giving the heroes more depth without distracting the story.*
Student #2:	*Yogi Bear aha moment of being the same 3D all the way through, it's an aha moment in a negative way. Rogue One aha moment when 3D fills out dark spaces in small spacecraft. Realising the 3D doesn't have to be emphasised to work well in a movie.*
Student #3:	*The dance film 'Pina' had amazing use of 3D with moving dancers on dark stage. Didn't know 3D could work so well.*
Student #4:	*Some scenes in Journey to the Centre looked too much 3D. Good to avoid these.*
Student #5:	*When "Rogue One-Star Wars" used 3D without being noticeable. Aha moment.*
Student #6:	*"PINA" with use of space in 3D. All the scenes on the dance stage.*
Student #7:	*"Rogue One Star Wars had small amount of 3D yet looked very good and helped the story.*
Student #8:	*"Hugo" opening shot flying into Paris train station was great. "Pina" was unusual use of 3D that worked great. Rogue One aha moment as a dark film where the 3D created space in the dark*
Student #9:	*"Pina" had impact with the 3D of dancers on a stage. "Rogue One" had impact through low use of 3D. "Journey to Centre…", "Hugo", and "Yogi Bear" didn't make much "aha" impact.*
Student #10:	*All were good 3D. "Journey…" had more 3D and "Star Wars Story" less 3D but more impressive.*

Question 3 on the survey asked whether there were any particular S3D films that provided any "aha" moments regarding application to story? This question was designed by the researcher to find if any particular applications of S3D had been recognised by the participants as breaking away from the more common practice of just using 3-D for wow-factor shots.

From this Question 3 summary, most of these 3rd Event films had a strong moment of S3D recognition by the course participants. "Pina" (Wenders, 2011) and "Rogue One-A Star Wars Story" (Edwards, 2016) particularly had significant effects on the participants with impressive and original use of S3D.

Table 7-13

Question 5 from S3D Coursework Survey

Q.5	Which aspects of the "Intro to S3D" course do you think worked well in your learning?

Table 7-14

Question 5 Responses from Case Study-3rd Event S3D Coursework Survey

Student No.	*Student comment*
Student #1:	*In-class demo of 3D when changing camera setup and using 3D glasses made me see how 3D really works.* *2D depth techniques and how big a part they play in 3D.* *Analysing lots of 3D films shown in great quality in a group.*
Student #2:	*Seeing the change in 3D on the lecture theatre screen in real time. This demonstration made it easy for me to understand what controls 3D.* *Being able to come in and watch 3D movies on my own between weekly classes helped me apply the theory outside of the sessions.*
Student #3:	*The theory section and the actual movie watching sessions with the group.*
Student #4:	*Section on visual adjustment of 3D on the classroom screen showed best how to create proper 3D. Brought the theory together.*
Student #5:	*All aspects but group discussions. screenings. and storyboarding I learnt a lot in.*
Student #6:	*Combination of watching films in the class and matching the 3-D theory during watching of the films.*
Student #7:	*The high definition movie screenings made it fun and better quality 3D than at the cinema.*
Student #8:	*The screenings with discussions worked well for my learning. Watching the class sessions with 3D glasses to see how the 3D changes with camera settings worked well.*
Student #9:	*The group of students I was in the class with made for good discussions in screenings and so the learning was better for me.*
Student #10:	*It was difficult to follow. Much to take in.* *Watch films and talking about them made it better.*

Table 7-15

Question 6 from S3D Coursework Survey

Q.6	Which aspects of the course could be improved upon and why?

Table 7-16

Question 6 Responses from Case Study-3rd Event S3D Coursework Survey

Student No.	*Student comment*
Student #1:	*Watching 3D films put theory to practice but having time to try it with 3D cameras for myself would be good.*
Student #2:	*A longer course. Or an advanced course to do after this first course where we shoot something in 3D.* *Have a guest lecturer who has shot a 3D movie.*
Student #3:	*A web version of the course so I can go over what I learnt each week. Also availability of 3D films to watch between weeks*
Student #4:	*The course was just the right size for me nothing else needed.*

Student No.	Student comment
Student #5:	*Longer course if possible.*
Student #6:	*If I could watch 3-D films at home between sessions.*
Student #7:	*This course is good. A second advanced course next?*
Student #8:	*More 3D screenings if there was time.*
Student #9:	*Being able to watch 3D movies at home in my own time. More sessions for more detail in each session*
Student #10:	*Slower. More revision would help me.*

Table 7-17

Question 7 from S3D Coursework Survey

Q.7	Could any of the 5 sectors be elaborated upon in the coursework for clearer learning? If so, please describe:

Table 7-18

Question 7 Responses from Case Study-3rd Event S3D Coursework Survey

Student No.	Student comment
Student #1:	*Access to 3D movies online to watch in my own time.*
Student #2:	*No.*
Student #3:	*All of it could be a much longer course with more time to concentrate on each section. The areas covered were good for a first introduction to 3D. More experience with an actual 3D camera would be good maybe.*
Student #4:	*No it was very clear for me.*
Student #5:	*Benchmarks section make longer for more 3D examples. Maybe two sessions for this not one.*
Student #6:	*More 3-D homework between weekly classes.*
Student #7:	*No.*
Student #8:	*Add more sessions and shoot a 3D scene.*
Student #9:	*All sectors being online for revision. More sessions with the same content and room for more film viewings.*
Student #10:	*Summary for each sector for revision.*

Table 7-19

Question 8 from S3D Coursework Survey

Q.8	Are there any of the 5 sectors in the coursework that you think should be reduced for any reason? Please describe:

Table 7-20

Question 8 Responses from Case Study-3rd Event S3D Coursework Survey

Student No.	*Student comment*
Student #1:	*Less S3D Theory in one hit. Spread over more lessons.*
Student #2:	*No.*
Student #3:	*No. More please.*
Student #4:	*5 sessions is perfect. No reductions needed.*
Student #5:	*No.*
Student #6:	*No smaller than it already is.*
Student #7:	*Make it 6 classes not 5 and split the Theory session into two sessions. It's heavy in one session.*
Student #8:	*Don't reduce any of it.*
Student #9:	*Not long enough as it is.*
Student #10:	*Not reduced. Just slower would be good.*

7.4 Case Study-3rd Event Conclusions

Conclusions from this 3rd Event of the single case study on the two primary aspects of this research are listed below. Having come to the 3rd Event there was now a commonality that can be formally attributed to some of the findings as Yin had described (2014). The Depth Model conclusions from this 3rd Event are tabled here, followed by the summary observations from the data gathered for a refined curriculum resource.

7.4.1 Depth Model Conclusions from Case Study-3rd Event A

By combining the results from the Depth Model feedback, surveys, and group discussions a series of refined characteristics of good S3D practice emerged. A number of these S3D characteristics were common to some of the data sourced from previous Events but here are the distilled 3rd Event points from the data collected:

1. Telephoto lens shots regularly present a cardboard cut-out look that is unconvincing.
2. Extreme (in-your-face) gratuitous negative parallax shots generally distract from story.
3. Painful shots due to incorrect setting of S3D camera geometry (i.e. interaxial distances or convergence angles) need to be precluded from finished films.
4. Narrow depth of field shots if only slight DOF embellishes S3D.
5. 2D Depth Cues boost S3D considerably.
6. Dark backgrounds and high key character lighting delineates S3D.

In consideration of the Depth Model analysis results from this 3rd Event group, these conclusions have been added to the specific characteristics from all the Case Study Events in this research, to help define an S3D model for future S3D production. By looking at the 3rd Event's grammar model results using structuralist and formalist film theory the depth model attributes easily again compliment the storytelling techniques in the same way that they were understood by the film theorists in the 20th century (Buckland, 2004). The manipulation of the film image to project a more enhanced story being told, works within these structuralist/formalist guidelines because there are no distinctions between 2D and S3D imagery when it comes to such manipulation. The mise-en-scene grouping of 'whatever is in the frame is there to help tell the story', applies to S3D too (Monaco, 2000). In this 3rd Event, an example of such structuralist/formalist theory at work is in the film "Rogue One-A Star Wars Story" (Edwards, 2016). Here the physical distances between characters are often reflective of alliances and relationships, and the S3D in this film exemplifies these relationships through S3D-enhanced distances. Such embellishment using S3D, specifically connects with formalist film theory principles to magnify and enhance the cinematic story.

In further regard to realist film theory, being topical in the early 20th century, S3D has been interpreted as being immersive by nature and so this can be applied to S3D productions that emulate reality rather than embellish it. This distinction between realism and structuralism/formalism conceivably differs only in the amount of S3D characteristics being employed in its production. Just as the difference between a realist film and a formalist film can't be separated by the fact that a camera is likely to have been used for both, it is the same as the difference between a realist film and a formalist film not being able to be separated by the fact that S3D may have been used in both. It is simply more to the point, in what *way* was the camera or S3D used in each.

The literature review for this research study discusses the fact that the existence of any previous S3D grammar models was not especially forthcoming with many S3D publications dealing with issues other than that of this research. However, the publications that did recognise the potential for an S3D grammar model mostly stopped short of suggesting or improving upon such a model and instead recognised the need, or at least the potential for one. More harshly presented viewpoints by industry professionals of there being any benefit at all to the existence of S3D, is now a more easily opposed standpoint with these results. The fact that the results from all three Events in this research overwhelmingly suggested a strong model of S3D grammar recognised by film students, must clearly prove that the grammatical utilisation of S3D in cinema is not as negative as Roger Ebert says of S3D as having no future fiscally (Ebert, 2010, p. 1) or as Walter Murch believes that it destroys the immersive concept (Murch, 2010, p. 1). The comparison used earlier in this thesis of the initially negative reception to the introduction of sound, or the introduction of colour to cinema in the early 20th century, proves by its current importance in cinema, that S3D has at least as much potential for widespread inclusion in filmmaking.

7.4.2 Curriculum Resource Conclusions from Case Study-3rd Event

In regard to the S3D Grammar model as a learning resource from this Case Study-3rd Event, the following grammar points were identified for inclusion in the new course model to improve future S3D industry knowledge and storytelling:

1. More teaching content was replicated from the face-to-face delivery materials to online accessible slide-deck presentations as revision to face-to-face classes as well as flipped classroom content for upcoming classes.
2. Inclusion of more short S3D clips to the face-to-face class content due to the success of learning from the group discussions.
3. Have at least two S3D films viewed by course students prior to the S3D Theory sessions.
4. Within the in-class screenings play S3D exemplars and stop at points to discuss exemplar moment recognition, and how it relates to the story.

7.4.3 Comparison of Case Study-1st, 2nd, 3rd Events

With having two S3D titles appearing in three of the Events run for this research project over an eighteen-month period, there is an added advantage in comparing all three sets of results. These learning results are in the form of S3D characteristics that have been observed to be constructive to building an S3D model, or detrimental to the building of an S3D model as the case may be. However, these Likert graphs also serve as a comparison of learning if the data results from each instance of film screening is looked at in terms of increased learning. If there is a deemed change in the reading of the film's attributes in the latter Events then it stands to reason that this potentially is a result of the refinement of the S3D Grammar as a resource for the "Intro to S3D" coursework delivered over the eighteen-month period.

The participants in each Event were made up of a different group of ten students each time, and the coursework and screenings were delivered in the same Auditorium with large screen S3D projection facilities, as well as high quality S3D 4K LED screening facility using polarised glasses. All research used the same survey questions for each group over the eighteen-month period.

7.4.3.1 Comparison of Case Study-1st, 2nd, 3rd Events - Learning Comparison Results - "Journey to the Center of the Earth" (Brevig, 2008)

Below are the Likert graph results for all three of the "Journey to the Center of the Earth" (Brevig, 2008) observations run over an eighteen-month period in the 1st, 2nd, and 3rd Events as a part of this single Case Study (Figures 7-11, 7-12, 7-13, and 7-14). By comparing all three results one question at a time, a clear view is formed on the differences between observations of the three groups of "Intro to S3D" course participants.

"Journey to the Center of the Earth" (Brevig, 2008) was screened at or near the end of each of the "Intro to S3D" course instances, and so the knowledge learned from the course content was near complete and equivalent for all 1st, 2nd, and 3rd Event screening participants. In this way a fair comparison of the S3D observations was made based on each subsequent Event group having undertaken the most recently revised version of the "Intro to S3D" course. Even though this comparison uses S3D Depth Model characteristics of a specific film as a source, this comparison also reflects any change in learning of the three groups, and so may inform the evolution of the curriculum rather than initially seeming to reflect depth model changes.

The first survey completed by participants in this research for each Event was the S3D Depth Budget Graphic Survey, and for all three Events for "Journey to the Center of the Earth" (Brevig, 2008) these surveys also showed corresponding patterns of similarities and differences over the time period (Figure 7-10). It is important to remember that these S3D Depth Budget Graphic Surveys were completed by each participant either during or directly after the screening of, in this case, the film "Journey to the Center of the Earth" (Brevig, 2008). This side-by-side comparison however, highlights greater differences between the 2nd Event results, than the 1st and 3rd Event results.

The 1st and 3rd Event results are quite similar in that the participants recognised a medium amount of negative parallax reaching out to them in the audience, whilst the 2nd Event respondents recognised a lesser amount of negative parallax space being used for the most part. This might at first glance be attributable to an expected normal variation between participants, except that each group otherwise had a distinctive leaning within each group to mostly a similar observation. Therefore, such little variation within each group indicates that the difference between whole groups is unlikely to be attributable to "normal" variation levels.

Another possibility for this relatively significant change in the 2nd Event group's average perception of negative parallax space usage, may be because of one S3D element pointed out by the researcher to these groups.

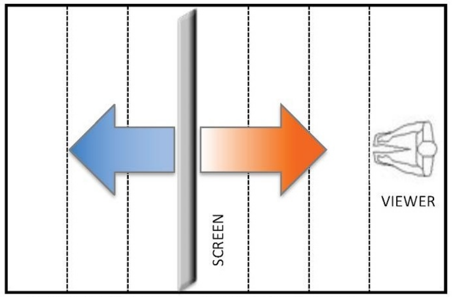
Figure 7-10

Comparison of all three Events' S3D Depth Budget Graphic Surveys for the same S3D film: "Journey to the Centre of the Earth" (Brevig, 2008)

1st Event

Results for: **"Journey to the Center of the Earth"**

	Distance behind the screen: S3D reached large distances behind the screen	Distance behind the screen: S3D reached moderate distance behind the screen	Distance behind the screen: S3D reached a short distance behind the screen	Distance in front of screen: S3D reached a short distance in front of the screen	Distance in front of screen: S3D reached moderate distance in front of the screen	Distance in front of screen: S3D reached a large distance in front of the screen	Rating of what extent S3D became a part of the story:
Student: # 1		•				•	3
# 2		•			•		2.5
# 3		•				•	4
# 4		•			•		3
# 5		•			•		3
# 6		•			•		3.5
# 7		•			•		2.5
# 8		•			•		2
# 9		•			•		2.5
# 10		•			•		2.5



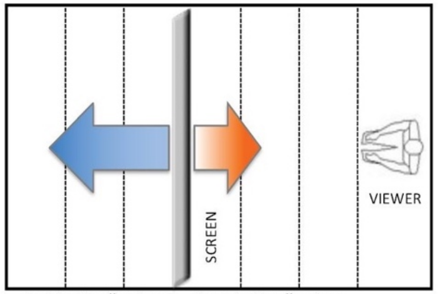
Positive Parallax Area   Negative Parallax Area

1= Seamless integration with the story
2= Not very obvious but somewhat noticeable S3D
3= Quite noticeable S3D
4= Very obvious S3D and distracting from the story
5= The S3D is broken and is unwatchable

2nd Event

Results for: **"Journey to the Center of the Earth"**

	Distance behind the screen: *S3D reached large distances behind the screen*	Distance behind the screen: *S3D reached moderate distance behind the screen*	Distance behind the screen: *S3D reached a short distance behind the screen*	Distance in front of screen: *S3D reached a short distance in front of the screen*	Distance in front of screen: *S3D reached moderate distance in front of the screen*	Distance in front of screen: *S3D reached a large distance in front of the screen*	*Rating of what extent S3D became a part of the story:*
Student: # 1		•				•	**4**
# 2		•				•	**3**
# 3		•				•	**3**
# 4		•		•			**1**
# 5		•		•			**2**
# 6		•		•			**2**
# 7		•		•			**2**
# 8	•			•			**1**
# 9	•			•			**1**
# 10	•			•			**1**



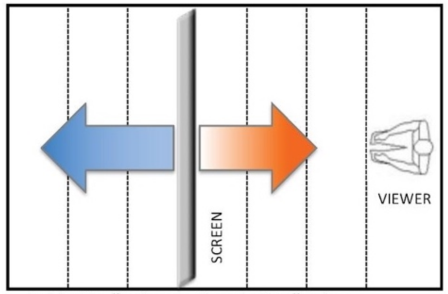
Positive Parallax Area   Negative Parallax Area

1= Seamless integration with the story
2= Not very obvious but somewhat noticeable S3D
3= Quite noticeable S3D
4= Very obvious S3D and distracting from the story
5= The S3D is broken and is unwatchable

3rd Event

Results for: **"Journey to the Center of the Earth"**

	Distance behind the screen: *S3D reached large distances behind the screen*	Distance behind the screen: *S3D reached moderate distance behind the screen*	Distance behind the screen: *S3D reached a short distance behind the screen*	Distance in front of screen: *S3D reached a short distance in front of the screen*	Distance in front of screen: *S3D reached moderate distance in front of the screen*	Distance in front of screen: *S3D reached a large distance in front of the screen*	*Rating of what extent S3D became a part of the story:*
Student: # 1		•				•	**4**
# 2		•				•	**4**
# 3	•				•		**4**
# 4		•			•		**4**
# 5		•			•		**3**
# 6	•			•			**3**
# 7		•			•		**3**
# 8		•			•		**2**
# 9	•				•		**3**
# 10		•			•		**3**

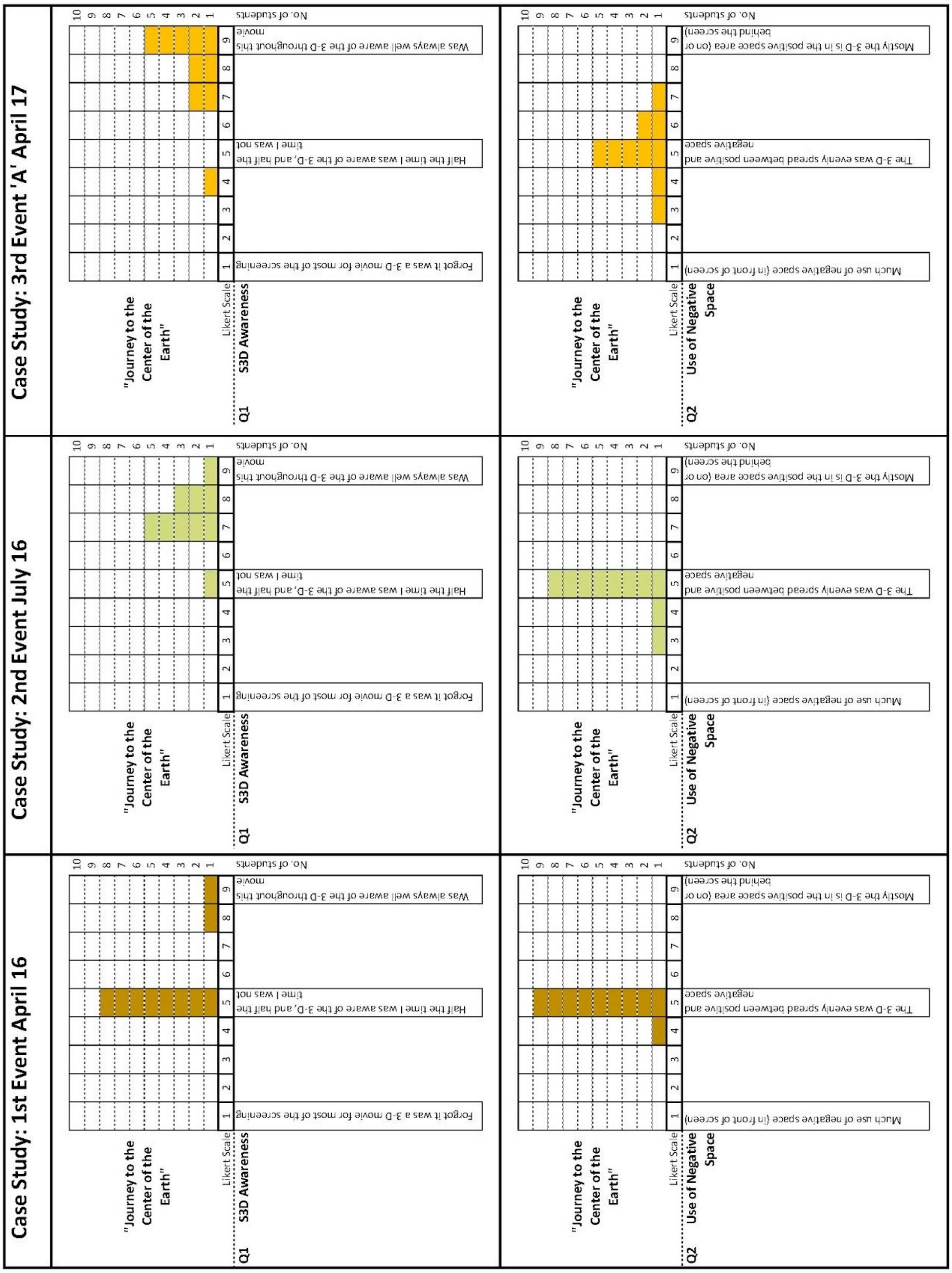


Positive Parallax Area   Negative Parallax Area

1= Seamless integration with the story
2= Not very obvious but somewhat noticeable S3D
3= Quite noticeable S3D
4= Very obvious S3D and distracting from the story
5= The S3D is broken and is unwatchable

Figure 7-11

1st, 2nd, and 3rd Events' Bar Graph Compilation Likert Surveys Q1-Q2 for Results Comparison of "Journey to the Center of the Earth" (Brevig, 2008)



Note. Compilation of ten participant's results in each of the 1st, 2nd, and 3rd Event surveys for "Journey to the Center of the Earth" (Brevig, 2008). A comparison here of Q1 and Q2 results over all three events.

As facilitator of all three courses over the eighteen-month period, discussions were had with each group about individual S3D films' characteristics. One of the significant aspects of the film "Journey to the Center of the Earth" (Brevig, 2008), was the intermittent poking objects in the face particularly in the beginning 15 minutes of this film. If such a point was made at the time of the group's discussion it is conceivable that this highlighted the obtuse usage of negative space in that film. The fact is though, that for most of this film the S3D was held back from too much of that negative space usage of poking in the faces of the viewers. So, it is quite likely that because the beginning of "Journey to the Center of the Earth" (Brevig, 2008) had this handful of obtrusive S3D shots, this 2nd participant group may well have judged the whole film to be reflective of these early S3D characteristics – particularly as these early S3D shots were made a point of by the facilitator (researcher) in this 2nd Event screening, and was not highlighted as much during the 1st nor 3rd Event's screenings.

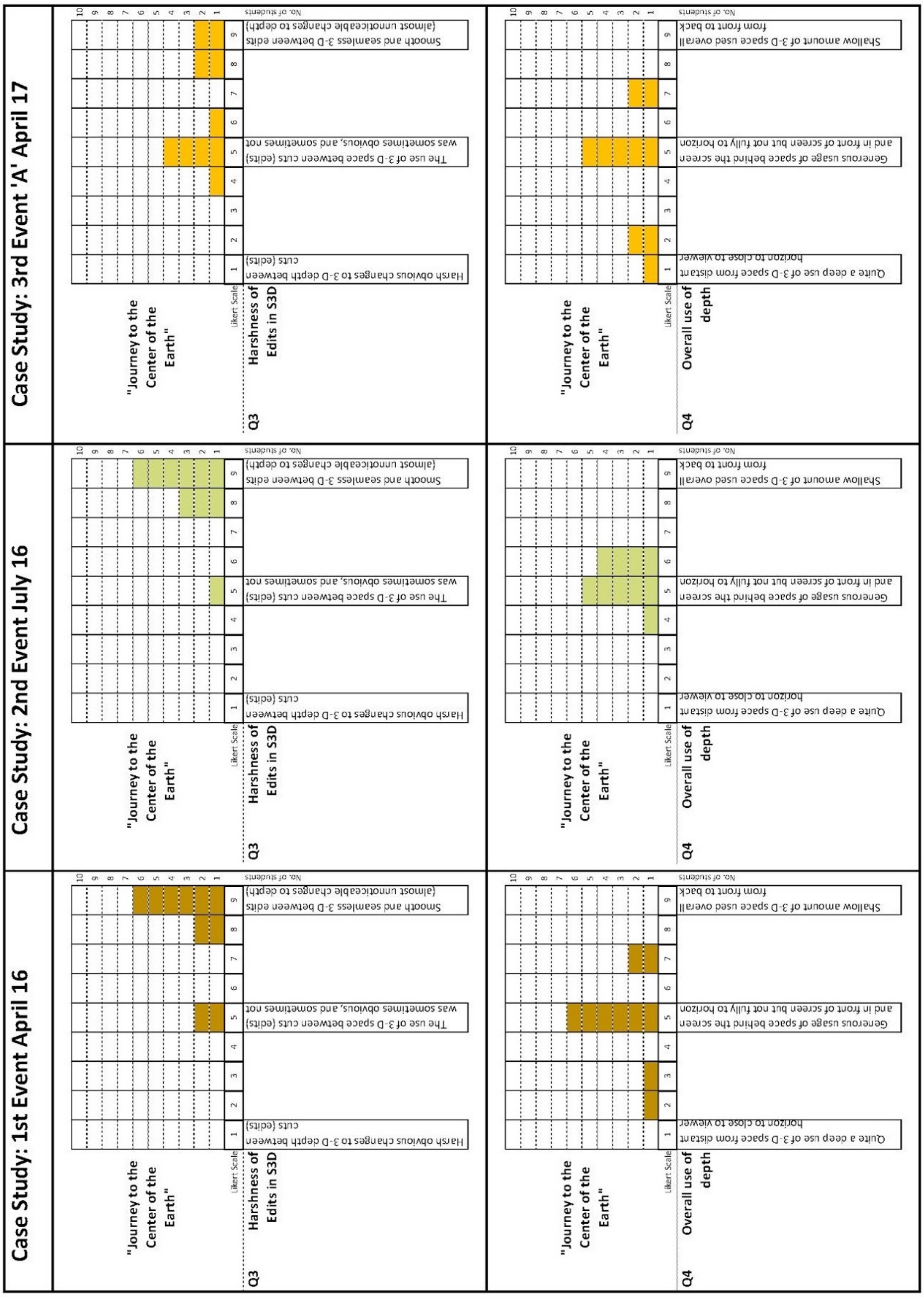
The Likert scale surveys however were filled in by respondents after more time was given to each respondent to think about their understandings of what they had learned. The following images (Figures 7-11, 7-12, 7-13, and 7-14) highlight the direct comparison of the Likert questions between each of the three Events over the eighteen-month period, of the same S3D film, "Journey to the Center of the Earth" (Brevig, 2008).

For the Question 1 comparison between the three Events, this question deals with the 'S3D Awareness' of "Journey to the Center of the Earth" (Brevig, 2008). 2nd Event and 3rd Event respondent groups both recognised more awareness of the S3D in this film than did the 1st Event respondents. However, all three Events' respondents recognised the same amount of 3-D space usage (being generally evenly spread positive parallax space). The same result seems to be evident for all three Events' participants for the recognition of the 'Overall use of depth' in Question 4, with a "Generous usage of space behind the screen and in front of screen but not fully to horizon". Each group had a similar observation here.

In fact, with the broader view afforded by this side-by-side comparison, most of the eight questions asked in each of the surveys for each of the Events', resulted in mostly similar responses to each other except for Question 1 (mentioned above), and also for Question 7. Question 7 on the 'Benefit of use of S3D' showed that the 3rd Event's group observed notably less 'Benefit of use of S3D' to the story for "Journey to the Center of the Earth" (Brevig, 2008) than did the 1st and 2nd Events' participants. The 1st and 2nd Event groups for this question noted that there was more of a "Somewhat beneficial experience being in S3D" whereas the 3rd Event group indicated more toward "No apparent benefit at all using S3D".

Figure 7-12

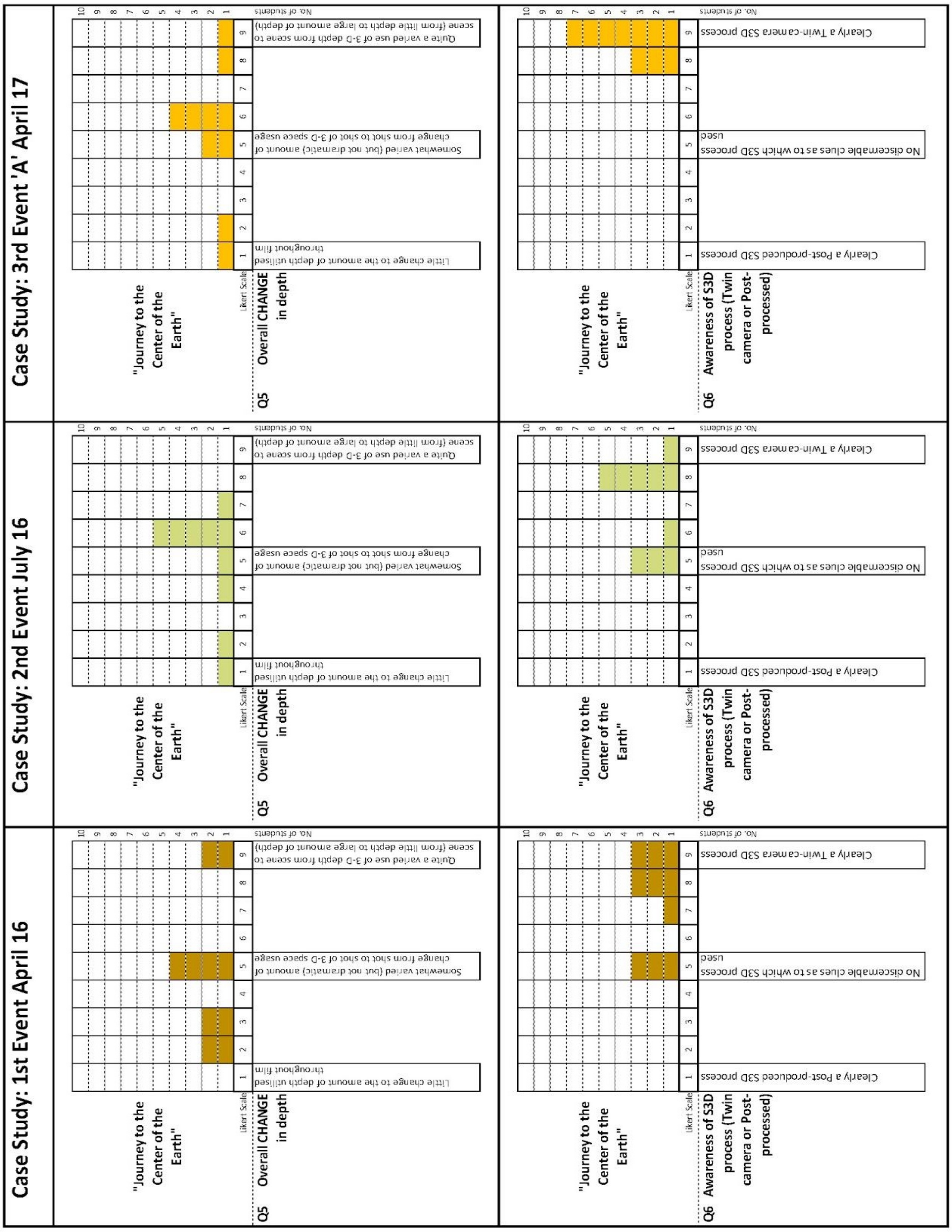
1st, 2nd, and 3rd Events' Bar Graph Compilation Likert Surveys Q3-Q4 for Results Comparison of "Journey to the Center of the Earth" (Brevig, 2008)



Note. Compilation of ten participant's results in each of the 1st, 2nd, and 3rd Event surveys for "Journey to the Center of the Earth" (Brevig, 2008). A comparison here of Q3 and Q4 results over all three events.

Figure 7-13

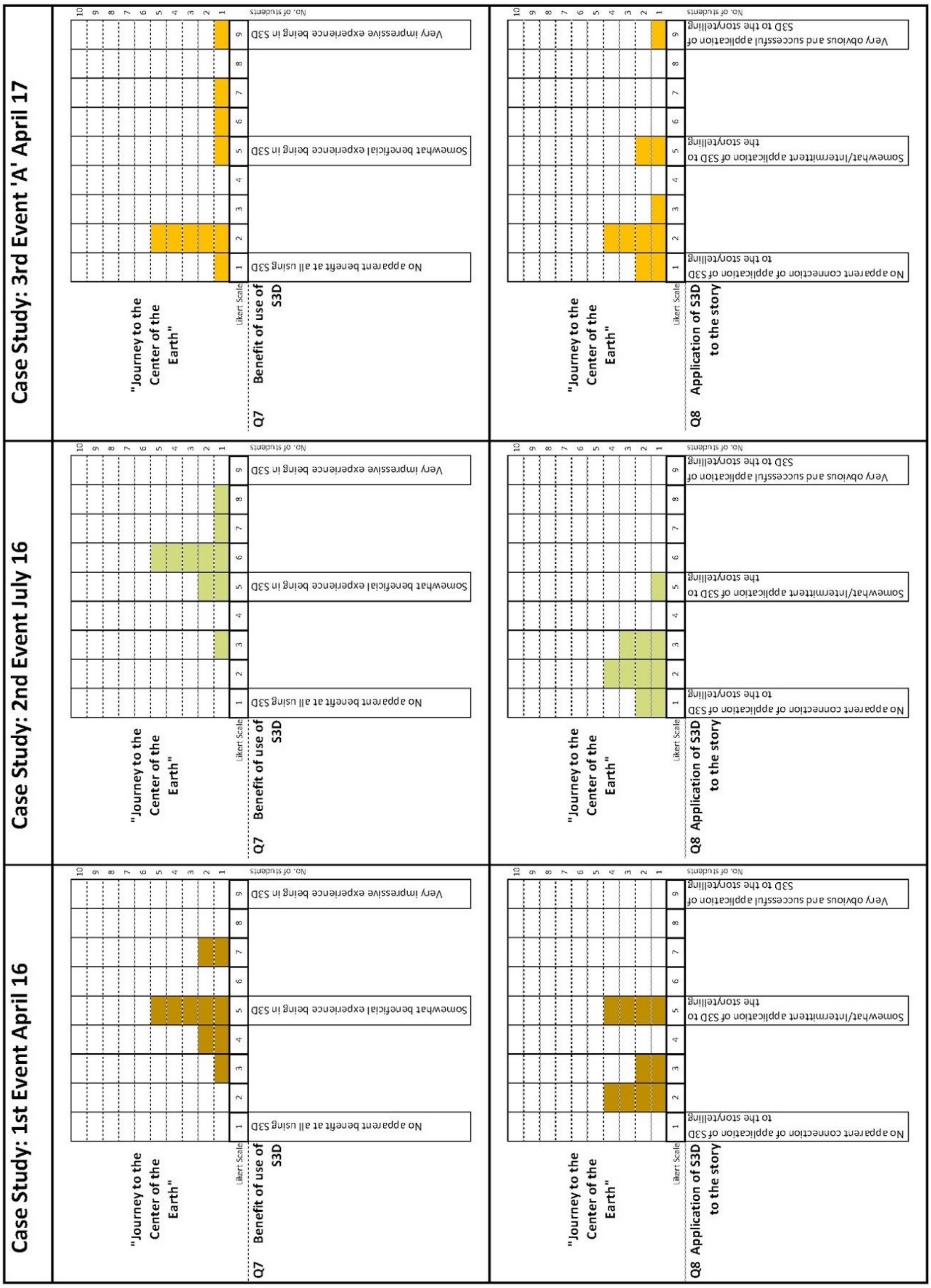
1st, 2nd, and 3rd Events' Bar Graph Compilation Likert Surveys Q5-Q6 for Results Comparison of "Journey to the Center of the Earth" (Brevig, 2008)



Note. Compilation of ten participant's results in each of the 1st, 2nd, and 3rd Event surveys for "Journey to the Center of the Earth" (Brevig, 2008). A comparison here of Q5 and Q6 results over all three events.

Figure 7-14

1st, 2nd, and 3rd Events' Bar Graph Compilation Likert Surveys Q7-Q8 for Results Comparison of "Journey to the Center of the Earth" (Brevig, 2008)



Note. Compilation of ten participant's results in each of the 1st, 2nd, and 3rd Event surveys for "Journey to the Center of the Earth" (Brevig, 2008). A comparison here of Q7 and Q8 results over all three events.

Somewhat surprisingly, where there may have been an expected difference in readings between the three Events over the eighteen-month period, with each group utilising the same surveys, and watching similar S3D films (although only a few of the S3D films were the exact same titles between all three Events), there was in fact little difference. Expected reasons for more marked differences between these Events' results - that didn't eventuate in this research - conceivably could have been:

1. The longer time frame between the 2nd and 3rd Event than between the 1st and the 2nd Event.
2. This same time differential conceivably contributing to a stronger evolutionary improvement to the course curriculum content by the researcher due to the very nature of S3D film process improvements at that time.
3. The extra development of online courseware in streamlining the delivery and the content of the "Intro to S3D" course.

However, to a large extent the evidence here suggests that none of these evidential reasons seemed to affect this one S3D film title's results - despite being cross-referenced over the three Events, and over the eighteen-month period of research.

7.4.3.2 Comparison of Case Study-1st, 2nd, 3rd Events - Learning Comparison Results - "The Martian" (Scott, 2015)

Following are the Likert graph results for all three of the "The Martian" (Scott, 2015) observations that were run over the eighteen-month period in the 1st, 2nd, and 3rd Events, as a part of this single Case Study (Figure 7-16, Figure 7-17, Figure 7-18, and Figure 7-19). By comparing all three results of the one S3D film a pattern forms with the 2nd and 3rd Event's results being quite similar, with the 1st Event's results varying somewhat in only the following areas.

The 'Use of negative space' was observed to be greater for the 1st Event's participants than the 2nd or 3rd Event's participants and 'Overall use of depth' also in the 1st Event's responses indicating a greater utilisation of depth space for this film than did the 2nd and 3rd Event's participants. Interestingly, the 'Overall CHANGE in depth' observations between the three Event's responses were all significantly different from each other, with no immediately attributable reason except that, it just may be read differently by different people. The 'Application of S3D to the story' question however, got a common response across all three Events with significantly positive results in S3D's use in telling the story.

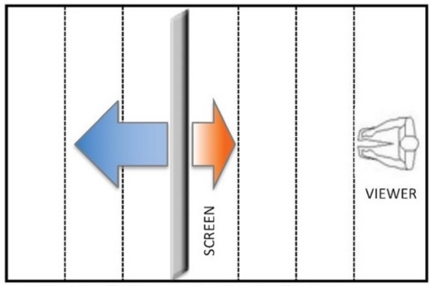
Figure 7-15

Comparison of all three Events' S3D Depth Budget Graphic Surveys for the same S3D film; "The Martian" (Scott, 2015)

1st Event

Results for: **"The Martian"**

	Distance behind the screen			Distance in front of screen			
Student:	S3D reached large distances behind the screen	S3D reached moderate distance behind the screen	S3D reached a short distance behind the screen	S3D reached a short distance in front of the screen	S3D reached moderate distance in front of the screen	S3D reached a large distance in front of the screen	Rating of what extent S3D became a part of the story:
# 1		•		•			1
# 2		•		•			1
# 3			•	•			1
# 4		•		•			1
# 5		•		•			1.5
# 6			•	•			1
# 7		•		•			1
# 8		•		•			1
# 9		•		•			1
# 10	•			•			1

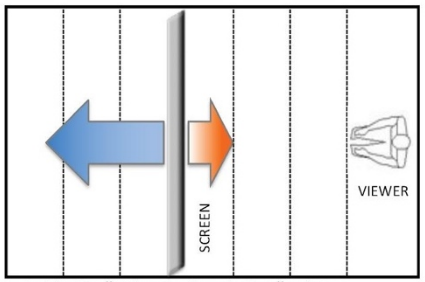


1= Seamless integration with the story
2= Not very obvious but somewhat noticeable S3D
3= Quite noticeable S3D
4= Very obvious S3D and distracting from the story
5= The S3D is broken and is unwatchable

2nd Event

Results for: **"The Martian"**

	Distance behind the screen			Distance in front of screen			
Student:	*S3D reached large distances behind the screen*	*S3D reached moderate distance behind the screen*	*S3D reached a short distance behind the screen*	*S3D reached a short distance in front of the screen*	*S3D reached moderate distance in front of the screen*	*S3D reached a large distance in front of the screen*	*Rating of what extent S3D became a part of the story:*
# 1		•		•			**1**
# 2	•			•			**2**
# 3	•			•			**1**
# 4		•		•			**1**
# 5	•			•			**2**
# 6		•		•			**2**
# 7	•			•			**2**
# 8	•			•			**1**
# 9	•			•			**1**
# 10	•			•			**1**

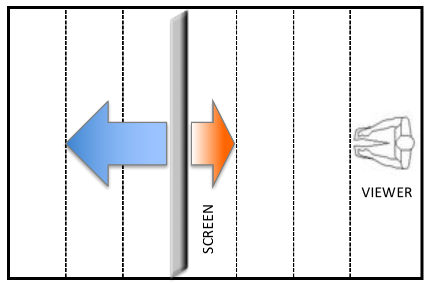


1= Seamless integration with the story
2= Not very obvious but somewhat noticeable S3D
3= Quite noticeable S3D
4= Very obvious S3D and distracting from the story
5= The S3D is broken and is unwatchable

3rd Event

Results for: **"The Martian"**

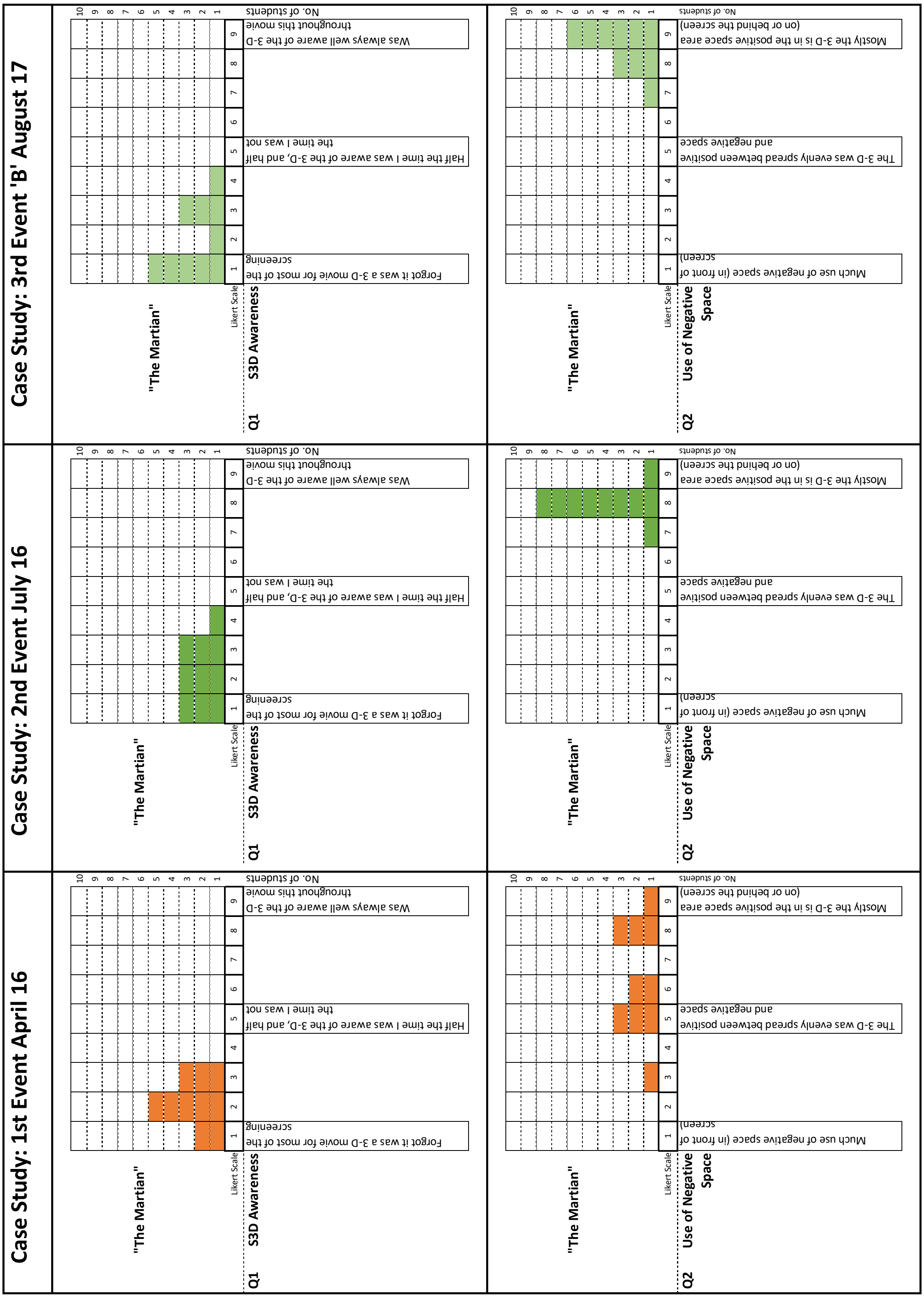
	Distance behind the screen			Distance in front of screen			
Student:	*S3D reached large distances behind the screen*	*S3D reached moderate distance behind the screen*	*S3D reached a short distance behind the screen*	*S3D reached a short distance in front of the screen*	*S3D reached moderate distance in front of the screen*	*S3D reached a large distance in front of the screen*	*Rating of what extent S3D became a part of the story:*
# 1		•		•			**1**
# 2		•		•			**1**
# 3		•		•			**1**
# 4		•		•			**1**
# 5		•		•			**1**
# 6		•		•			**1**
# 7		•		•			**1**
# 8		•		•			**1**
# 9		•		•			**1**
# 10		•		•			**1**



1= Seamless integration with the story
2= Not very obvious but somewhat noticeable S3D
3= Quite noticeable S3D
4= Very obvious S3D and distracting from the story
5= The S3D is broken and is unwatchable

Figure 7-16

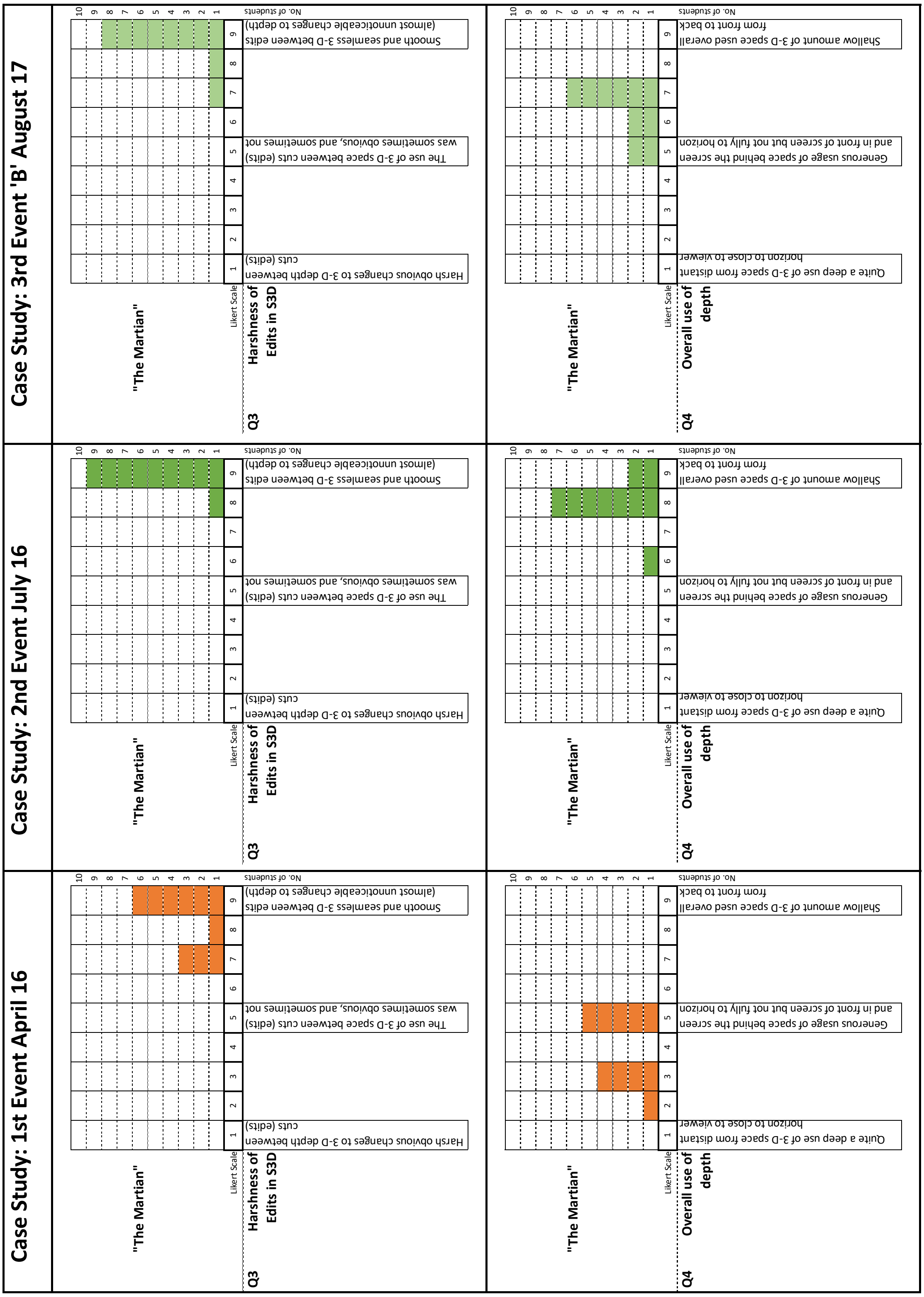
1st, 2nd, and 3rd Events' Bar Graph Compilation Likert Surveys Q1-Q2 for Results Comparison of "The Martian" (Scott, 2015)



Note. Compilation of ten participant's results in each of the 1st, 2nd, and 3rd Event surveys for "The Martian" (Scott, 2015). A comparison here of Q1 and Q2 results over all three events.

Figure 7-17

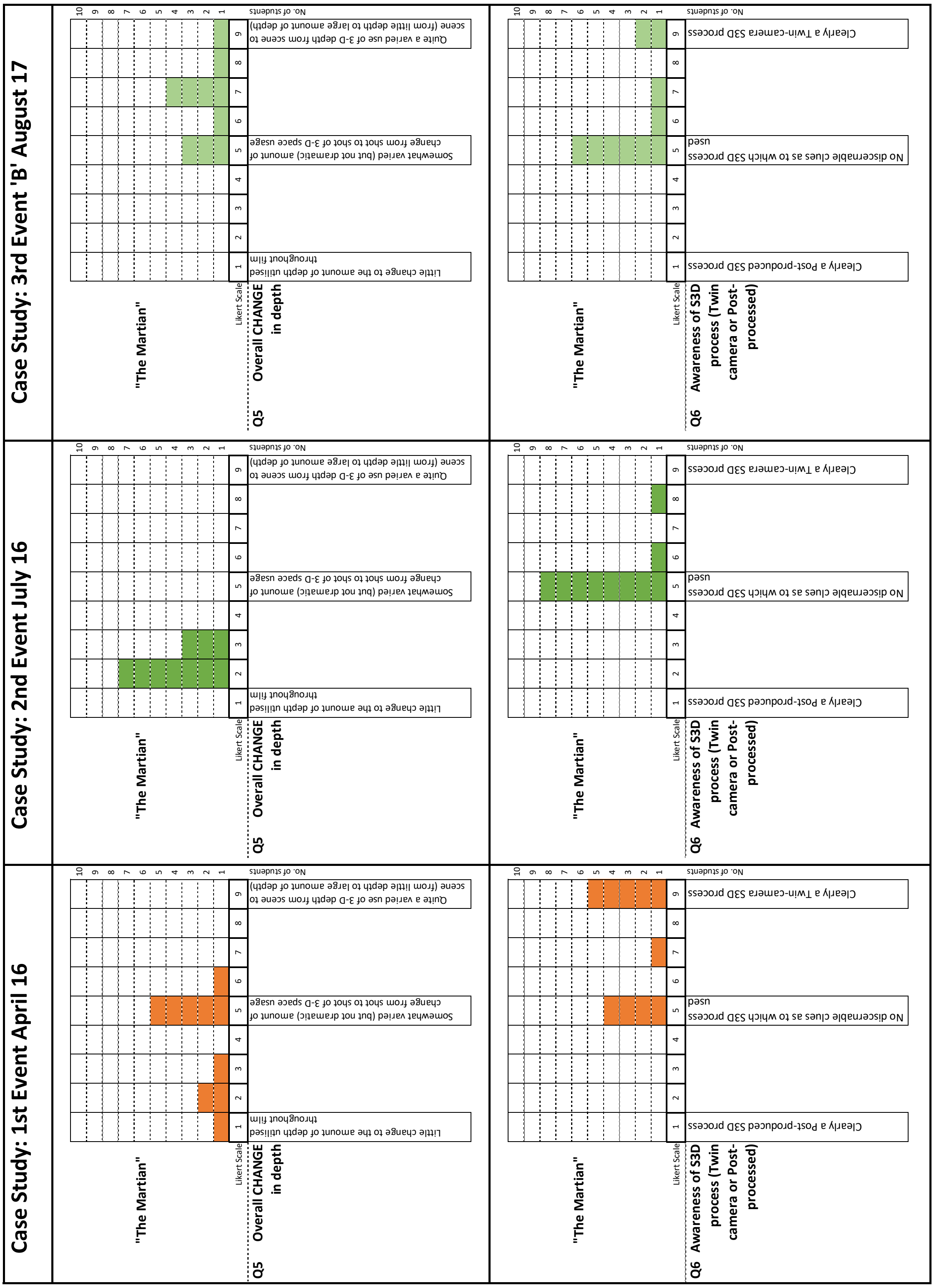
1st, 2nd, and 3rd Events' Bar Graph Compilation Likert Surveys Q3-Q4 for Results Comparison of "The Martian" (Scott, 2015)



Note. Compilation of ten participant's results in each of the 1st, 2nd, and 3rd Event surveys for "The Martian" (Scott, 2015). A comparison here of Q3 and Q4 results over all three events.

Figure 7-18

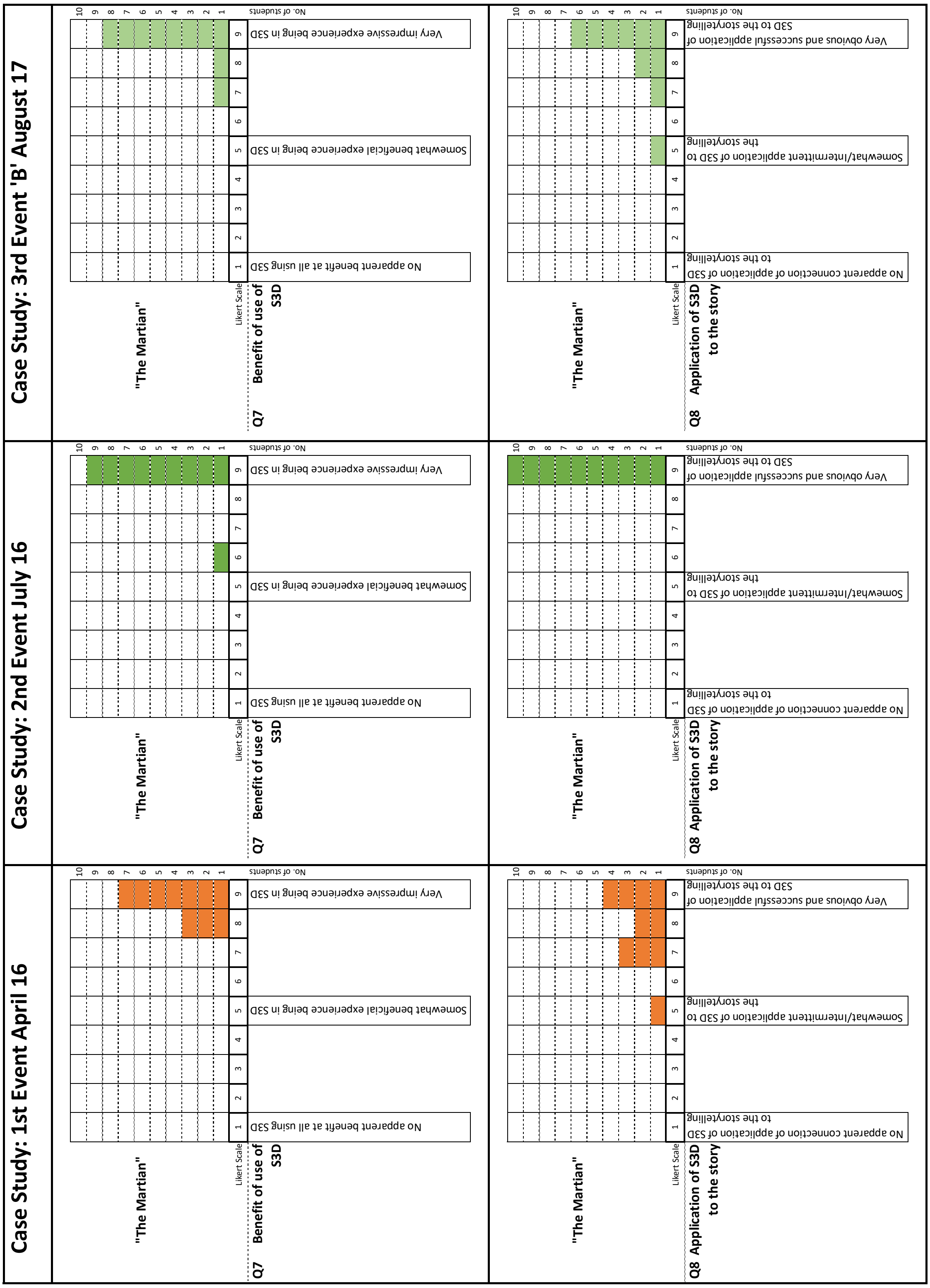
1st, 2nd, and 3rd Events' Bar Graph Compilation Likert Surveys Q5-Q6 for Results Comparison of "The Martian" (Scott, 2015)



Note. Compilation of ten participant's results in each of the 1st, 2nd, and 3rd Event surveys for "The Martian" (Scott, 2015). A comparison here of Q5 and Q6 results over all three events.

Figure 7-19

1st, 2nd, and 3rd Events' Bar Graph Compilation Likert Surveys Q7-Q8 for Results Comparison of "The Martian" (Scott, 2015)



Note. Compilation of ten participant's results in each of the 1st, 2nd, and 3rd Event surveys for "The Martian" (Scott, 2015). A comparison here of Q7 and Q8 results over all three events.

This is the same with the “Benefit of use of S3D’ question that was nearly a mirror image across all Events for this same film. As “The Martian” (Scott, 2015) was one of the identified S3D films in this research that scored highly with all participants when it came to implementation of S3D, it is interesting to note that the ‘Application of S3D to the story’ is the high score across all Events for this element.

When the interpretations and observations for all the other areas of the Likert survey are gathered, for this film that garnered popular results in the group discussion sessions, the mix is whilst remaining high, still indicative of a broad mix of results. The fact that the last two questions concerning the application and benefits of S3D are so high, whilst the remaining results are mixed, brings an argument that first observations are less informed, possibly due to the unknown nature of the topic, *except* when the S3D helps with the story.

7.4.3.3 Comparison of Case Study-1st, 2nd, 3rd Events - Learning Comparison Results – Conclusion

In taking a broad view of the comparison of survey responses over all Events, particularly when seeing the side-by-side survey results of the two common S3D film titles (in Figure 7-11, Figure 7-12, Figure 7-13, Figure 7-14, and Figure 7-16, Figure 7-17, Figure 7-18, and Figure 7-19), the variations between all, may be interpreted as somewhat unremarkable. The relatively small differences between each Event’s results from these Likert surveys, can be attributed to a number of smaller changes in the proceedings of each Event (identified in previous chapters), but for the most part, these differences may be considered to be negligible. If this is indeed the case, then it may be drawn that the improvements/changes to the curriculum as a result of the S3D Grammar model from Event to Event, did not significantly benefit the coursework.

The interpretation by the participants of the individual S3D elements as marked on the surveys over the course of the eighteen-month period of the three Events, may then be viewed as serving well for foundational S3D skill learning (also very important), but the S3D storytelling concepts appear to have been more successfully gained in the group discussion sessions as evidenced in the discussion transcripts quoted throughout chapters 5, 6, and 7, and summarised in Table 8-3. Having identified this, with the two S3D film titles that were screened across all Events, the one time there was a common survey question result across all three Events was with the last two survey questions concerning ‘Benefit of use of S3D’ and “Application of S3D to story’. In this area there was a common reading by all participants to the most positive Likert result possible.

Other than this one area, the lack of significant change in benefit between Events in regard to the results of the survey questions about the curriculum, is not the case with the S3D characteristics grammar model. Here the surveys fed the data input for these S3D characteristics from an unencumbered aspect. The observations by each participant in each Event were honest observations as they each saw from the film screenings. The variations from Event survey to Event survey are indicative of the variations that would be expected between anyone seeing these S3D films possibly for the first time.

So, the data analysis here has highlighted the benefits of both the qualitative and quantitative means of data collection. Even though the second (Likert) survey was completed by the research participants *soon after* they had viewed the screenings, the discussion groups were where the facilitator observed learning and understanding by the individuals for the storytelling aspect of S3D, and the surveys were where the results showed that the S3D skills were learned. The curriculum development happened with smart learning tool additions (blended, online, technological additions) but appears to not have been significantly influenced by surveys.

7.5 Reflection and Redesign

By the end of the third delivery of the coursework, and with a much more refined S3D grammar model, most of the teaching refinements from the previous two Events had already smoothed off many of the rougher edges of the course model. The participant feedback on the final coursework Event, reflecting somewhat similar attributes to the first two Events' feedback, meant that the refinements of a more structured coursework model in the form of blended delivery, with more time spent on theoretical elements, had begun to take shape as a significantly improved model already. The inclusion of more, and earlier, S3D film segment screenings was the overarching design improvement for the proffered S3D coursework. The screenings and subsequent student discussion group-work made advances to the pace and quality of learning through each Event, as observed by the facilitator. By screening and discussing S3D films more often and earlier, a much improved incorporation of S3D grammar education lifted the value of the coursework as each student group gained the experience of the importance of S3D grammar usage in the framework of structural film theory.

With a world moving closer to broad-based online learning, the porting of the S3D coursework for online *only* content was an easy progression decision. Blended delivery was a productive addition to S3D teaching, with fully online delivery meaning that the course had the potential to be a globally delivered course. This did however create a problem, in that the significant benefits of face-to-face S3D screenings and discussions were more difficult to achieve in a fully online environment. The most obvious benefit, was the purest form of S3D viewing from which all learning, discussions, and future learning would come from. The high-quality and technologically advanced nature of the S3D screenings offered in the face-to-face courses, risked dilution with the online anaglyph viewing process of S3D film segments (a less accurate viewing method to the polarised S3D viewing method that uses high-definition platforms). It was also less likely that students would have access to dedicated high-quality Stereoscopic 3-D viewing facilities in current times.

Such high S3D viewing standards were much more likely in domestic situations prior to five years ago, when *all* of the television sets available on the domestic market were 3-D capable. After 2016, almost none of the domestically available television displays had S3D playback capability, and subsequently there was a much-reduced chance that fully online students would have the luxury of access to such high standard S3D viewing. However, the anaglyph method that was used in the online coursework, was still able to graphically illustrate the S3D theory that embodied the core of the coursework, in particular when it came to implementation of the S3D grammar model concepts in the structural film theory framework.

8 Chapter Eight: Conclusions

The outcomes of this research are a result of the integration of the data sourced from the three separate groups of students who undertook the original introductory course at undergraduate level of Stereoscopic 3-D.

This research study's aims at the outset of this work proposed to:

1. Explore and determine a model of S3D that works.
2. Synthesise research findings into a curriculum resource for delivery to tertiary film students.

After the design, implementation and analysis of a grammar model as proposed, the findings of this research project, through a single case study methodology with its mixed method approach of data analysis yielded:

1. A literature review/thesis that presents an S3D grammar within the traditional structuralist film theory frameworks whilst fitting in realist, and formalist frameworks also.
2. A new S3D grammar resource for incorporation into film education.

The initial stated aims of the research, when compared to the ultimate findings in the end, had a more direct correlation than was originally expected. The objective of finding a new S3D grammar model was ultimately successful, however, the evidence of such implemented S3D grammar in existing S3D film releases was found in surprisingly fewer S3D films than was expected by the researcher, given the sheer number of S3D feature films released continuously every year (Hall, 2012). The second objective of providing an S3D resource that refined the delivery of this evidently difficult area of the film industry, also combined the results of the first objective. In this way, by incorporating the learned S3D storytelling language and characteristics that arose from each of the delivered 'Events', both elements of this research's findings were merged for the final result.

The practical outcome of this research, beyond the period of the study and data analyses, is the final research result now being used as the basis for a five-credit point S3D module, delivered to Master of Creative Industries students at the researcher's place of employment. By merging the data results from all three of the course Events over the period of the research, a redesigned course for "Introduction to Stereoscopic 3-D" was compiled for delivery online (screenshot examples of this online coursework are in Appendix H). Within this, a compiled set of S3D characteristics formed a model that reigned in poor S3D performance regularly seen in contemporary S3D production, and importantly this S3D model will now contribute to a film's storytelling. All of the triangulated data from the triangulated sources, including course surveys, S3D depth budget graphic surveys, Likert surveys, and group discussions, fed the remodelling of the course content to be not only improved, but also redesigned and adapted for delivery online. This process produced a set of model characteristics to improve S3D storytelling into the future. The following sections outline the distilled S3D model characteristics from the three sets of course feedback, providing a resource for inclusion within a working coursework model.

8.1 Final Results

Here is the distillation of the data gathered over the period of this research refining and defining S3D Depth Model characteristics, as well as its use as an S3D curriculum resource for better storytelling.

8.1.1 1st, 2nd, 3rd Events - Summary S3D Depth Model Characteristics Results

The path of S3D Depth Model characteristics over the 1st, 2nd, and 3rd Events plotted the evolution of the summary characteristics of Depth Models for S3D, and through this distillation a broad-based S3D Depth Model rather than a number of them, emerged as a benchmark for S3D production. All of the found S3D characteristics in this research (shown in Table 8-1 and Table 8-2) fit easily with the same theoretical film models that Metz and other 20th century film theorists proposed for 2D film. The only difference being that very few S3D filmmakers used a structured S3D storytelling model, likely as a consequence of these S3D productions not requiring more audience draw-power than the wow-factor that was already doing this.

Table 8-1

S3D Depth Model Feedback Comparison of all Three Case Study Events

1st Event S3D Depth Model Results	*2nd Event S3D Depth Model Results*	*3rd Event S3D Depth Model Results*
Location and setting has an effect on how well the S3D appears to work.	Locations and setting (story, setting, scale) should be considered a major influence on the amount and type of S3D that is designed and instituted.	
Close-distanced horizons (interiors for instance) allow for more manipulation of S3D than far distanced horizons.	Minimise negative and positive depth extremes.	
Less extreme negative parallax space usage in front of the screen gave better viewer responses.	Gratuitous shots are a distraction.	

1st Event S3D Depth Model Results	*2nd Event S3D Depth Model Results*	*3rd Event S3D Depth Model Results*
	Mostly positive parallax area usage is less distracting from story than use of negative parallax area.	Extreme (in-your-face) or gratuitous negative parallax shots generally distract from the story.
Identifying the characteristics of a film's themes and then using S3D to illustrate these thematic points is more likely to garner good S3D responses.	Genre specific stories can make S3D usage seem less overt by the fact that the genre-based experience is usually already out of a normal human experience.	
S3D is better used as one of a number of tools rather than an end unto itself. For instance, when S3D is employed in unison with appropriate cinematography, and appropriate production design, this creates a more impressive product than just the deployment of S3D on its own.	S3D combines well with texture and colour as an embellishment to cinematography and production design elements for a "look", not just for Stereoscopic 3-D depth placement.	
The Post-converted process for S3D can produce excellent S3D results when used carefully, despite a previous industry belief that the post-converted S3D process was an inferior process. For instance, when post-converted S3D is used in conjunction with selective 2D Depth Cue models then problematic cardboard cut-out issues are reduced.		Post-conversion process S3D films can look very good.
Animated (CGI) films have a better chance of great S3D than real-world films due to controllability of the CGI environment. For instance, environments with large geographic topography can be built within a CGI world with much closer horizons (creating smooth S3D depths) than would a real-world geological horizon.	Careful technical S3D production can cover extremes of distances without 'breaking' the S3D (i.e. CGI is not the only method of shooting large distances/panoramas).	
Careful inclusion of 2D Depth Cues will have a significant effect on S3D quality.		2D Depth Cues boost S3D considerably.
Narrow depth of field can exaggerate the S3D. Broader DOF works too but narrow DOF forces the 2D Depth Cues to add to the experience.	Regular use of slightly narrow depth of field shots expands the depth sense of the S3D along with standard 2D Depth Cues (i.e. Chiaroscuro, motion parallax).	Narrow depth of field shots if only very slightly DOF embellishes S3D.
	Simple or dark environments with little distraction allow a character to move within an S3D space for its own manipulation of S3D space.	Dark backgrounds and high key character lighting delineates S3D.

1st Event S3D Depth Model Results	*2nd Event S3D Depth Model Results*	*3rd Event S3D Depth Model Results*
Painful shots in some outdoor shots seem unnecessary with better science.		Painful shots due to incorrect setting of S3D camera geometry (i.e. interaxial distances or convergence angles) need to be precluded from finished films
Telephoto shots look fake and flatten the image even in S3D.		Telephoto lens shots regularly present a cardboard cut-out look that is unconvincing.
	Smart employment of S3D can be used to heighten tension in fast action scenes where required.	
	Playing with expectations such as, larger S3D depths for smaller spaces and smaller S3D depths for larger spaces can manipulate otherwise obvious characteristics.	
	Adding intermittent negative space to an otherwise positive parallax S3D space usage can make a clear grammar point in a story.	
	Changes in S3D depth from interiors to exteriors or one situation to another is a useful way of embedding story.	
	CGI particle effects for "added" depth (usually in foreground) can look out of place.	

Looking at the three Events lined up so as to highlight S3D Depth characteristics common to all (Table 8-1), a number of similar attributes were identified despite the film viewing list being mixed in all of the three Events. The triangulation aspect of this research methodology meant that where a mix of films is studied by a different group of individuals this would ensure a higher quality of data sourced. Any similar attributes identified across these individual Events were reinforced when these attributes replicated across two or more Events. By combining all three Event's results and looking for commonalities, the significant characteristics shown in Table 8-1, both positive and negative, were observed in some or all of the screenings in each Event. The produced list of S3D grammar characteristic outcomes (Table 8-2), is the distillation of the data collected from this mixed method research in uncovering a new S3D grammar model for this project. In reducing the size of this list further by merging near duplicates, the resulting S3D model characteristics have been ported as a concentric circle diagram (Figure 8-1). This concentric circle diagram shows the principle characteristics distilled from this research, and it also illustrates the causal relationships between these characteristics, with the final research result labelled here as "S3D Model Characteristics Distilled from Research".

Table 8-2

Recommended S3D Depth Model Characteristics from all Three Case Study Events

No.	*S3D Depth Model Characteristics*
1	Locations and setting (story, setting, scale) should be considered a major influence on the amount and type of S3D that is designed and instituted.
2	Close-distanced horizons (interiors for instance) allow for more manipulation of S3D than far distanced horizons.
3	Minimise negative and positive depth extremes.
4	Less extreme negative parallax usage in front of the screen gave better viewer responses.
5	Gratuitous shots are a distraction.
6	Mostly positive parallax area usage is less distracting from story than use of negative parallax space.
7	Identifying the characteristics of a film's themes and then using S3D to illustrate these thematic points is more likely to garner good S3D responses.
8	Genre specific stories can make S3D usage seem less overt by the fact that the genre-based experience is usually already out of normal human experience.
9	S3D is better used as one of a number of tools rather than an end unto itself. For instance, when S3D is employed in unison with appropriate cinematography, and appropriate production design, this creates a more impressive product than just the deployment of S3D on its own.
10	S3D combines well with texture and colour as an embellishment to cinematography and production design elements for a "look", not just for Stereoscopic 3-D depth placement.
11	The Post-converted process for S3D can produce excellent S3D results when used carefully, despite a previous industry belief that the post-converted S3D process was an inferior process. For instance, when post-converted S3D is used in conjunction with selective 2D Depth Cue models then problematic cardboard cut-out issues are reduced.
12	Post-conversion process S3D films can look very good.
13	Animated (CGI) films have a better chance of great S3D than real-world films due to controllability of the CGI environment. For instance, environments with large geographic topography can be built within a CGI world with much closer horizons (creating smooth S3D depths) than would a real-world geological horizon.
14	Careful technical S3D production can cover extremes of distances without 'breaking' the S3D (i.e. CGI is not the only method of shooting large distances/panoramas).
15	Careful inclusion of 2D Depth Cues will have a significant effect on S3D quality.
16	2D Depth Cues boost S3D considerably.
17	Narrow depth of field can exaggerate the S3D. Broader DOF works too but narrow DOF forces the 2D Depth Cues to add to the experience.
18	Regular use of slightly narrow depth of field shots expands the depth sense of the S3D along with standard 2D Depth Cues (i.e. Chiaroscuro, motion parallax).
19	Narrow depth of field shots if only very slightly DOF embellishes S3D.
20	Simple or dark environments with little distraction allow a character to move within an S3D space for its own manipulation of S3D space.
21	Dark backgrounds and high key character lighting delineates S3D.
22	Painful shots in some outdoor scenarios seem unnecessary with better science.
23	Painful shots due to incorrect setting of S3D camera geometry (i.e. interaxial distances or convergence angles) need to be precluded from finished films.
24	Telephoto shots look fake and flatten the image even in S3D.
25	Telephoto lens shots regularly present a cardboard cut-out look that is unconvincing.
26	Smart employment of S3D can be used to heighten tension in action scenes if required.
27	Playing with expectations such as, larger S3D depths for smaller spaces and smaller S3D depths for larger spaces can manipulate otherwise obvious characteristics.
28	Adding intermittent negative space to an otherwise mostly positive parallax S3D space usage can make a clear grammar point in a story.
29	Changes in S3D depth from interiors to exteriors or one situation to another is a useful way of embedding story.
30	CGI particle effects for "added" depth (usually in foreground) can look out of place.

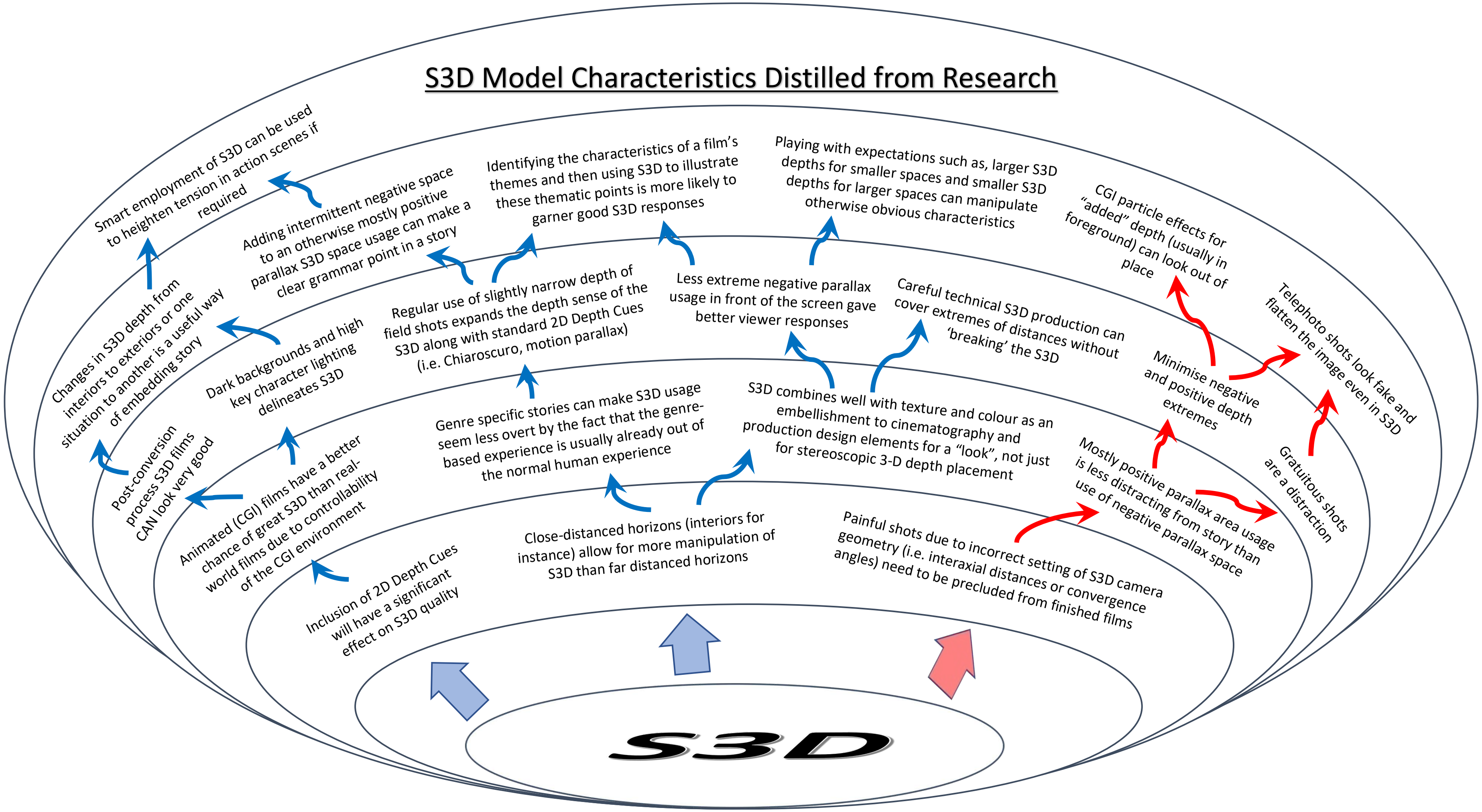
This concentric circle diagram lists the observed key characteristics from all three Events over the research period, and through the group discussions held over this time, any relationships between these listed characteristics that were observed by the Event participants (these are shown as linked via blue (cool) and red (hot) arrows). This final model of the research result, as far as characteristics for better S3D production into the future as a set of descriptors, can not only be used as a pattern for future S3D production, but can also be used to match any new or existing S3D films that fit this set of characteristics. Of the films that were viewed in this study, (and also films that were viewed by observers, but not officially used in this research), three existing S3D films from this research list already seem to closely match this set of S3D descriptors. “The Adventures of Tintin” (Spielberg, 2011), “The Martian” (Scott, 2015), and “Rogue One-A Star Wars Story” (Edwards, 2016). Each of these S3D films display a large amount of these refined and now defined S3D characteristics as researched, and so serve as models of good S3D for future “Introduction to Stereoscopic 3-D” courses. The most significant aspect of the observations and surveys drawn from the participant students in this study, is the natural learning that was shown to have occurred through the group discussions and surveys, in drawing their own conclusions when considering these S3D characteristics’ attribution to story. Each film screening and discussion over the eighteen-month period of the three Events held, elicited evidence that the students recognised the contribution that S3D had (albeit in precious few S3D titles), or could potentially have in future S3D titles.

From a broad view, the premise of this research in finding an S3D grammar model for Stereoscopic 3-D film production, in terms of S3D’s engagement in the storytelling, has resulted in this set of listed S3D attributes (Figure 8-1). These attributes are still however, simply items on a list until they are placed in context. It is important to remember that for S3D engagement in storytelling via the use of film language, its implementation is largely in the hands of the creative players, being most likely directors, and/or other heads of film departments. By careful articulation and application of the S3D characteristics on this list by such creative minds, a refined set of S3D storytelling characteristics is recognised.

At the beginning of this research project an important aspect was planned to be the potential application of any found S3D grammar principles to other forms of S3D such as virtual reality, gaming, or training simulations. At first it was not clear to the researcher if any such S3D characteristics would apply to these other S3D forms, despite being broadly applicable theoretically. The possibility of *story-based* S3D implementation in future gameplay (i.e. raising tension when needed in gaming actions), was possible outside of common wow-factor implementation but unlikely to be of any use (or understanding) to users in regard to developing story outside of the cinema S3D production experience.

Figure 8-1

S3D Model Characteristics Distilled from Research



The concentric circles model of distilled S3D characteristics (Figure 8-1) finally brings together the recognised grammar elements of S3D from all of the Events, all of the screenings, and all of the collected data, that have shown to be significant in the creation of a final model of S3D production for cinema. Not only has this collected data defined the best S3D production characteristics expected of future S3D film production, but it also showed that the participants throughout this research had continuously applied this S3D characteristic recognition to intelligent implementation with storytelling (Table 8-3). This table lists S3D film titles used in this research that had significant S3D influence on the film's story as recognised by the student participants in this project. Some participants immediately drew these S3D story enhancement conclusions from their observations, and throughout the Event screenings and discussions, individuals recognised and so brought to other group participants an understanding of how particular S3D characteristics were seen by them to benefit the story. Good examples of this are shown in Table 8-3 where student participants are credited (via code) with reference to their discussion points made in earlier chapters of this thesis. The film titles in Table 8-3 that illustrate best examples of recognised S3D story contribution, are a 'best of' set of titles from this research.

Table 8-3

S3D Storytelling Attribution in 1st, 2nd, and 3rd Event Data

S3D Film Title	*S3D Story Attribution*	*Event #*	*Noted in discussion group by Student #*
"Dial M for Murder" (Hitchcock, 1952)	Points of drama seemed to reach to the cinema viewer 'for help' in such provocative scenes using the personal space between the screen and the viewer. This was in contrast to other scenes that had quite stayed S3D depth characteristics.	1st	Student 6, & 7
"Gravity" (Cuarón, 2013)	The main character's burden of personal loss is magnified with the S3D by enveloping the viewer with a feeling of a lack of physical support and the widening of the distances between celestial bodies.	1st 2nd	Student 2 Student 4
"The Martian" (Scott, 2015)	S3D used to enlarge the otherwise small space that is his tiny living quarters, but emphasising the importance of his hope to be rescued and his 'big' will to live.	1st 2nd 3rd	Students 4, & 5 Students 1, 5, & 7
"Pina" (Wenders, 2011)	The use of S3D provided the extra dimension of a dance space to a traditional dance stage. It enabled the art form of dance (which uses space very carefully and deliberately) to bring the viewer onto the stage with the dancers.	2nd 3rd	Students 3, & 6 Students 1, 2, & 3
"Rogue One-A Star Wars Story" (Edwards, 2016)	A claustrophobic feel to this dark film meant the S3D was able to open up some of this claustrophobia as the main characters moved forward in their journey. S3D opened up spatial distances between characters representing their relationships in many otherwise dark, dim, and closed surroundings.	3rd	Students 3, 5, & 6

There are a number of S3D film titles used in this research, as well as titles outside of this research, that could head a list of 'what not to do' in creating notable characteristics and techniques of S3D for story contribution. Such titles too have been worthy of creating excellent learning opportunities for film students by teaching them what doesn't work being just as important as what does work.

In the section of this research study on methodology, and also at the beginning of the study under research aims, it was proposed that possibly a number of S3D grammar models may be the answer to the possibility of an S3D grammar model for cinema. For instance, it was suggested that a narrow usage of S3D may be a "model" that might be chosen for a certain S3D film genre or story, and possibly a broader S3D usage may suit another genre or S3D story type. However, the result from the gathering of all the qualitative and quantitative data in this study, points to the fact that there is no *one* S3D model, nor is there a finite number of differing S3D models of grammar. There is however evidence from this study, that *any* or *all* of the characteristics of S3D can be brought to a film as is creatively required. So, in effect there is no "S3D grammar model" *choice* required. If there was in fact a choice, such S3D grammar choices would be endless, and so it now stands to reason that there is either no S3D model required, or depending on how it is interpreted, it could be seen as one S3D model required, which is in effect where every single S3D characteristic is a possibility.

In order to describe this final result of the research, being the final S3D grammar model in terms of its contribution to story and its service to film language, the film area of Production Design will be used here as a clear comparison for this film grammar application to storytelling using here the same principles in modern filmmaking of structuralist/formalist film theory (Metz, 1991). Production Design is the field of film where the colours, textures, staged sets, creative choices in fabrics, costumes, and props are used to enhance a film's story. Such creative choices are made by a Production Designer, from an almost infinite array of possible choices in the world, but from their careful selection we can see how Production Design helps describe a film's story. So, good Production Design isn't about how many of these such elements can be thrown at the screen, good Production Design arguably is how a Production Designer's selective creative choices mirror the themes of a film's story or a film's characters. There is no minimum inclusion of Production Design elements needed to make a film, because there is an almost infinite amount of choices available to a Production Designer. By the same token, there is also certainly an infinite number of ways to get the Production Design wrong too. A film's story is therefore, informed by the mix of creative applications of selected Production Design elements. Using this Production Design analogy, the premise of this Stereoscopic 3-D research was not to list the amount of ways that S3D films get it wrong in telling the story, but to refine the S3D characteristics within which the storytelling can creatively live and breathe. S3D will then have the same creative film language application to a story, just as Production Design (or Cinematography, or Editing, or Sound Design) does by using these same elements.

To highlight detail of an S3D example cited in this research as having significant S3D benefits to the story, “The Martian” (Scott, 2015), we will expand on a major premise of that particular movie, being the astronaut’s solitude on Mars whilst he awaits rescue. A creative way of implementing film language to help tell this aspect of the story, is the employment of *more* 3-D depth space in scenes within the small enclosures that the astronaut finds himself rather than less S3D space. This (inversely) contrasts with the huge expanses of the planet Mars just outside of the doors of his domicile, that the film viewer does not experience as having the same expansive feeling as could have been played up with S3D. Therefore, the astronaut’s “world” (living inside small buildings or vehicles whilst on Mars) is shown from the perception of the astronaut’s character, who sees these spaces as important places within which his only means of salvation is possible – and therefore S3D has helped this aspect of the director’s vision. This specific S3D application example from “The Martian” (Scott, 2015) reflects a number of the listed S3D model characteristics distilled in this research project, including (from Table 8-2) characteristic numbers 1 to 19, and 27 to 29.

Another example of the results of this research in the application of S3D to story using film language, is from the 3rd Event participant group reaction to the S3D feature film “Rogue One-A Star Wars Story” (Edwards, 2016). The interesting application of S3D to story here from the 3rd Event screening of this film, highlights the survey results. Being quite a dark film with centre-framed character highlights, the 3rd Event participant group noted that in several dark scenes (where many Hollywood S3D films would inevitably be much brighter, and thus would “see everything” in the shot) there was very little reliance on the background to show off the S3D or the expanses of science-fiction genre settings. The S3D in several scenes was recognised by some of the research participants (as quoted in Chapter Seven), to subtly expand the perceived distance around the main character of the film as she confronts her antagonist. The S3D in these scenes, had the extraordinary effect of placing the characters in a circle, giving a completely three-dimensional arrangement of the relationships between these characters. This seemingly rare use of S3D to illustrate character relationships via distance placement, was not recognised at all when the same scene was viewed in the traditional two-dimensional method. In the 2D viewing, the contents of the film frame became a blurred dark background behind the main character, yet it illustrated a stand-off of power in the S3D version of the same scene, delivering a significant display of the powerplays within the story as a result. As pointed out by students in this discussion group, this was an important moment in their understanding of the power of S3D with story and film language. Interestingly enough, this difference was not noticed until the group participants removed their 3-D glasses to compare the 2D with the S3D versions.

In essence, the cues for the application of S3D to a film's story come from applying the already learned language of film techniques from structuralist, classicalist, and formalist film theories used in film areas like cinematography and sound, etc. to the parameters recognised and listed in this research on S3D characteristics. By applying the language of film to the use of these distilled S3D characteristics, a new form of S3D application has been identified. The research participants in this study had limited knowledge of advanced film studies but all had undertaken foundational film studies modules and so were aware of the concepts and base film theories around the reading of a film. From the recognition of the sudden change in the use of the S3D space due to the shock of witnessing a murder ("Dial M for Murder" (Hitchcock, 1952)), through to the claustrophobic use of space of an astronaut marooned on Mars, (being reflected inverse-proportionally by the use of S3D to seemingly "enlarge" his otherwise small abode "The Martian" (Scott, 2015)), these are significant S3D storytelling realisations learned by the participants in this study.

Comments from student participants referring to the effect that the size of the film's projection had on the effect of the S3D, was also significant. This was evident particularly in relation to the genre and setting of some of the film's stories. In both "Gravity" (Cuarón, 2013) and "The Martian" (Scott, 2015) where the opening scenes are literally celestial in size (by the nature of the genre and story setting) the implementation of the S3D drew remarks from the research participants on the befitting nature of the S3D to the huge objects and distances on the screen. The same point is highlighted in reverse, when many of the films that were screened in this research happened to be films where their stories are set generally in less expansive environments with more enclosed spaces. In these cases, few remarks were made about the size of the large screen projections when the nature of the S3D didn't call attention to it. Therefore, the size of the screen has an impact on the successful application of S3D in a film depending upon its location and setting. The likelihood of future S3D film producers being able to nominate what optimal sized screens their S3D work will be viewed on is remote as we move forward. However, as the world is learning to embrace a multiple-screen society, where films can be viewed on screens ranging from handheld smartphone-sized screens, to IMAX-sized behemoth screens, and all size points between, there may become a time when a choice of screen sizes and technologies will allow more accommodation of certain genre films for instance to be made available only on aptly sized screens.

8.1.2 1st, 2nd, 3rd Events - Summary Curriculum Resource Results

In building a model of S3D Depth characteristics to use as a template for S3D film production, the coursework, Stereoscopic 3-D film screenings, group discussions, and surveys provided the data to inform this model. The research participants being undergraduate film students of a similar but relatively broad demographic, of between 19 years old and 45 years old, and all having some interest in the concept of Stereoscopic 3-D film, were intellectually more suited to undertaking this research and courses than the average person from the general public would be. Their vested interest in the topic area was a driver in this new area of education for them, and in their motivation to be a part of this research. The research area was not only new to these research participants, but it was new to most people in the global film industry at the time of this research.

It became clear from as early as the 1st Event sessions, that the newfound S3D knowledge quickly gained by the student participants, was significant in the student's appreciation of the need for finding an S3D grammar model to use for (eventual) S3D production. It took for them some fundamental basics of how S3D was created for cinema, to begin the understanding of not only how to make S3D, but how to avoid making bad S3D. The base knowledge taken away by these volunteer student participants from the coursework, made the during and after-film discussions much more informed and significantly more fruitful as far as the data retrieved for this study, and this also made for an even deeper understanding by these students, of the base S3D processes themselves.

It became clear very quickly that the film industry personnel who the researcher had organised to be participants in this study, would have little or no knowledge of even the base aspects of S3D, and therefore would have been put at a severe disadvantage in being able to contribute at the same level as the undergraduate students to the S3D film discussions.

This observed disadvantage was the first sign of the importance of the possible merging of both aims of this research, where the S3D film grammar model aspect, and the S3D curriculum resource aspect, depended upon each other to inform each's aspect to create the full picture.

Before this potential of the merging of the two aims became obvious, the second aim of this research was developed to refine a curriculum resource for this new area of Stereoscopic 3-D for future education of undergraduate film students. The table (Table 8-4) shows the cross-Event referencing of the feedback that built the curriculum resource in its current form:

Table 8-4

S3D Curriculum Feedback from all Three Case Study Events

1st Event Curriculum Feedback	*2nd Event Curriculum Feedback*	*3rd Event Curriculum Feedback*
The theoretical content in session two to be spread over more sessions, and to have a flipped classroom aspect where students are required to read and view clips prior to attending the S3D theory session.	Content has already been moved from face-to-face (F2F) delivery to be accessible to students to watch/read prior to sessions. More of the content-heavy "S3D Theory" to be made flipped classroom study for F2F classes.	More teaching content was replicated from the face-to-face delivery materials to online accessible slide-deck presentations as revision to F2F classes as well as flipped classroom content for upcoming classes.
The 2D Depth Cue content to have more emphasis and more examples to boost its importance in S3D storytelling.	More discussion group work so that merging of opinions and happens during S3D screenings as well as in F2F classes.	Inclusion of more short S3D clips to the face-to-face class content due to the success of learning from the group discussions
Triangulated data showed that S3D screenings were very important to learning. Therefore, more S3D content to be played every week to reinforce learning.	Make arrangements to allow more S3D screenings between set classes.	Have at least two S3D films viewed by course students prior to the S3D Theory sessions.
A higher quality demonstration of S3D technique (through polarised S3D models) for a better understanding of the S3D production process. It replaces the more basic anaglyph method for the same demonstration.	For screenings, mix S3D titles that are exemplars of S3D storytelling, as well as poor examples for learning.	Within the in-class screenings play S3D exemplars and stop at points to discuss exemplar moment recognition, and how it relates to the story.
Downloadable content for each session to be made available to students after the session delivery for multiple viewings and revision. This is in the form of pdf copies of the slide deck presentations, as well as links to extra online reading content.	More online S3D content for class revision as well as broader scope for students who are looking for more at this early introductory course level.	
Choice of screening titles to be discussed with the class in regard to lineage of S3D progression. The fact that early S3D productions did not necessarily employ the best examples of what S3D can do for storytelling. More recent S3D titles to be used in the screening and discussion sessions to evidence great examples in the initial stages.		
The content within the S3D Techniques session to be moved earlier in the schedule so that students get the benefit of the importance of specific tricks and techniques during the initial S3D screenings.		

Figure 8-2

Screenshot of 2019 online "Intro to S3D" course – S3D Theory #1

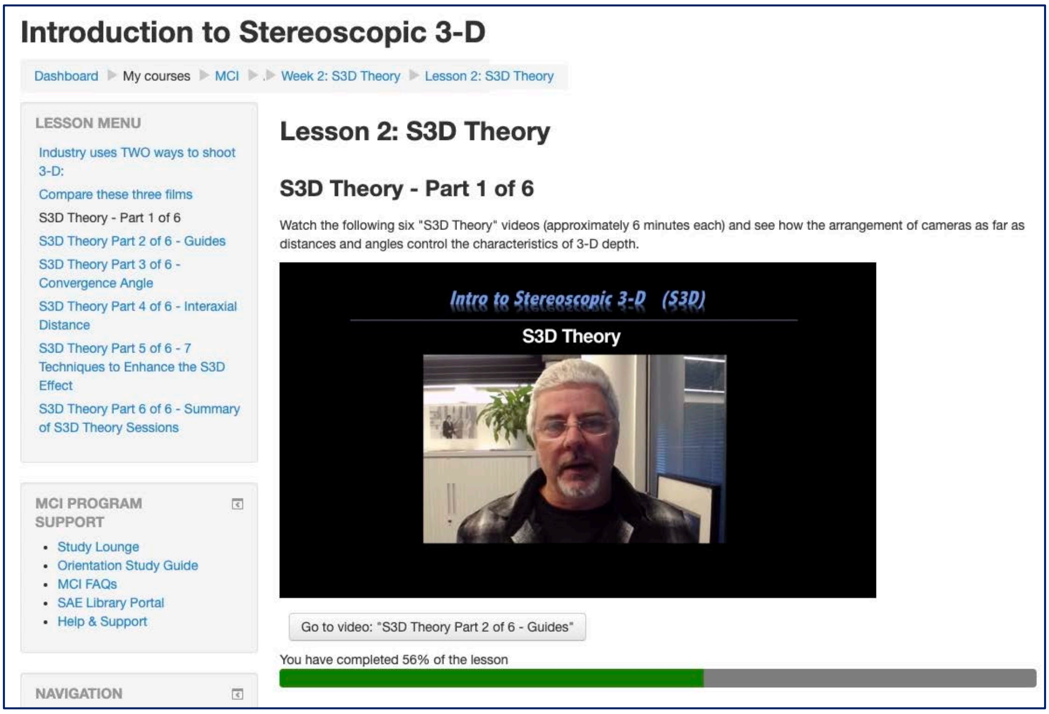
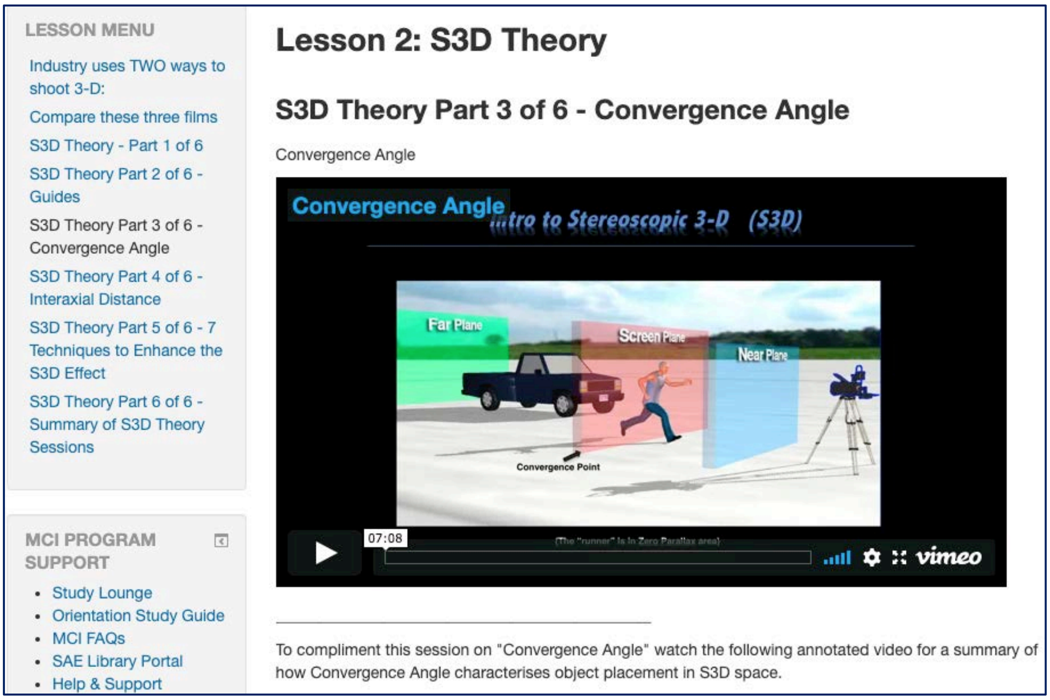


Figure 8-3

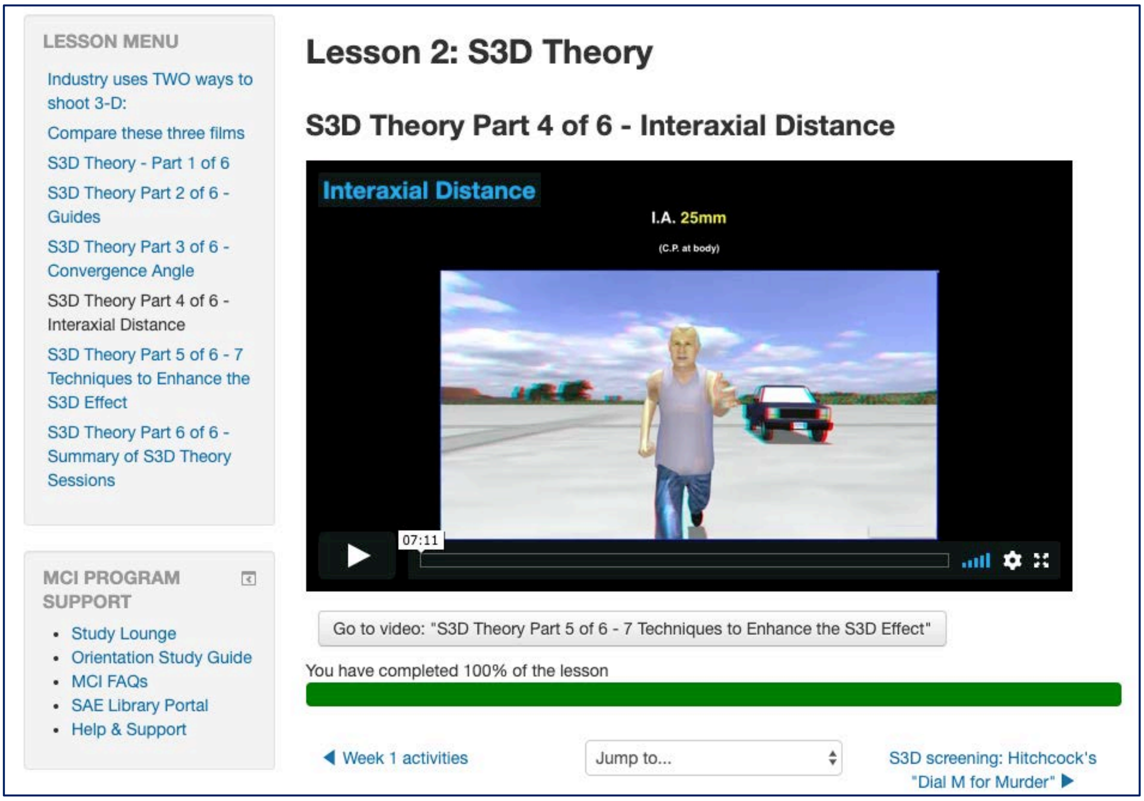
Screenshot of 2019 online "Intro to S3D" course – S3D Theory #2



Note. Screenshots from the 2019 version of the online Higher Education "Introduction to Stereoscopic 3-D" course. This curriculum is a result of the refinement of the coursework from over the period of this research. Images used by permission of the author.

Figure 8-4

Screenshot of 2019 online "Intro to S3D" course – S3D Theory #3



Note. A screenshot from the 2019 version of the online Higher Education "Introduction to Stereoscopic 3-D" course. This curriculum is a result of the refinement of the coursework from over the period of this research. Image used by permission of the author.

The three Events' results for the use of the S3D grammar model as an 'S3D Curriculum Resource' shows the lineage of the course feedback, and includes significant refinements from all three Event research periods (Table 8-3). The ultimate rendition of the "Introduction to Stereoscopic 3-D" course was a Higher Education five-credit-point module delivered online to Higher Education students from 2017 to present (Figure 8-2, Figure 8-3, Figure 8-4, Figure 8-5, and Figure 8-6, and Appendix H).

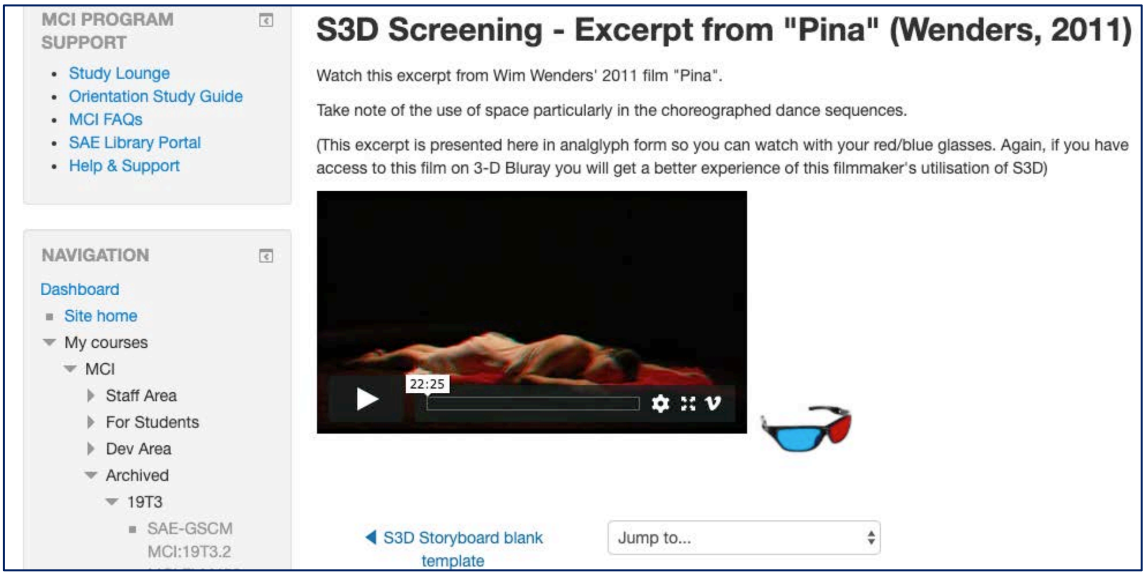
A pooling of all the research data from all three Event's, resulted in a smoother delivery to the coursework, as well as a higher level of technological teaching, with the inclusion and refinement of the "live" demonstration of the polarised variable changes to S3D on-screen. The immediacy of this polarised approach to showing the students the result of changes in S3D parameters, was evidenced in the feedback (Table 7-5, Table 7-14, Table 7-23), and is a technological leap forward in face-to-face "Introduction to S3D" course delivery.

Included in the final “Intro to S3D” delivery model is flipped classroom content that provide viewing of S3D film sequences via social media players embedded into the online coursework. For completely online courses these can be viewed via anaglyph (red/blue) glasses method so that *all* S3D examples can be viewed on *any* screen without specialised 3-D viewing facilities if they are not available. For students who are able to attend some sessions on campus, they potentially have access to fully polarised 3-D screenings of S3D films as a part of the coursework. The online coursework content also includes custom animations that were created using Pre-visualisation software to deliver negative parallax/positive parallax S3D screen theory online (Figure 8-3).

In light of the incorporation into this coursework of this study’s new S3D model characteristics (grammar model), the required viewing of the many S3D films that was an inherent part of this coursework, brought together both aspects of this research into one. So, this refined coursework is an informed teaching design, and also includes the refined grammar model from this research. It not only teaches film students how to create S3D, but also how to create S3D within the new framework of a refined structuralist grammar model, and most importantly, how to apply each of these aspects to benefit a film’s story. The multiple S3D screenings that occurred throughout the coursework along with the group discussions, was not only a method by which this research was undertaken, but proved to be an imperative aspect to the student’s learning.

Figure 8-5

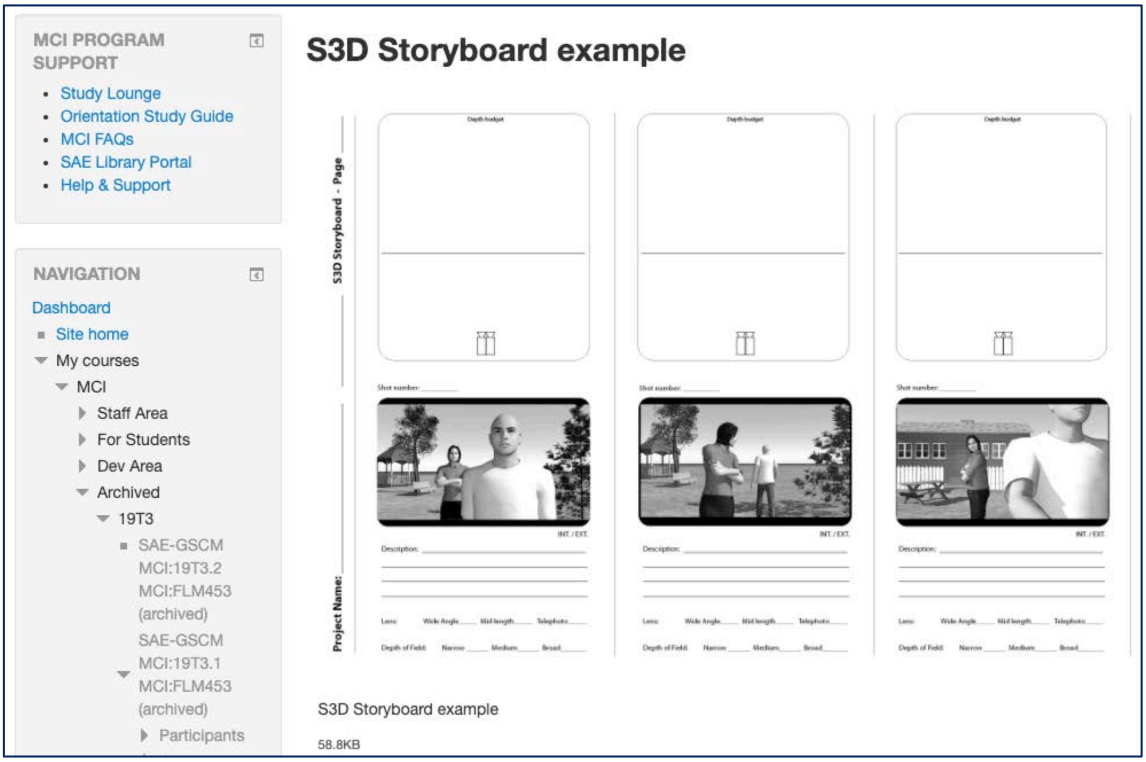
Screenshot of 2019 online “Intro to S3D” course – S3D Screening Excerpt



Note. A screenshot from the 2019 version of the online Higher Education “Introduction to Stereoscopic 3-D” course. Image from “Pina” (Wenders, 2011) owned by Neue Road Movies but used under fair use for purposes of research, criticism, and review.

Figure 8-6

Screenshot of 2019 online "Intro to S3D" course – S3D Storyboard



Note. A screenshot from the 2019 version of the online Higher Education "Introduction to Stereoscopic 3-D" course. (Example S3D Storyboard as shown is in Appendix K in more detail). This curriculum is a result of the refinement of the coursework over the period of this research. Image used by permission of the author.

The inclusion of group screenings and discussions to the coursework created the window by which students learned the application of S3D to story. The triangulation aspect of this research methodology meant that, where a mix of films is studied by a different group of individuals for each Event, this would ensure a higher quality of data sourced. Any similar attributes identified across these individual Events were reinforced when these attributes replicated across two or more Events.

Robert Yin's concept of triangulation (2011) in relation to this case study's results, where three Event's findings were replicated, suggests that as there is evidence of established general conclusions, then a model can be constructed and analysed as a result.

The outcomes of the research for the first aim of this study, became a model built on the sourced data reflecting the positive S3D attributes (or otherwise), of the films viewed for more advanced S3D application to their stories. These attributes were identified by the research participants after learning the concepts of S3D, and then putting these concepts to theoretical practice in light of structuralist film theory by the viewing of a cross-section of exemplar S3D films. The descriptive set of S3D characteristics that emerged from the separate "Introduction to Stereoscopic 3-D" courses, has formed an S3D design 'guidebook' of what works, what doesn't work, when specific S3D arrangements should be considered, and when certain S3D arrangements should not be considered. Such an S3D design 'guidebook' falls entirely within the structuralist and formalist film theories of creating a film story, being greater than the surface level image as it appears. Just as other film disciplines become a greater part as a whole than its initial individual usage, this S3D design 'guidebook' is an S3D grammar model for contributing to a greater result than the simplest single addition that it may initially appear to be.

The final incarnation to date of this "Introduction to Stereoscopic 3-D" coursework that sets it apart from other known Stereoscopic 3-D coursework, is the application and inclusion of the now refined S3D grammar model through the structuralist film eyes of a storyteller. Training undergraduate film students to be able to 'read' S3D in a film, like they would 'read' cinematography in a film, is now the overarching umbrella of this coursework, from which all the technical aspects of S3D is supported.

8.2 Recommendations for Future Research

If Stereoscopic 3-D film returns commercially in popularity, there is a significant opportunity for S3D film producers to relinquish their timidity in the use of 3-D within film production. From this research it can be seen that such film studio timidity is more realistically a likely result of a lack of knowledge of the potential of S3D to storytelling, than any creative decision not to pursue it more fully.

Despite a commercial downturn in broad S3D viewing interest in the second decade of the 21st century, S3D film titles were still being released by these major studios. Many of these new S3D film titles were produced in S3D via the post-conversion method so they were cheaper to produce, and they also benefit from the advanced technological post-conversion processes of more recent times. This means that not only are existing 3-D film devotees placated in terms of any fears of future S3D unavailability, the opportunity for new S3D aficionados to enter the scene is also still vibrant and open for future expansion. Continued 3-D research within production circles will still develops further avenues of S3D film grammar exploration into the future, but only if S3D is welcomed back into the arms of a non-binary public with the ability of viewing S3D without any of the historical issues that inhibited better S3D cinema.

As previously mentioned, subsequent to this research there is an opportunity for further research in the application of S3D grammar, in the area of gaming, and other newer future immersive technologies that involve S3D. Although the outcomes of this research are significantly embedded in the storytelling and film language aspects of S3D within cinema and therefore in formalist but more likely structuralist film theory, a porting of these S3D concepts has a high potential for inclusion in gaming – particularly when gaming starts to take on more storytelling concepts as it evolves. Opportunities for such further research in S3D will also be needed in exploration of the new media area of virtual reality 360-degree vision that will incorporate S3D in the coming years. The complete end-game of virtual reality 360 is still an unknown in regards to what form (if any) such implementation of storytelling will be required.

Traditionally structured movie entertainment in this medium requires quite different concepts than S3D cinema stories do. S3D cinema is just one more logical step forward for traditional cinema, whereas the virtual reality 360-degree medium is a significantly different concept as far as visual representation. Nevertheless, research into the use of Stereoscopic 3-D within 360-degree virtual reality technology is happening at the time of writing of this research project at the School for Cinematic Arts at the University of Southern California (Cinema.usc.edu, 2020).

As far as future research recommendations for technical Stereoscopic 3-D concepts, the design of complete, and user-friendly stereoscopic camera rigs, is far behind requirements for being able to adequately control the S3D characteristics described in this research. Widespread planning of television broadcasts in Stereoscopic 3-D was underway for the 2012 Olympic Games (First Live 3D Olympic Games for London 2012, 2011), using multi-camera sports broadcasting with easy-to-handle, compact and functional S3D camera rigs (Panasonic Australia, 2011, p. 1). The Panasonic branded camera designed and chosen for this purpose was the highest quality turn-key S3D video camera of its kind available at that time, yet is still below requirements to adequately implement the S3D results from this study. The gap between this S3D Panasonic camera prototype (designed for sports broadcasting), and cinema-quality S3D rigs for the highest professional cinema level, is an area where research in view of manufacture would create the ability for many people to create S3D films (using S3D for story as presented by the research from this study), without requiring significant money and infrastructure to create. Such a design would build confidence in the area of S3D, and in particular, in developing S3D in its use for story.

8.3 Implications

The implications of this research are positive, with the potential to have a far-reaching influence if taken up by S3D film producers. These implications however, are not as far-reaching as originally expected by the researcher - not because the results of this study are disappointing, in fact the results of this study are quite exciting. Despite the rewarding financial returns of S3D cinema releases statistically (Figure 1-1 and Figure 1-2), the impetus for the film industry to continue with its pursuit of high quality Stereoscopic 3-D has slowed slightly in recent years. As a result, the general public's interest has slowed slightly also, taking some of the fervour out of the potential of this research study's results. As pointed out, major film studios are still releasing high-budget films in S3D, and the concept of S3D contributing more to story technique is ready to be applied for film-goers to benefit from. The implications of this study lead predominantly to the time in the future when S3D integration with feature filmmaking becomes more significant to serious film viewers. That will be after the novelty value of S3D has truly worn off, but the value *added* by S3D as a film tool is more highly prized, possibly due in part, to this research study.

8.4 Concluding Statements

The significance of this set of S3D grammar characteristics for the incorporation of better story-telling techniques serves two purposes. It not only opens the doors for the making of better S3D films by producers into the future, it is also a significant element in the evolution of teaching "Introduction to Stereoscopic 3-D" coursework to undergraduate (and post-graduate) film students. As a result of this study, the merging of this always evolving set of S3D depth model characteristics with future creative film language applications, can now be understood and taught using an always evolving curriculum of S3D. The blending of both of these aspects is the key to its value.

Possibly the simplest method of creating a more widespread awareness of what S3D is capable of achieving within film grammar, is to simply have the viewing public watch more S3D films. An increased familiarity of movie-goers with S3D will see viewers accept S3D's characteristics as a democratic informer of the grammatic story, just as traditional elements do. This conceivably is the answer to changing the perception of S3D in cinema into the future.

As with many such creative pursuits, not every S3D film is going to achieve a mix of fine S3D craftsmanship with finessed film grammar storytelling technique. However, the more that this understanding of S3D is broadly recognised, the better the S3D films will be in the future. Such a refinement of the role of S3D should begin to transcend the novelty aspect that S3D has endured, and place the S3D form as a tool in any of the schools of film theory, alongside the traditional cinematic tools used in filmmaking like sound, production design, colour, and drama.

As a result, the graphic representation of the distilled S3D grammar model from this research (presented in Figure 8-1) will hopefully serve as a theoretical framework for future studies in this field, that potentially will test and add to the set of found components drawn from this study.

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10 Appendices:

10.1 Appendix A - Informed consent form:

JAMES COOK UNIVERSITY
AUSTRALIA

INFORMED CONSENT FORM

PRINCIPAL INVESTIGATOR:	**David Crowe**
PROJECT TITLE:	**"A Curriculum Model for the Delivery of Stereoscopic 3-D Film Production Techniques: Keeping up to date with technological advances now and in the future"**
COLLEGE	**Education**

I understand the aim of this research study is to explore and determine a model of Stereoscopic 3-D (S3D) grammar that industry recognises as successful. S3D has tended to be an "in your face" and side-show style of attraction in its use in cinema, so exploring its use as a more integral part of cinema storytelling is the key here. This study will also use the results of the research to help build an education model of curriculum for delivery to tertiary film students. I consent to participate in this project, the details of which have been explained to me, and I have been provided with a written information sheet to keep.

I understand that my participation will involve class participation, interviews, questionnaires and focus groups and I agree that the researcher may use the results as described in the information sheet.

I acknowledge that:

- taking part in this study is voluntary and will in no way impact upon my otherwise formal undergraduate studies. Class sessions and results of this research study are being administered outside of normal class sessions and are completely separate of the academic requirements of the Bachelor of Film degree that I am studying at the college. I am aware that I can stop taking part in it at any time without explanation or prejudice and to withdraw any unprocessed data I have provided;
- that any information I give will be kept strictly confidential and that no names will be used to identify me with this study without my approval;
- confidentiality cannot be assured in focus groups.

(Please tick to indicate consent)

I consent to be included in video recordings as a class participant		**Yes**		**No**
I consent to my resultant film production work as a class participant being used in this study		**Yes**		**No**
I consent to be interviewed		**Yes**		**No**
I consent for the interview to be audio taped		**Yes**		**No**
I consent to complete a questionnaire		**Yes**		**No**
I consent to participate in a focus group		**Yes**		**No**

Name: *(printed)*	
Signature:	**Date:**

Cairns - Townsville - Brisbane – Singapore
CRICOS Provider Code 00117J

10.2 Appendix B - Course Survey (Case Study-2nd Event, April 2016)

10.2.1 Course Survey Example (Case Study-2nd Event, April 2016). Page 1

2016 "Intro to Stereoscopic 3D" Course Survey

Thank you for participating in this survey. Your feedback is important.

This survey is to be done after you have completed the "Intro to S3D" module and is about your responses to the coursework itself.

In order to get the benefit of your participation in this survey you are asked to comment on the coursework and how its structure helped or hindered the learning. Based upon your perceived learned knowledge from this coursework your answers will help refine the coursework into the future.

Thank you again for your participation.

- Researcher, David Crowe
david.crowe@my.jcu.edu.au

1. With the “Intro to S3D” course structured in 5 parts being:

1. Brief History of Stereoscopic 3-D (S3D)
2. S3D Theory (How It Works)
3. S3D Screening and Discussion
4. S3D Techniques & Benchmarks
5. S3D Storyboarding & S3D Into the Future

Were there any of these sectors that you consider to be instrumental in your understanding of the potential of S3D to help tell the story? If so, please describe.

1

10.2.2 Course Survey Example (Case Study-2nd Event, April 2016). Page 2

2. With your prerequisite understanding of the physics of how a film is made (i.e. aspects of cinematography, or sound design, or production design that inform a film's "story"), **how has your consideration of Stereoscopic 3-D's effect on story changed from when you started this "Intro to S3D" course?** (Answer ONE choice from the first three multiple choice questions, AND ALSO ONE answer from the last two multiple choice answers - so you will need to have TWO CHECKED CHOICES IN TOTAL from the below list).

- ◯ I think that S3D has only a slight influence on story when compared to the sound design, production design, etc. effect on story
- ◯ I think that S3D has roughly the same amount of influence on story when compared to the sound design, production design, etc. effect on story
- ◯ I think that S3D has significantly more influence on story than the influence of sound design, production design, etc. on story
- ◯ My opinion on how much effect S3D has on story HAS CHANGED since doing this "Intro to S3D" coursework
- ◯ My opinion on how much effect S3D has on story HAS NOT CHANGED since doing this "Intro to S3D" coursework

Please expand on your answer here if you wish:

3. After viewing the listed S3D films as a component of the "Intro to S3D" course, were there any particular S3D films that provided any "aha" moments for you regarding application to story? If so can you identify which moments or scenes specifically made an impression on you as to S3D's impact on telling the story?

4. Did such identifying moments get discussed in your class amongst the "Intro to S3D" course's students?

- ◯ Yes
- ◯ No
- ◯ Not applicable

5. Which aspects of the "Intro to S3D" course do you think worked well in your learning?

2

10.2.3 Course Survey Example (Case Study-2nd Event, April 2016). Page 3

6. Which aspects of the course could be improved upon and why?

7. Could any of the 5 sectors be elaborated upon in the coursework for clearer learning? If so, please describe:

8. Are there any of the 5 sectors in the coursework that you think should be reduced for any reason? Please describe:

3

10.3 Appendix C - S3D Class Screening Example

The Auditorium that the “Introduction to S3D” coursework was delivered in. This is an example of a class watching an S3D film in this facility.

10.4 Appendix D - Copyright Compliance Table

Copyright Compliance Table - Page 1 of 3

Higher Degree Research Candidate Name: David Crowe

Date	*Page of Thesis*	*Copyright Item*	*Amount in relation to the whole work*	*Nature/Quality of item utilised (essential, important or material part of the item)*	*Substantial Part (Yes/No)*	*Fair Dealing (Yes/No)*	*Other Exception*	*Permission Required and Requested (Yes/No)*	*Permission Obtained (Yes/No)*	*Remaining Issues*
1st May 2020	50	Figure 4-2. Still-frame from feature film "Gravity" (Cuarón, 2013)	Less than 1%	Not significantly important. Is indicative of S3D critique in text description	No	Yes	Fair use for purposes of research, criticism, and review	No	NA	NA
1st May 2020	50	Figure 4-2. Still-frame from feature film "Hugo" (Scorsese, 2011)	Less than 1%	Not significantly important. Is indicative of S3D critique in text description	No	Yes	Fair use for purposes of research, criticism, and review	No	NA	NA
1st May 2020	60	Figure 5-1. Graph from Graphics & Media Lab at Moscow State University (Voronov et al, 2013)	Less than 1%	Moderately important	No	Yes	Fair use for purposes of research	No	NA	NA
1st May 2020	61	Figure 5-2. Graph from Graphics & Media Lab at Moscow State University (Voronov et al, 2013)	Less than 1%	Moderately important	No	Yes	Fair use for purposes of research	No	NA	NA

Copyright Compliance Table - Page 2 of 3

Date	*Page of Thesis*	*Copyright Item*	*Amount in relation to the whole work*	*Nature/Quality of item utilised (essential, important or material part of the item)*	*Substantial Part (Yes/No)*	*Fair Dealing (Yes/No)*	*Other Exception*	*Permission Required and Requested (Yes/No)*	*Permission Obtained (Yes/No)*	*Remaining Issues*
1st May 2020	83	Figure 5-10. Still-frame from feature film "Journey to the Center of the Earth" (Brevig, 2005)	Less than 1%	Not significantly important. Is indicative of S3D critique in text description	No	Yes	Fair use for purposes of research, criticism, and review	No	NA	NA
1st May 2020	83	Figure 5-11. Still-frame from feature film "Journey to the Center of the Earth" (Brevig, 2005)	Less than 1%	Not significantly important. Is indicative of S3D critique in text description	No	Yes	Fair use for purposes of research, criticism, and review	No	NA	NA
1st May 2020	84	Figure 5-12. Still-frame from feature film "Journey to the Center of the Earth" (Brevig, 2005)	Less than 1%	Not significantly important. Is indicative of S3D critique in text description	No	Yes	Fair use for purposes of research, criticism, and review	No	NA	NA
1st May 2020	90	Figure 5-15. Still-frame from feature film "Gravity" (Cuarón, 2013)	Less than 1%	Not significantly important. Is indicative of S3D critique in text description	No	Yes	Fair use for purposes of research, criticism, and review	No	NA	NA
1st May 2020	91	Figure 5-16. Still-frame from feature film "Gravity" (Cuarón, 2013)	Less than 1%	Not significantly important. Is indicative of S3D critique in text description	No	Yes	Fair use for purposes of research, criticism, and review	No	NA	NA

Copyright Compliance Table - Page 3 of 3

Date	*Page of Thesis*	*Copyright Item*	*Amount in relation to the whole work*	*Nature/Quality of item utilised (essential, important or material part of the item)*	*Substantial Part (Yes/No)*	*Fair Dealing (Yes/No)*	*Other Exception*	*Permission Required and Requested (Yes/No)*	*Permission Obtained (Yes/No)*	*Remaining Issues*
1st May 2020	116	Figure 5-27. Still-frame from feature film "Mad Max: Fury Road" (Miller, 2015)	Less than 1%	Not significantly important. Is indicative of S3D critique in text description	No	Yes	Fair use for purposes of research, criticism, and review	No	NA	NA
1st May 2020	123	Figure 5-31. Still-frame from feature film "The Martian" (Scott, 2015)	Less than 1%	Not significantly important. Is indicative of S3D critique in text description	No	Yes	Fair use for purposes of research, criticism, and review	No	NA	NA
1st May 2020	123	Figure 5-32. Still-frame from feature film "The Martian" (Scott, 2015)	Less than 1%	Not significantly important. Is indicative of S3D critique in text description	No	Yes	Fair use for purposes of research, criticism, and review	No	NA	NA
1st May 2020	266	Figure 8-5. Still-frame from feature film "Pina" (Wenders, 2011)	Less than 1%	Not significantly important. Is indicative of S3D critique in text description	No	Yes	Fair use for purposes of research, criticism, and review	No	NA	NA
1st May 2020	288	Appendix C. Still-image of David Crowe delivering class	Less than 1%	Not significantly important. Students in photograph have mosaiced faces for anonymity	No	Yes	Private photo. No student recognition	No	NA	NA

10.5 Appendix E - Extract from 1st Event Group Discussion transcript

	"Mad Max: Fury Road" (Miller, 2015) Case Study–1st Event April 2016
	Discussion recorded as notes by David Crowe on 12th April 2016.
Researcher/Student #	***Question & Answer***
Researcher	***What are your first impressions of the employment of S3D in the movie excerpts just watched?***
Student #1	Great setting for the movie [Namibian desert] but a lot of cardboard cut-out style 3-D noticeable throughout the otherwise great cinematography. Mostly broad depth of field shots (with little soft-focus background shots) used, then added to by cardboard cut-out 3-D.
Student #2	Quite obvious 3-D. Seemed like the filmmaker was a first-time user of 3-D and felt the need to use it all the time just because it was there. It appears to be a post-converted process of 3-D and some shots did not work well in the conversion.
Researcher	***How were your 3-D impressions manifested?***
Student #3	A big dose of 3-D in both negative space and positive space is used in most of this film.
	Hard to forget the flattened but layered 3-D look to some shots.
Student #4	Reminded me of "Clash of the Titans" in some parts as far as the cardboard pop-up look. It seems a bit careless to be honest [to use post-conversion process] when you have all other aspects of the film having so much attention to detail.
Student #5	Some shots looked cardboard cut-out but others with shadows and sidelight didn't. Maybe the post-converted process needs to use more 2D depth cues used to stop the cardboard cut-out look.
Student #2	Slightly blurred background and foreground [depth of field] makes the flattened "converted" look in this film look worse.
Researcher	***How would you describe the use of negative and positive parallax in the sequences viewed? (i.e. was much of the 3-D space utilised?)***
Student #5	A lot of negative parallax space used for the 3-D particularly with sand/smoke/burning matter particles around the near space. This was odd to view as it seemed to be the filmmakers used the 3-D space just because it needed filling rather than it be there for any other reason.
Student #6	Quite a big reach of foreground and background space is used even though the story doesn't seem to require its use. The 3-D is all there all the time and is conspicuous for this reason. If it were used "at the right time" it might have worked more effectively in this film.
Researcher	***For the sequences that utilised only a limited amount of negative and positive parallax describe what you felt about the presence of the third dimensional aspect (i.e. did the third-dimension draw attention to itself, or was it not immediately obvious that a 3-D element was in use?)***
Student #7	Scenes in the cabin of the truck rig where everything was quite close, and was mostly talking scenes worked fine in 3-D - I even forgot it was 3-D in some of these shots. But then there were the shots that brought home some bad 3-D so it was jarring.
Student #1	The busy truck cabin interior with bits and pieces, chains, rust, lots of detail looked good in 3-D.
Researcher	***Did you notice any significant variations in the use of S3D in this film sequence from scene to scene? For instance, did the amount of negative and positive parallax space usage change noticeably as the story progressed?***

Student #7	The variation was noticeable between shots that had the cut-out 3D look and shots that looked ok in 3D. It was distracting to watch this film with cut-out 3D shots appearing from time to time.
Student #5	The huge desert location made the trucks and the characters stand out in 3-D. In some scenes characters were on an infinite desert that stretched to the horizon. This gave the 3-D more strength, and made the desert seem like a much bigger place to escape through.

	"Gravity" (Cuarón, 2013) Case Study–1st Event April 2016
	Discussion recorded as notes by David Crowe on 19th April 2016.
Researcher	***What are your first impressions of the employment of S3D in the movie excerpts just watched?***
Student #1	The size of the big screen viewing helped with the sense of expanse of space especially as the S3D effect was really effective.
Student #2	It seems like space-based and gravity-free environments where people float - like maybe underwater, or trapeze artist storylines - maybe suits 3-D stories really well (?)
Student #3	We are floating in space along with [these characters] - and doing it with a big screen, and in great 3-D - [means] I believe I'm floating in big space out there with them. This story fits the sum of the parts really well, and I feel like I've just watched a much bigger film than most films are.
Researcher	***How were your 3-D impressions manifested?***
Student #2	The more successful looking S3D so far of the S3D films we've viewed was from a film set in the least likely location that any of the film's viewers is likely to ever experience for themselves - being outer space.
Student #3	This film is a post-converted S3D film so one of the best looking S3D films so far is not twin stereo real-world cameras either!
Researcher	***How would you describe the use of negative and positive parallax in the sequences viewed? (i.e. was much of the 3-D space utilised?)***
Student #4	Not overused which was nice but in space you kind of expect some depth if you go to the movie knowing it's a 3D movie.
Student #2	I'm seeing a slightly narrower depth of field in the better of the S3D shots. It looks like the 3-D is better with a slightly blurred background and foreground.
Student #4	I forgot about the 3D after a while except for wearing the 3D glasses.
Student #3	Did anyone else notice that Chiaroscuro-style side-lighting made the astronauts pop out of the dark of outer space? That's a good example of the 2-D Depth Cues we covered in the coursework.
Researcher	***For the sequences that utilised only a limited amount of negative and positive parallax describe what you felt about the presence of the third dimensional aspect (i.e. did the third-dimension draw attention to itself, or was it not immediately obvious that a 3-D element was in use?)***
Student #6	Even though the S3D expanse seemed quite noticeable there were only three objects in the opening shot from which any S3D effect could be seen. Earth, Space Shuttle orbiting the Earth, and a space-walking astronaut.
Researcher	***Did you notice any significant variations in the use of S3D in this film sequence from scene to scene? For instance, did the amount of negative and positive parallax space usage change noticeably as the story progressed?***
Student #7	There wasn't much 3D inside the capsules, but more 3D when they were outside the capsules and space stations.

10.6 Appendix F - Email to Undergraduate Film Students About "Intro to S3D" Course

Dear Dayse,

As I have mentioned to some recently in my film classes, there is now an opportunity for interested film students to undertake a voluntary six session module on **"Introduction to Stereoscopic 3D (S3D)"**. It is an intro to how S3D works, how most S3D films use 3-D, and how to plan your own S3D production. It will likely be run over six Saturdays in the SAE Auditorium on Saturdays from 1pm till 4pm and I hope to begin this Saturday 25th June. This is a call out for students who may want to attend this.

This "Intro to S3D" will be a trial subject that I have run previously (and will run again in 16T3) and it is important that you are aware that this is extra to your degree requirements. In other words your participation in this module is voluntary and is completely separate from your enrolled film degree, and also there is no associated extra cost to do this.

There is no expectation that students need to do this for their degree but I expect students who might be interested in how Stereoscopic 3D works and how to read a 3-D film will want to do this. There will be a production component to this topic but this will likely be covered in more detail in a second set of classes to come later. There will be some surveys and interviews required of students associated with this first delivery to help streamline the topic for future delivery.

There is a prerequisite for this S3D module of having passed the **MDU116 Intro to Cinematography & Film Production** module (or VET equivalent) as basic camera skills are required knowledge for this. I also need to have students who know that they can attend each of the six classes. If you think there is a risk that you may miss one then this is not the time to do this module.

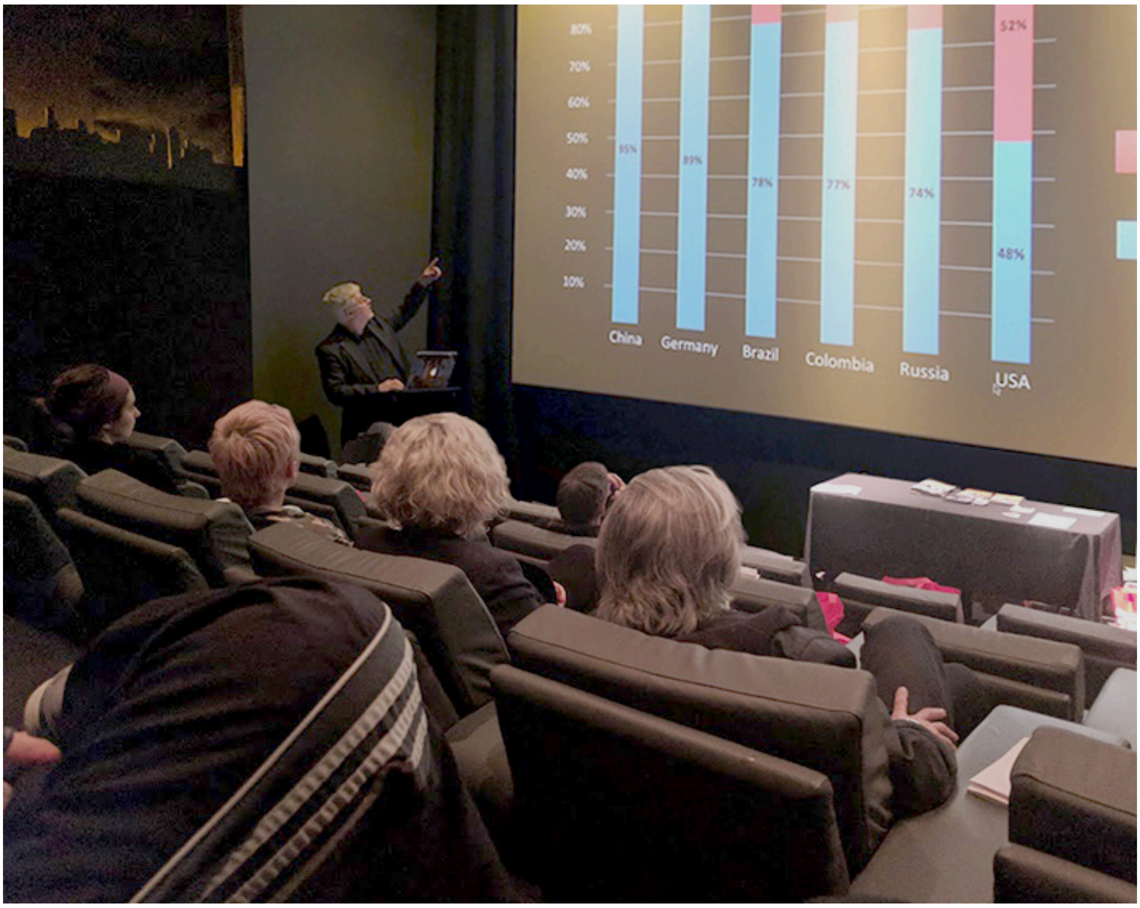
Please email me directly at d.crowe@sae.edu if you are interested in participating in this extra module and it will be first-in-first-served for a maximum of ten students to start. I will make a standby list after ten seats are filled.

Cheers,

David Crowe

Film Dept. Coord.

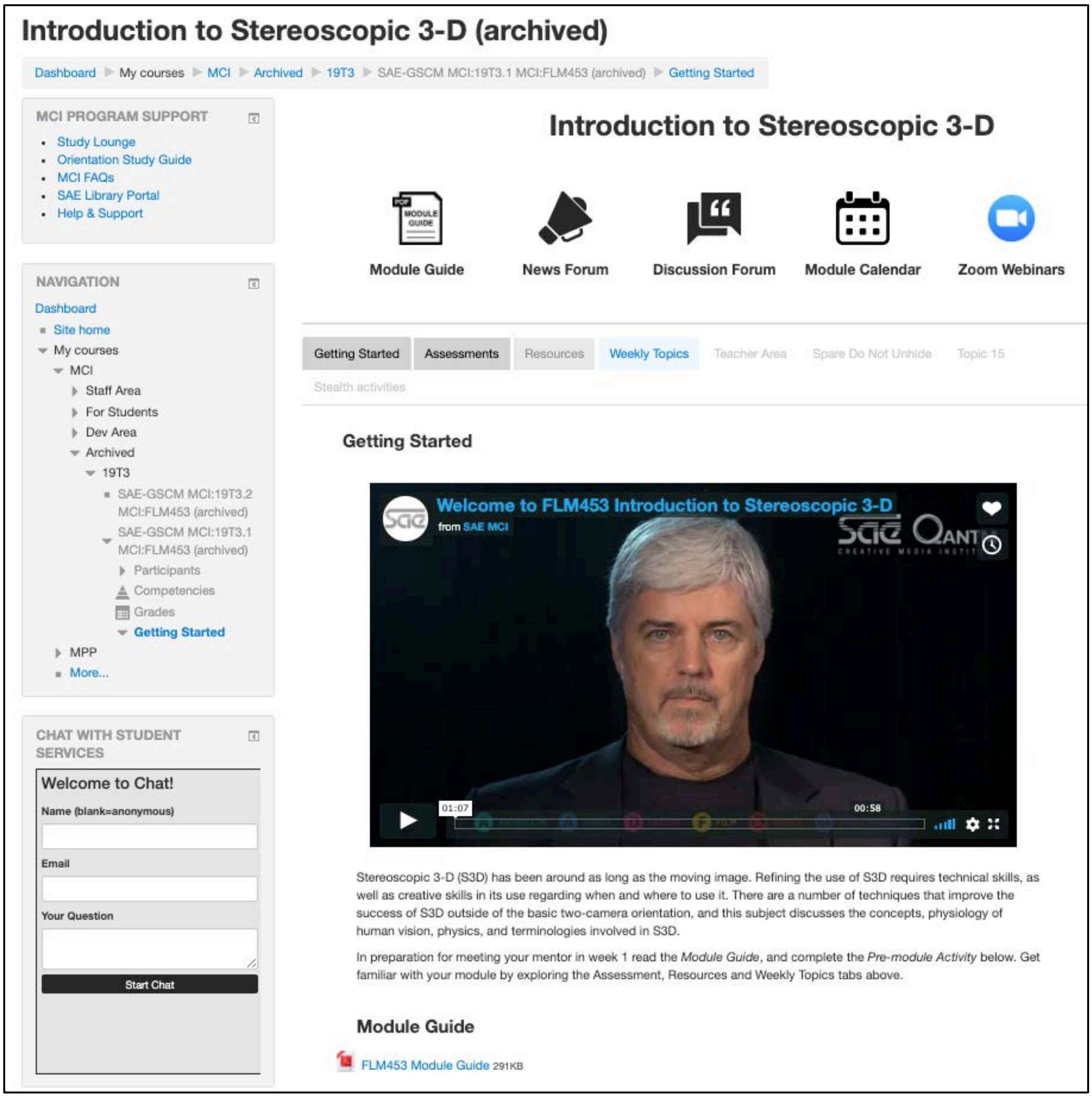
10.7 Appendix G - Seminar Presentation at Revelation Academic Conference 2018

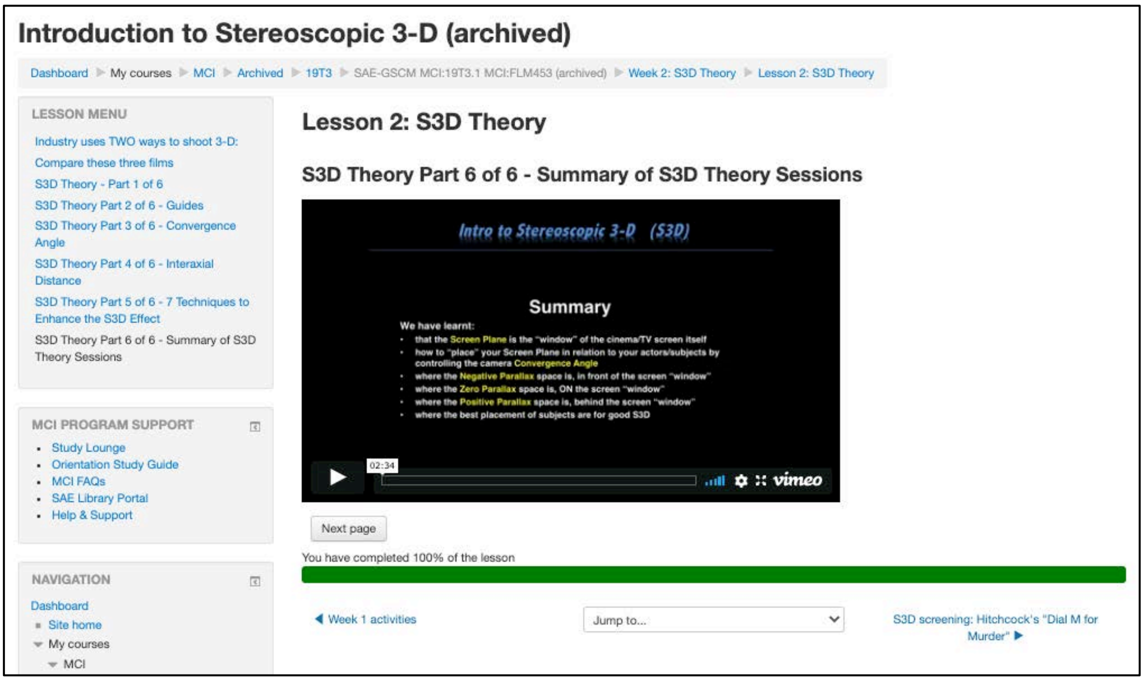


August 2018 presentation of work in progress of researcher's thesis at Perth, WA, Revelation Academic Conference

10.8 Appendix H - Resulting "Introduction to S3D" Coursework 2019

Following are screenshots from the 2019 online version of the "Introduction to Stereoscopic 3-D" coursework that is the result of the refinement of the research in this study.





Introduction to Stereoscopic 3-D (archived)

Dashboard ▶ My courses ▶ MCI ▶ Archived ▶ 19T3 ▶ SAE-GSCM MCI:19T3.1 MCI:FLM453 (archived) ▶ Week 2: S3D Theory ▶ Lesson 2: S3D Theory

LESSON MENU

- Industry uses TWO ways to shoot 3-D:
- Compare these three films
- S3D Theory - Part 1 of 6
- S3D Theory Part 2 of 6 - Guides
- S3D Theory Part 3 of 6 - Convergence Angle
- S3D Theory Part 4 of 6 - Interaxial Distance
- S3D Theory Part 5 of 6 - 7 Techniques to Enhance the S3D Effect
- S3D Theory Part 6 of 6 - Summary of S3D Theory Sessions

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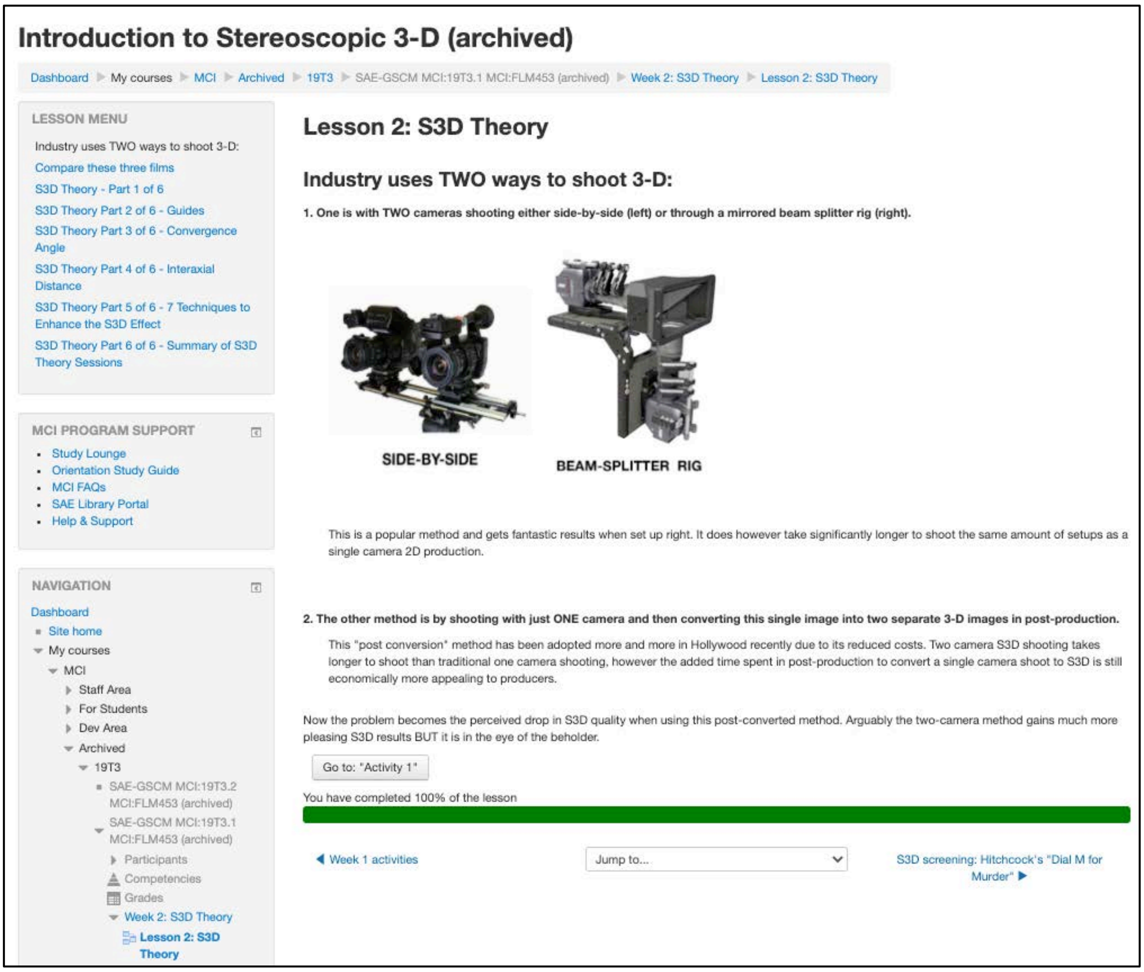
Lesson 2: S3D Theory

S3D Theory Part 6 of 6 - Summary of S3D Theory Sessions

Next page

You have completed 100% of the lesson

◀ Week 1 activities | Jump to... | S3D screening: Hitchcock's "Dial M for Murder" ▶



Introduction to Stereoscopic 3-D (archived)

Dashboard ▶ My courses ▶ MCI ▶ Archived ▶ 19T3 ▶ SAE-GSCM MCI:19T3.1 MCI:FLM453 (archived) ▶ Week 2: S3D Theory ▶ Lesson 2: S3D Theory

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- Industry uses TWO ways to shoot 3-D:
- Compare these three films
- S3D Theory - Part 1 of 6
- S3D Theory Part 2 of 6 - Guides
- S3D Theory Part 3 of 6 - Convergence Angle
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Lesson 2: S3D Theory

Industry uses TWO ways to shoot 3-D:

1. One is with TWO cameras shooting either side-by-side (left) or through a mirrored beam splitter rig (right).

SIDE-BY-SIDE | BEAM-SPLITTER RIG

This is a popular method and gets fantastic results when set up right. It does however take significantly longer to shoot the same amount of setups as a single camera 2D production.

2. The other method is by shooting with just ONE camera and then converting this single image into two separate 3-D images in post-production.

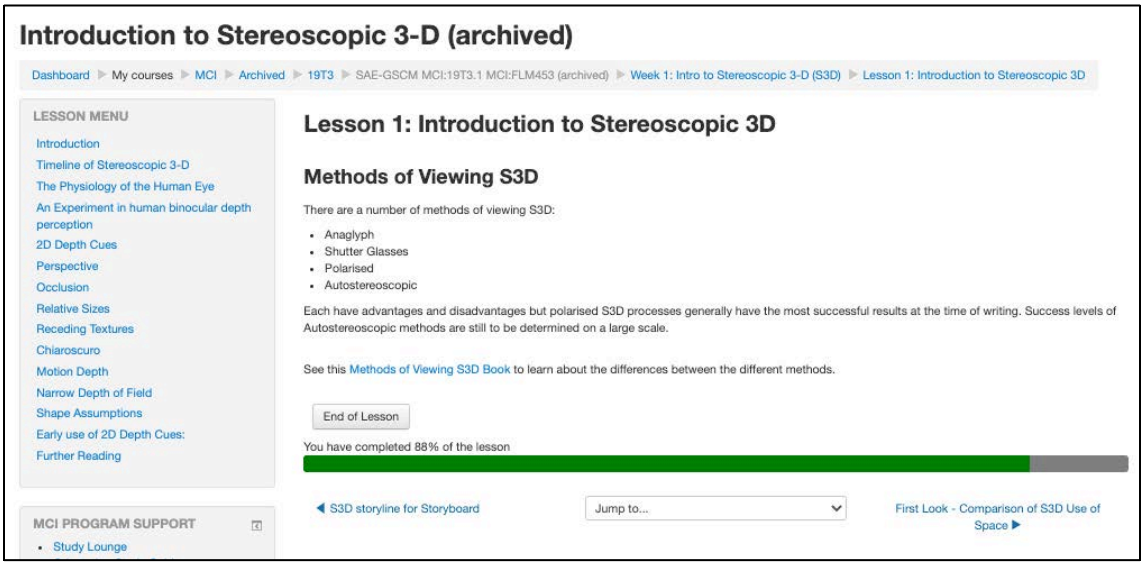
This "post conversion" method has been adopted more and more in Hollywood recently due to its reduced costs. Two camera S3D shooting takes longer to shoot than traditional one camera shooting, however the added time spent in post-production to convert a single camera shoot to S3D is still economically more appealing to producers.

Now the problem becomes the perceived drop in S3D quality when using this post-converted method. Arguably the two-camera method gains much more pleasing S3D results BUT it is in the eye of the beholder.

Go to: "Activity 1"

You have completed 100% of the lesson

◀ Week 1 activities | Jump to... | S3D screening: Hitchcock's "Dial M for Murder" ▶


Introduction to Stereoscopic 3-D (archived)
Dashboard ▸ My courses ▸ MCI ▸ Archived ▸ 19T3 ▸ SAE-GSCM MCI:19T3.1 MCI:FLM453 (archived) ▸ Week 1: Intro to Stereoscopic 3-D (S3D) ▸ Lesson 1: Introduction to Stereoscopic 3D
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An Experiment in human binocular depth perception
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Motion Depth
Narrow Depth of Field
Shape Assumptions
Early use of 2D Depth Cues:
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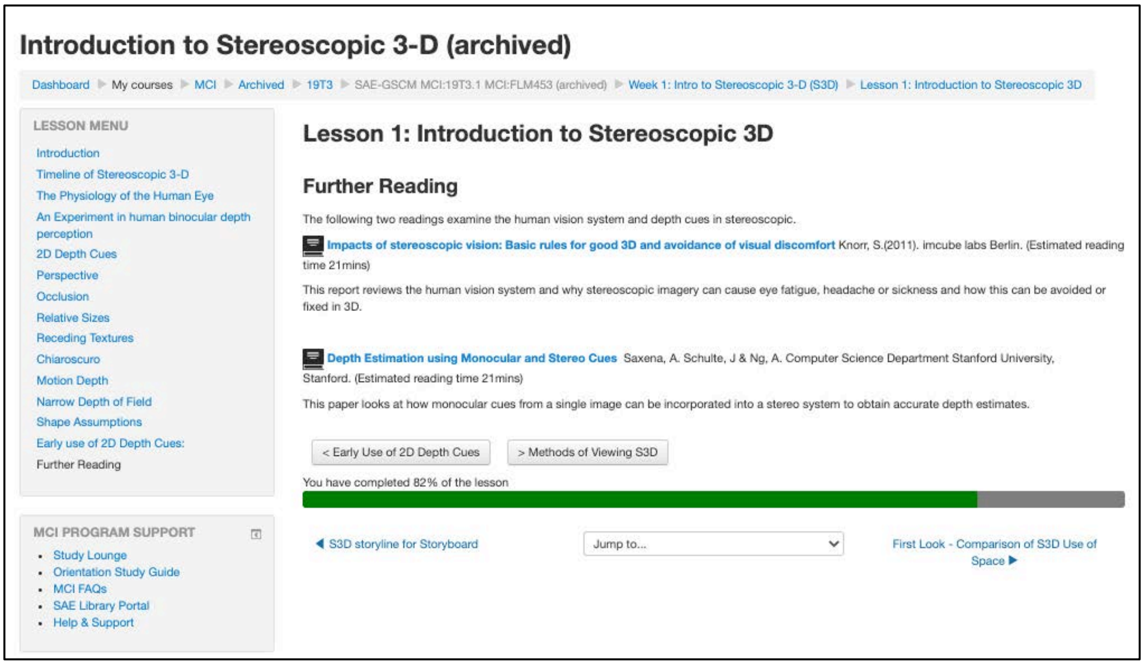
Methods of Viewing S3D
There are a number of methods of viewing S3D:
Anaglyph
Shutter Glasses
Polarised
Autostereoscopic
Each have advantages and disadvantages but polarised S3D processes generally have the most successful results at the time of writing. Success levels of Autostereoscopic methods are still to be determined on a large scale.
See this Methods of Viewing S3D Book to learn about the differences between the different methods.
End of Lesson
You have completed 88% of the lesson
S3D storyline for Storyboard
Jump to...
First Look - Comparison of S3D Use of Space


Introduction to Stereoscopic 3-D (archived)
Dashboard ▸ My courses ▸ MCI ▸ Archived ▸ 19T3 ▸ SAE-GSCM MCI:19T3.1 MCI:FLM453 (archived) ▸ Week 1: Intro to Stereoscopic 3-D (S3D) ▸ Lesson 1: Introduction to Stereoscopic 3D
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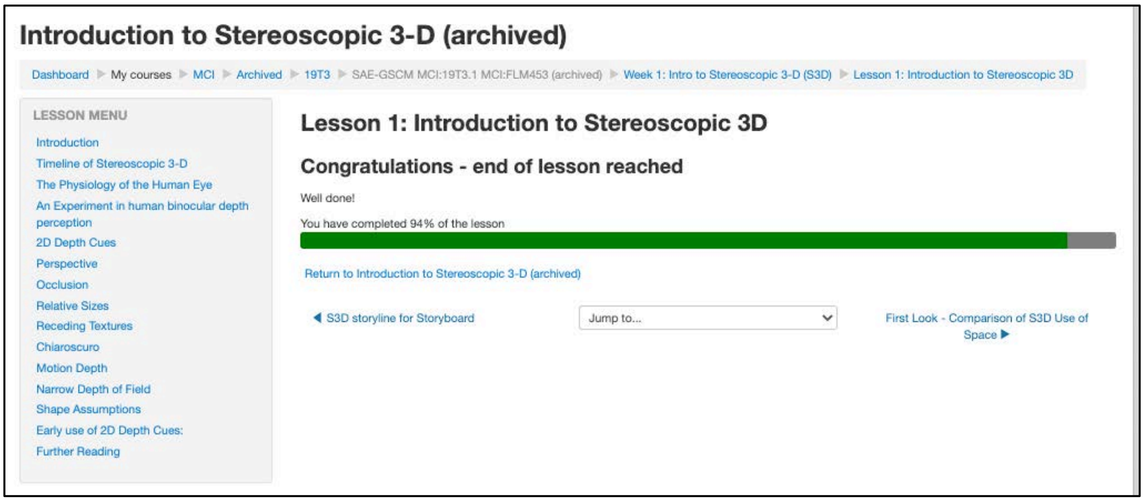
Further Reading
The following two readings examine the human vision system and depth cues in stereoscopic.
Impacts of stereoscopic vision: Basic rules for good 3D and avoidance of visual discomfort Knorr, S.(2011). imcube labs Berlin. (Estimated reading time 21mins)
This report reviews the human vision system and why stereoscopic imagery can cause eye fatigue, headache or sickness and how this can be avoided or fixed in 3D.
Depth Estimation using Monocular and Stereo Cues Saxena, A. Schulte, J & Ng, A. Computer Science Department Stanford University, Stanford. (Estimated reading time 21mins)
This paper looks at how monocular cues from a single image can be incorporated into a stereo system to obtain accurate depth estimates.
< Early Use of 2D Depth Cues
> Methods of Viewing S3D
You have completed 82% of the lesson
S3D storyline for Storyboard
Jump to...
First Look - Comparison of S3D Use of Space


Introduction to Stereoscopic 3-D (archived)
Dashboard ▸ My courses ▸ MCI ▸ Archived ▸ 19T3 ▸ SAE-GSCM MCI:19T3.1 MCI:FLM453 (archived) ▸ Week 1: Intro to Stereoscopic 3-D (S3D) ▸ Lesson 1: Introduction to Stereoscopic 3D
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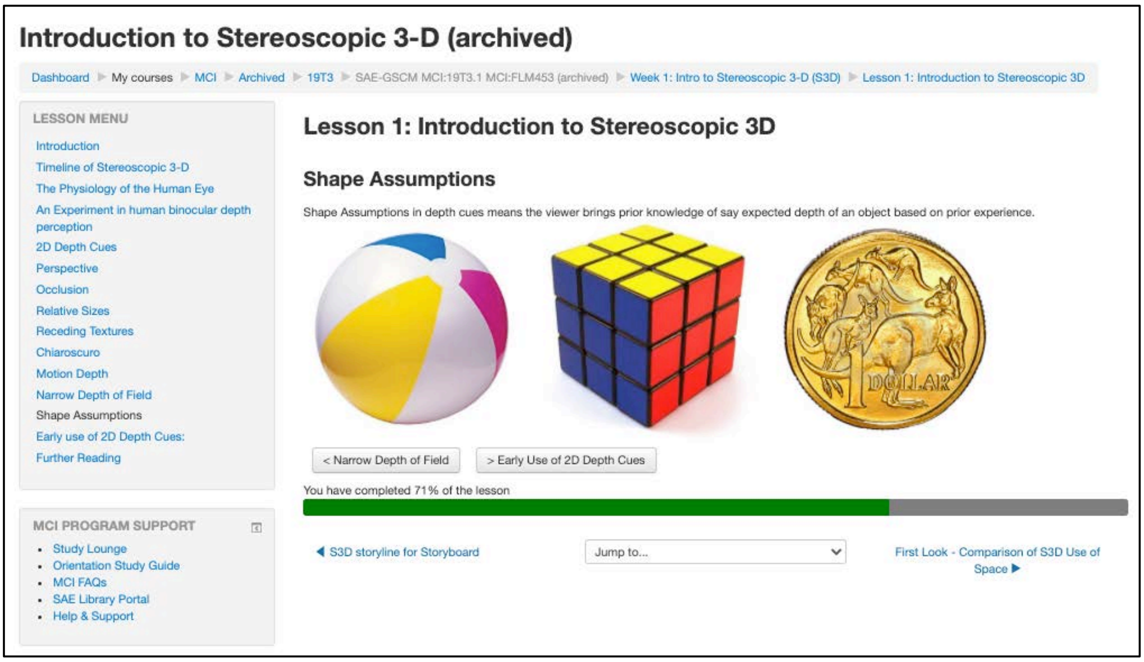
Shape Assumptions
Early use of 2D Depth Cues:
Further Reading
Lesson 1: Introduction to Stereoscopic 3D
Congratulations - end of lesson reached
Well done!
You have completed 94% of the lesson
Return to Introduction to Stereoscopic 3-D (archived)
S3D storyline for Storyboard
Jump to...
First Look - Comparison of S3D Use of Space


Introduction to Stereoscopic 3-D (archived)
Dashboard ▶ My courses ▶ MCI ▶ Archived ▶ 19T3 ▶ SAE-GSCM MCI:19T3.1 MCI:FLM453 (archived) ▶ Week 1: Intro to Stereoscopic 3-D (S3D) ▶ Lesson 1: Introduction to Stereoscopic 3D
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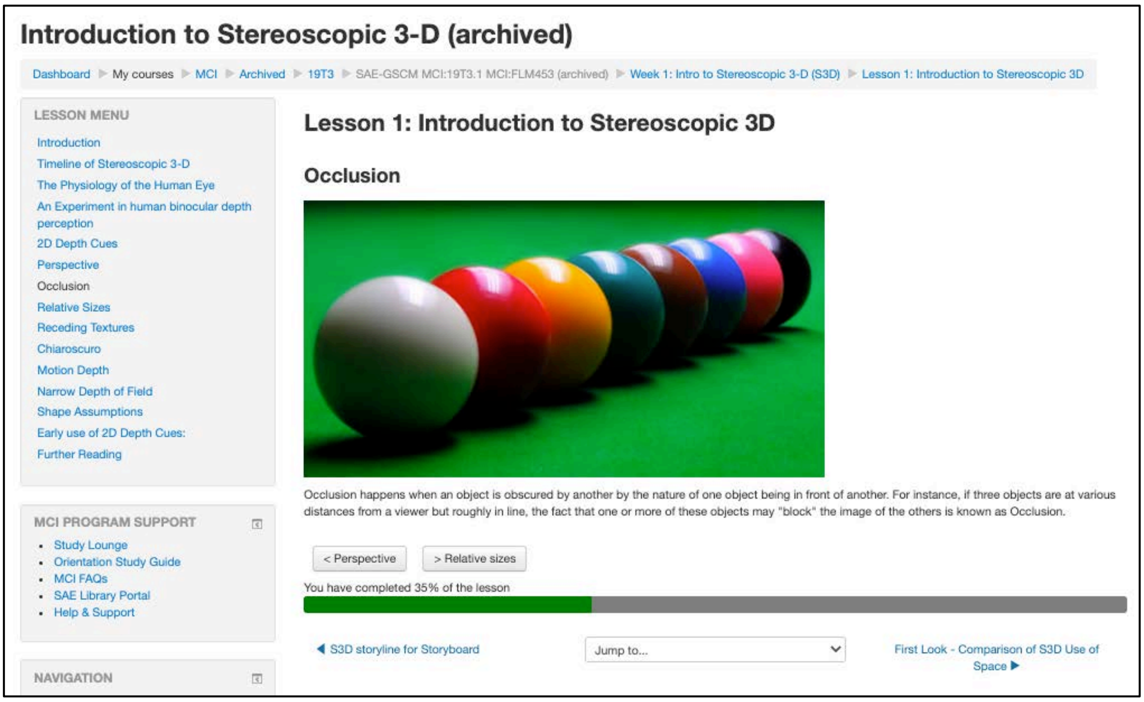
Shape Assumptions
Shape Assumptions in depth cues means the viewer brings prior knowledge of say expected depth of an object based on prior experience.
DOLLAR
< Narrow Depth of Field
> Early Use of 2D Depth Cues
You have completed 71% of the lesson
◀ S3D storyline for Storyboard
Jump to...
First Look - Comparison of S3D Use of Space ▶


Introduction to Stereoscopic 3-D (archived)
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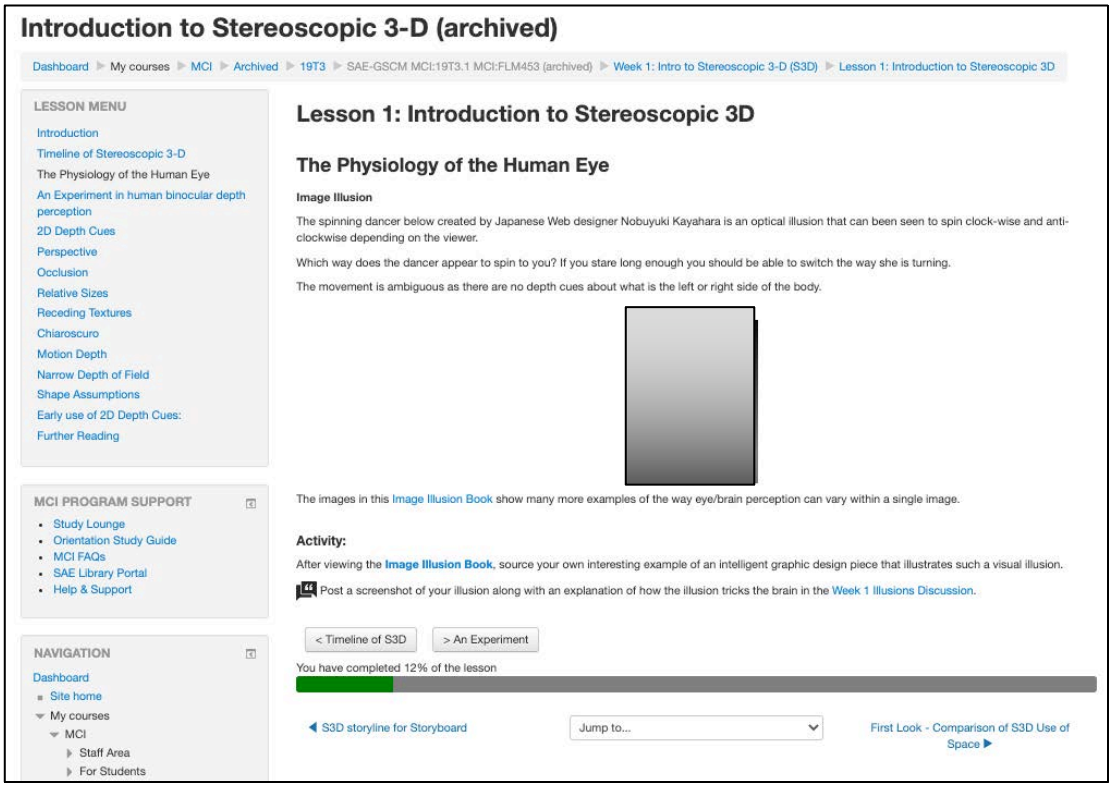
Occlusion
Occlusion happens when an object is obscured by another by the nature of one object being in front of another. For instance, if three objects are at various distances from a viewer but roughly in line, the fact that one or more of these objects may "block" the image of the others is known as Occlusion.
< Perspective
> Relative sizes
You have completed 35% of the lesson
◀ S3D storyline for Storyboard
Jump to...
First Look - Comparison of S3D Use of Space ▶


Introduction to Stereoscopic 3-D (archived)
Dashboard ▶ My courses ▶ MCI ▶ Archived ▶ 19T3 ▶ SAE-GSCM MCI:19T3.1 MCI:FLM453 (archived) ▶ Week 1: Intro to Stereoscopic 3-D (S3D) ▶ Lesson 1: Introduction to Stereoscopic 3D
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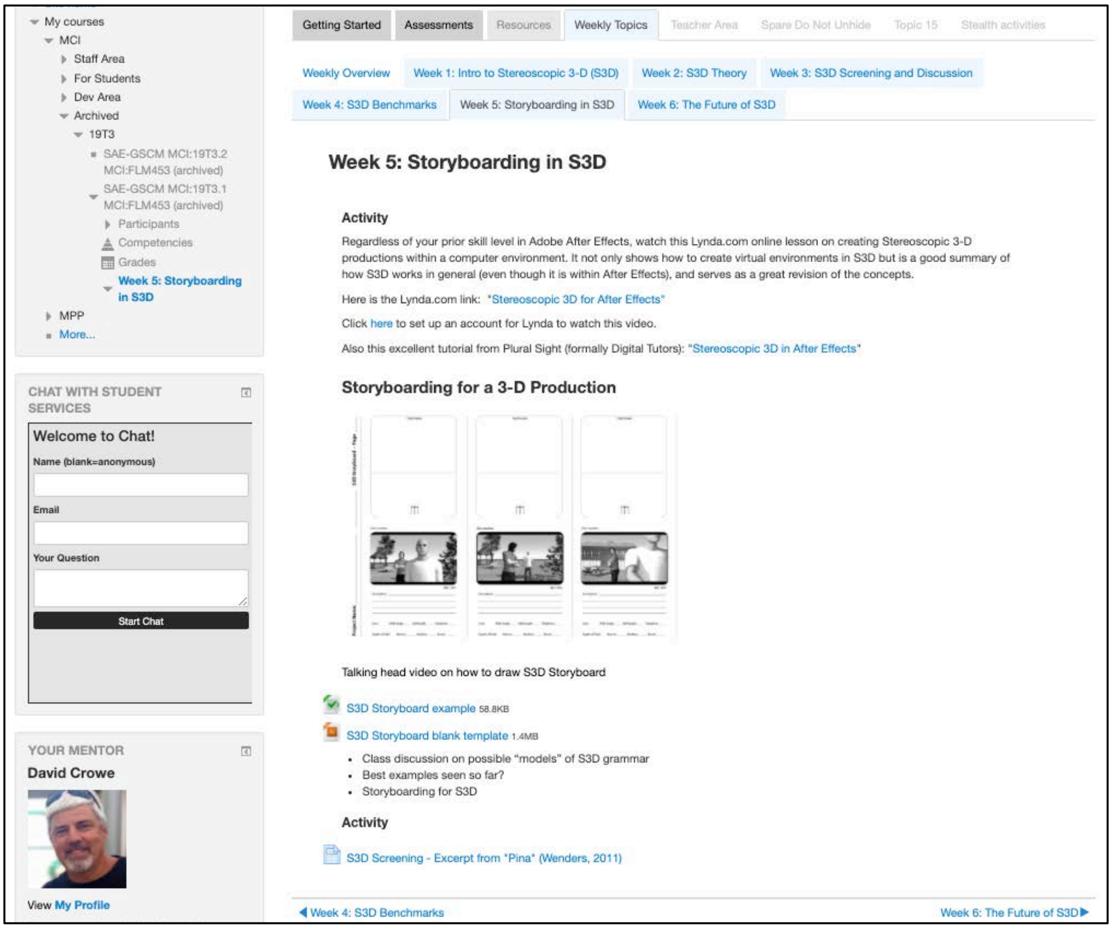
The Physiology of the Human Eye
Image Illusion
The spinning dancer below created by Japanese Web designer Nobuyuki Kayahara is an optical illusion that can been seen to spin clock-wise and anti-clockwise depending on the viewer.
Which way does the dancer appear to spin to you? If you stare long enough you should be able to switch the way she is turning.
The movement is ambiguous as there are no depth cues about what is the left or right side of the body.
The images in this Image Illusion Book show many more examples of the way eye/brain perception can vary within a single image.
Activity:
After viewing the Image Illusion Book, source your own interesting example of an intelligent graphic design piece that illustrates such a visual illusion.
Post a screenshot of your illusion along with an explanation of how the illusion tricks the brain in the Week 1 Illusions Discussion.
< Timeline of S3D
> An Experiment
You have completed 12% of the lesson
S3D storyline for Storyboard
Jump to...
First Look - Comparison of S3D Use of Space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Week 5: Storyboarding in S3D
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Welcome to Chat!
Name (blank=anonymous)
Email
Your Question
Start Chat
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David Crowe
View My Profile
Getting Started
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Weekly Topics
Teacher Area
Spare Do Not Unhide
Topic 15
Stealth activities
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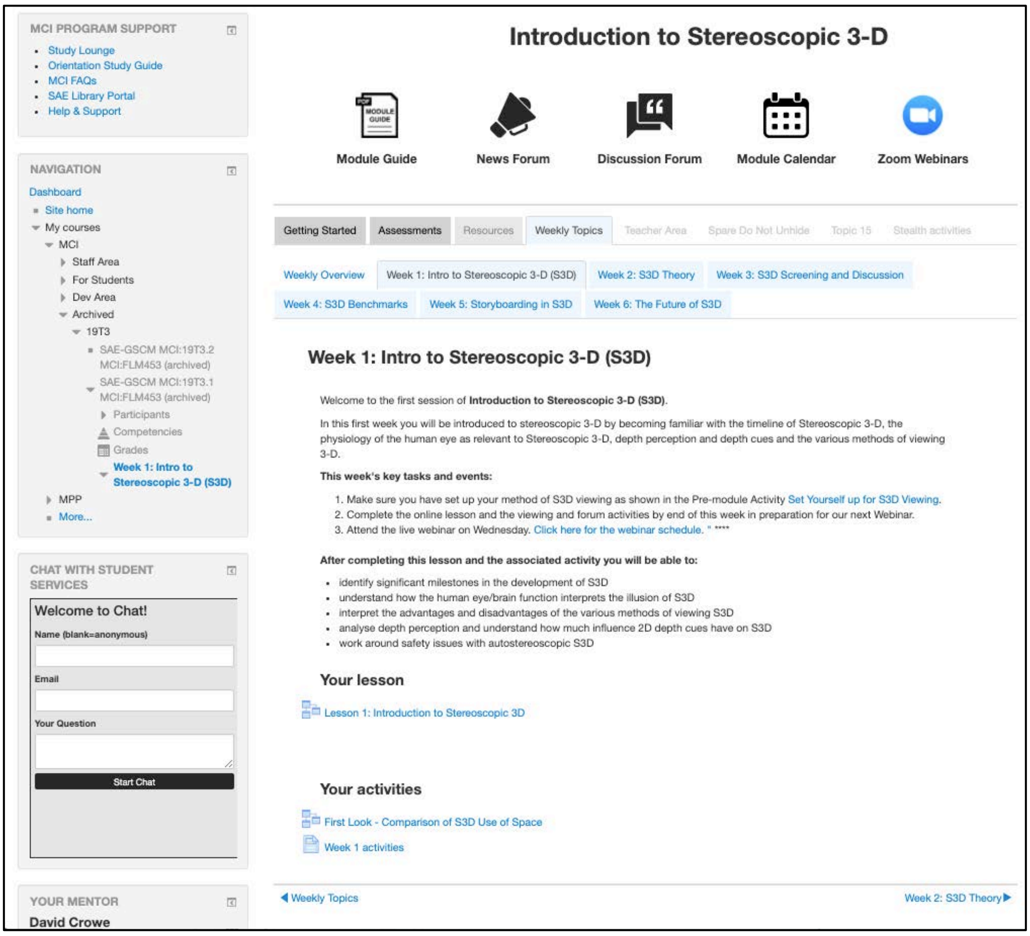
Week 4: S3D Benchmarks
Week 5: Storyboarding in S3D
Week 6: The Future of S3D
Week 5: Storyboarding in S3D
Activity
Regardless of your prior skill level in Adobe After Effects, watch this Lynda.com online lesson on creating Stereoscopic 3-D productions within a computer environment. It not only shows how to create virtual environments in S3D but is a good summary of how S3D works in general (even though it is within After Effects), and serves as a great revision of the concepts.
Here is the Lynda.com link: "Stereoscopic 3D for After Effects"
Click here to set up an account for Lynda to watch this video.
Also this excellent tutorial from Plural Sight (formally Digital Tutors): "Stereoscopic 3D in After Effects"
Storyboarding for a 3-D Production
Talking head video on how to draw S3D Storyboard
S3D Storyboard example 58.8KB
S3D Storyboard blank template 1.4MB
Class discussion on possible "models" of S3D grammar
Best examples seen so far?
Storyboarding for S3D
Activity
S3D Screening - Excerpt from "Pina" (Wenders, 2011)
Week 4: S3D Benchmarks
Week 6: The Future of S3D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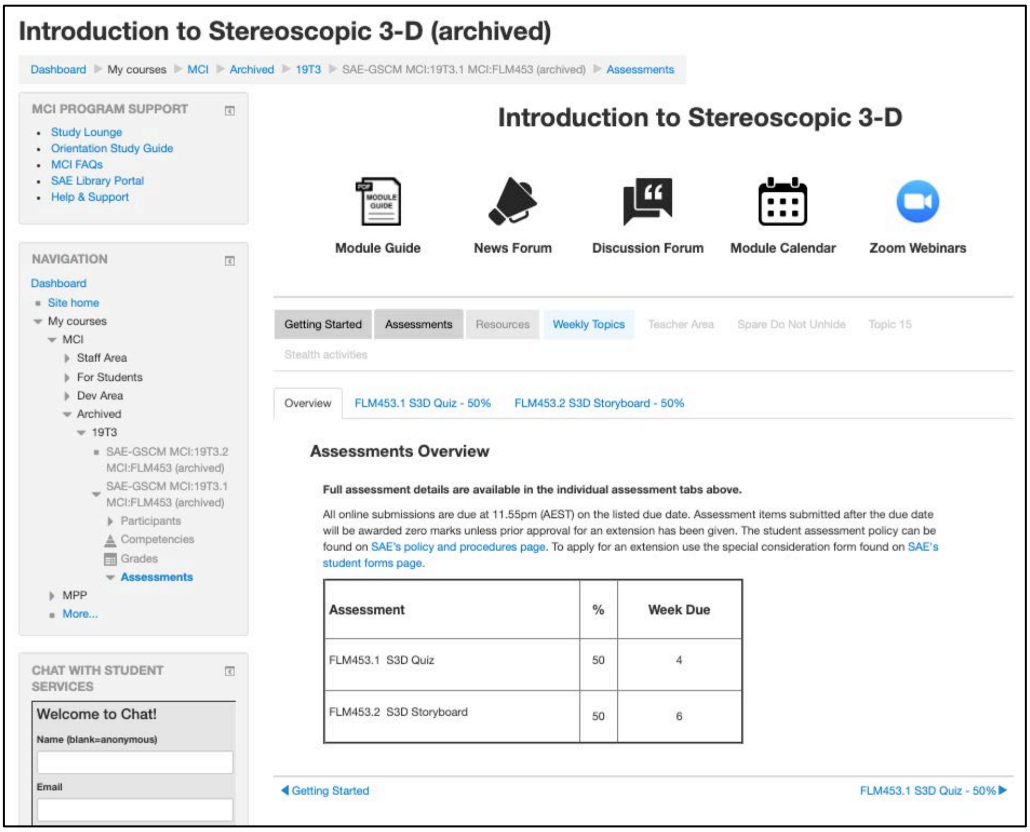
Week 5: Storyboarding in S3D
Week 6: The Future of S3D
Week 1: Intro to Stereoscopic 3-D (S3D)
Welcome to the first session of Introduction to Stereoscopic 3-D (S3D).
In this first week you will be introduced to stereoscopic 3-D by becoming familiar with the timeline of Stereoscopic 3-D, the physiology of the human eye as relevant to Stereoscopic 3-D, depth perception and depth cues and the various methods of viewing 3-D.
This week's key tasks and events:
1. Make sure you have set up your method of S3D viewing as shown in the Pre-module Activity Set Yourself up for S3D Viewing.
2. Complete the online lesson and the viewing and forum activities by end of this week in preparation for our next Webinar.
3. Attend the live webinar on Wednesday. Click here for the webinar schedule.
After completing this lesson and the associated activity you will be able to:
identify significant milestones in the development of S3D
understand how the human eye/brain function interprets the illusion of S3D
interpret the advantages and disadvantages of the various methods of viewing S3D
analyse depth perception and understand how much influence 2D depth cues have on S3D
work around safety issues with autostereoscopic S3D
Your lesson
Lesson 1: Introduction to Stereoscopic 3D
Your activities
First Look - Comparison of S3D Use of Space
Week 1 activities
Weekly Topics
Week 2: S3D Theory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Teacher Area
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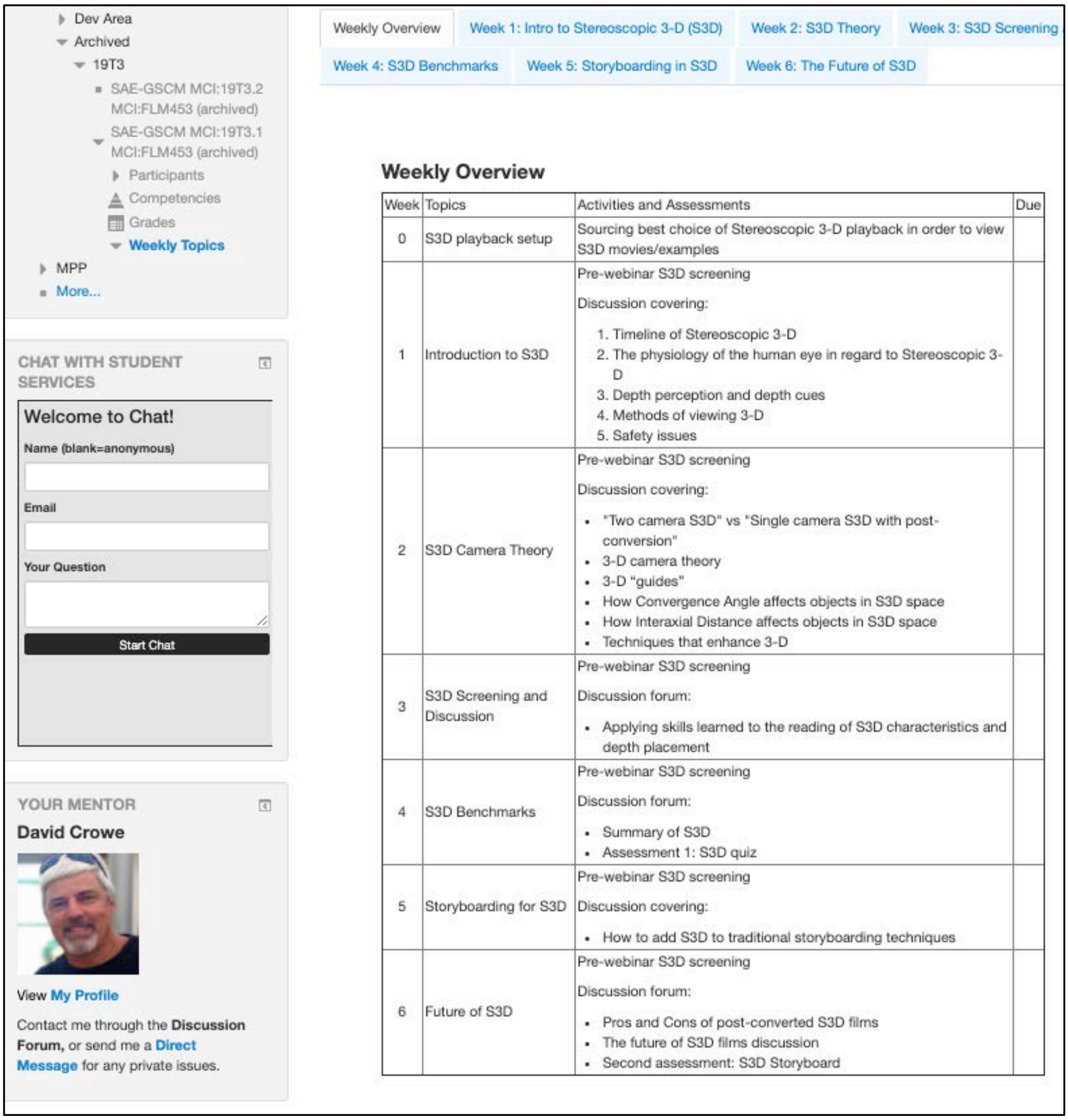
Stealth activities
Overview
FLM453.1 S3D Quiz - 50%
FLM453.2 S3D Storyboard - 50%
Assessments Overview
Full assessment details are available in the individual assessment tabs above.
All online submissions are due at 11.55pm (AEST) on the listed due date. Assessment items submitted after the due date will be awarded zero marks unless prior approval for an extension has been given. The student assessment policy can be found on SAE's policy and procedures page. To apply for an extension use the special consideration form found on SAE's student forms page.
Assessment
%
Week Due
FLM453.1 S3D Quiz
50
4
FLM453.2 S3D Storyboard
50
6
Getting Started
FLM453.1 S3D Quiz - 50%



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SAE-GSCM MCI:19T3.2 MCI:FLM453 (archived)
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Name (blank=anonymous)

Email

Your Question

Start Chat

YOUR MENTOR

David Crowe

View **My Profile**

Contact me through the **Discussion Forum**, or send me a **Direct Message** for any private issues.

Weekly Overview | Week 1: Intro to Stereoscopic 3-D (S3D) | Week 2: S3D Theory | Week 3: S3D Screening | Week 4: S3D Benchmarks | Week 5: Storyboarding in S3D | Week 6: The Future of S3D

Weekly Overview

Week	Topics	Activities and Assessments	Due
0	S3D playback setup	Sourcing best choice of Stereoscopic 3-D playback in order to view S3D movies/examples	
1	Introduction to S3D	Pre-webinar S3D screening Discussion covering: 1. Timeline of Stereoscopic 3-D 2. The physiology of the human eye in regard to Stereoscopic 3-D 3. Depth perception and depth cues 4. Methods of viewing 3-D 5. Safety issues	
2	S3D Camera Theory	Pre-webinar S3D screening Discussion covering: • "Two camera S3D" vs "Single camera S3D with post-conversion" • 3-D camera theory • 3-D "guides" • How Convergence Angle affects objects in S3D space • How Interaxial Distance affects objects in S3D space • Techniques that enhance 3-D	
3	S3D Screening and Discussion	Pre-webinar S3D screening Discussion forum: • Applying skills learned to the reading of S3D characteristics and depth placement	
4	S3D Benchmarks	Pre-webinar S3D screening Discussion forum: • Summary of S3D • Assessment 1: S3D quiz	
5	Storyboarding for S3D	Pre-webinar S3D screening Discussion covering: • How to add S3D to traditional storyboarding techniques	
6	Future of S3D	Pre-webinar S3D screening Discussion forum: • Pros and Cons of post-converted S3D films • The future of S3D films discussion • Second assessment: S3D Storyboard	

10.9 Appendix I – Ethics Approval Form

This administrative form
has been removed

10.10 Appendix J – Early Draft S3D Survey

Stereoscopic 3-D 2015

Selected S3D film characteristics

1. After watching the selection of S3D films, rank the perceived "depth budget" (amount of depth generally used) for each film

	Almost no "depth budget"	Most of the S3D happened within a narrow space	Space was used from well in front of the screen to a good way behind the screen	Quite a lot of 'z' space was utilised throughout the film	Extreme use of 'z' space (from in front of audiences eyes, to the horizon well behind the screen)
Dial M for Murder	○	○	○	○	○
Avatar	○	○	○	○	○
Legend of the Guardians: The Owls of Ga'Hoole	○	○	○	○	○
Hugo	○	○	○	○	○
Mad Max: Fury Road	○	○	○	○	○

2. After watching the selection of S3D films, rank each film in its perceived use of "depth budget" (i.e. the amount of 'z' space utilised generally) as a result of your answers to Q1 (above).

- Dial M for Murder
- Avatar
- Legend of the Guardians: The Owls of Ga'Hoole
- Mad Max: Fury Road
- Hugo

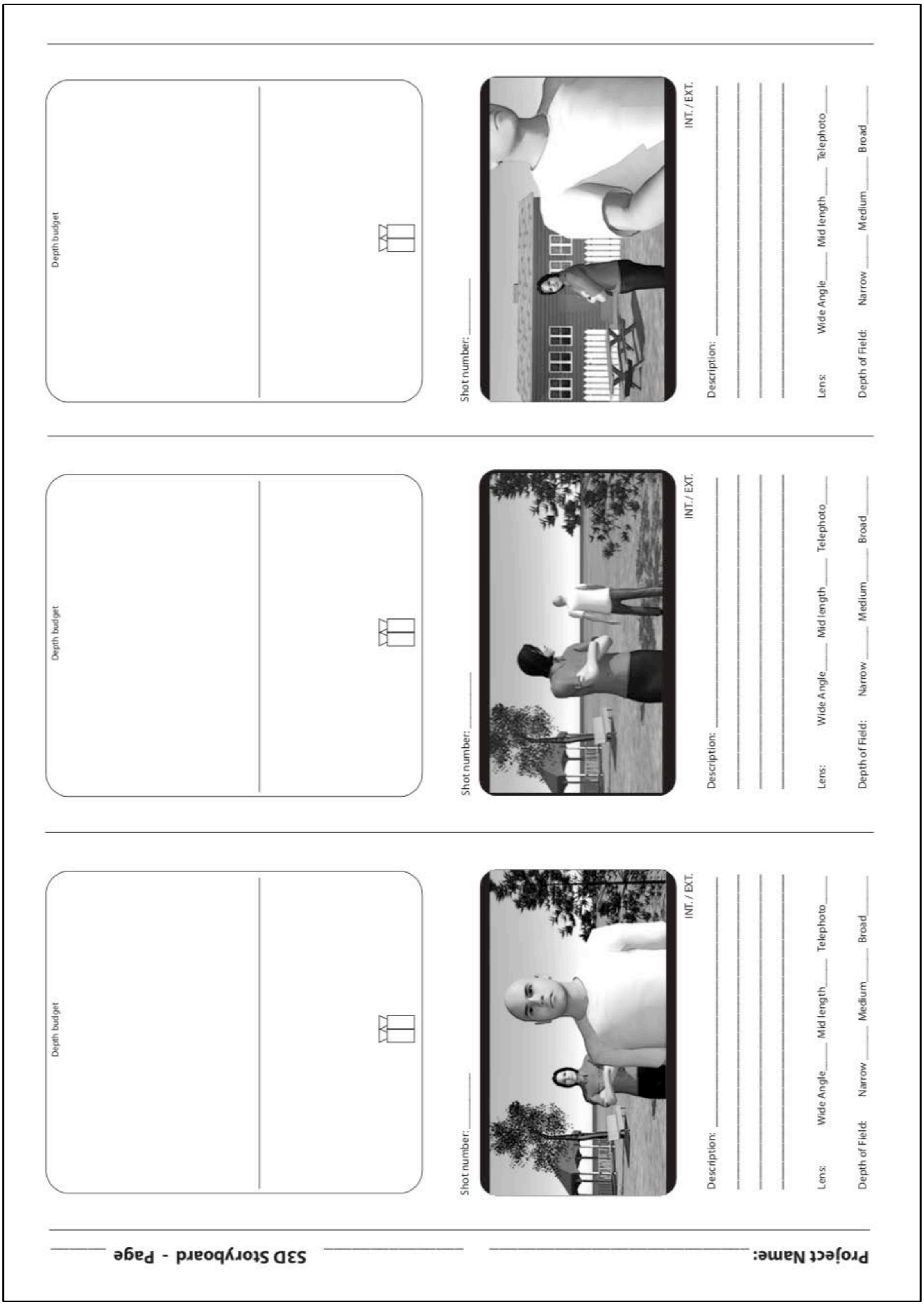
3. As a result of these differing uses of "depth budget" how much did the utility of this depth add to the story?

	Had no perceived effect on the story	Had little perceived effect on the story	Had a reasonable effect on the story	Had a significant effect on the story	The story was completely dependent upon the use of 3-D depth
Dial M for Murder	○	○	○	○	○
Avatar	○	○	○	○	○
Legend of the Guardians: The Owls of Ga'Hoole	○	○	○	○	○
Hugo	○	○	○	○	○
Mad Max: Fury Road	○	○	○	○	○

4. How noticeable was the use of S3D in each movie? (i.e. how conscious were you of the fact that S3D was used in the imagery, or were you caught up in the story)

	Didn't notice the use of S3D at all	Use of S3D was only slightly evident throughout the screening	The S3D was somewhat noticeable generally throughout this screening	The use of S3D was noticed often during this screening	The use of S3D was significantly noticeable all the way through the screening
Dial M for Murder	○	○	○	○	○
Avatar	○	○	○	○	○
Legend of the Guardians: The Owls of Ga'Hoole	○	○	○	○	○
Hugo	○	○	○	○	○
Mad Max: Fury Road	○	○	○	○	○

10.11 Appendix K – S3D Coursework “3-D Storyboard”



Example of original ‘S3D Storyboard’ as used in final Master of Creative Industries “Introduction to S3D” teaching program