Creative Emotional Reasoning Computational Tools Fostering Co-Creativity in Learning Processes

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CO-CREATIVITY ASSESSMENT METHODOLOGY

C²LEARN PROJECT DELIVERABLE NO. D2.3.2

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[1] Very sadly Professor Anna Craft died while this deliverable was being prepared. The team would like to acknowledge her leadership and contribution to the *C²Learn* project, and all its outcomes, even though she is no longer with us.

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EXECUTIVE SUMMARY

C²Learn at a glance

C²Learn (www.c2learn.eu) is a three-year research project supported by the European Commission through the Seventh Framework Programme (FP7), in the theme of Information and Communications Technologies (ICT) and particularly in the area of Technology-Enhanced Learning (TEL) (FP7 grant agreement no 318480). The project started on 1st November 2012 with the aim to shed new light on, and propose and test concrete ways in which our current understanding of creativity in education and creative thinking, on the one hand, and technology-enhanced learning tools and digital games, on the other hand, can be fruitfully combined to provide young learners and their teachers with innovative opportunities for creative learning. The project designs an innovative digital gaming and social networking environment incorporating diverse computational tools, the use of which can foster co-creativity in learning processes in the context of both formal and informal educational settings. The *C²Learn* environment or **C²Space** is envisioned as an open-world 'sandbox' (non-linear) virtual space enabling learners to freely explore ideas, concepts, and the shared knowledge through participating in **C²Experiences** assisted by the systems artificial intelligence (AI) known as **C²Assistants** (Figure 1). This innovation is co-designed, implemented and tested in systematic interaction and exchange with stakeholders following participatory design and participative evaluation principles. This happens in and around school communities covering a learner age spectrum from 10 to 18+ years.

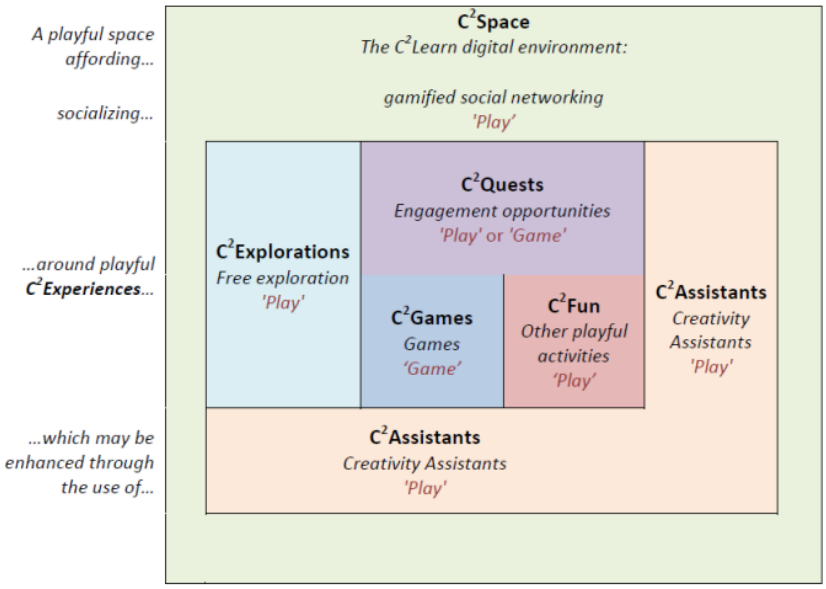

***Figure 1*: *C²Learn*'s C2Space and its subcomponents**

About this document

Deliverable 2.3.2 is the final installment of a document detailing the ***C²Learn Co-creativity Assessment Methodology,*** its **rationale**, **method**, **tools** and accompanying **operationalisation**. Led by the UEDIN team in close collaboration with the OU team, and other appropriate consortium members, it sets out the over-arching theoretical frame of the project further developed from

Deliverable 2.2.2 which closely integrates Creative Emotional Reasoning (Deliverable 2.1.2) and Wise Humanising Creativity, and argues in turn for an integrated approach to the assessment methodology which combines documenting change and lived experience. Deliverable 2.3.2 firstly deals with theoretical and then methodological integration, and from this details the evaluation categorisation scheme. It goes on to detail the methodology, and its accompanying aims, indicators and data collection tools. The final part considers the methodology's operationalisation including the evaluation plan, inclusion of teachers, issues of analysis and synthesis, training needs and ethics.

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LIST OF ABBREVIATIONS AND TERMS

A) Abbreviated names of the project consortium partners

Abbreviation	Explanation
EA	Ellinogermaniki Agogi, Greece (coordinator)
UEDIN	The University Of Edinburgh, UK
OU	The Open University, UK
NCSR-D	National Center For Scientific Research "Demokritos", Greece
UoM	Universita ta Malta, Malta
SGI	Serious Games Interactive, Denmark
BMUKK	Bundesministerium Für Unterricht, Kunst Und Kultur, Austria

B) Other abbreviations

Abbreviation	Explanation
CER	Creative Emotional Reasoning
LDS	Living Dialogic Space
MIA	Multimodal Interaction Analysis
SD	Socratic Dialogue
WHC	Wise Humanising Creativity

1. INTRODUCTION

Deliverable 2.3.2 is the final installment of a document detailing the ***C²Learn Co-creativity Assessment Methodology,*** its **rationale**, **method**, **tools** and accompanying **operationalisation**. The assessment methodology will be utilised to test the use of *C²Learn*'s computational tools, embedded within the pedagogical interventions and creative learning practices made available through the C²Space and its subcomponents or C²Experiences, in real-life educational settings. The core aim of **C²Learn's Co-creativity Assessment Methodology** is to evaluate *C²Learn*'s impact on students' (co-)creativity.

In the introductory part we begin with a concise presentation of *C²Learn*'s creativity framework, as developed by the OU and UEDIN teams (Section [1.1]). This integrated creativity framework is then analyzed into two dimensions of evaluating co-creativity, which provide the basis for specifying the research questions underlying and guiding the evaluation methodology (section [1.2]). Lastly we explicate the notion of a categorisation scheme, using an indicative example (Section [1.3]), premising our understanding for the exposition of the method that follows.

1.1 CREATIVITY WITHIN *C²LEARN*

Creativity within *C²Learn* emphasises collaborative and communal activity (co-creativity) whilst recognising the role of the individual. *C²Learn* co-creativity involves novelty emerging through a process of 'possibility thinking' (PT) – the transition from what is to what might be through 'what if' thinking (enquiry) and 'as if' thinking (imagining). Inherent within *C²Learn* co-creativity is attention to impact of creative outcomes in terms of the immediate and wider context. This ethically framed creativity therefore foregrounds the role of values in generating fundamental small-scale creative change (quiet revolutions). This conceptualisation also attends to how creative activity generates change in the makers as well as change by the makers (a process of becoming through making and being made). This ethically framed co-creativity or wise, humanising creativity (WHC[2]) involves within it, creative emotional reasoning (CER[3]).

CER is an umbrella term and refers to: a principled, unifying theory of non-linear thinking techniques that foster co-creativity within *C²Learn*'s computational tools. CER is premised on a notion of creativity as an intervention resulting in reframing. Intervention involves 'stepping into' *C²Learn* participants' thinking and creative process in order to change how the participants are thinking and acting. With CER embedded within a set of creative learning tools the aim is to disrupt established routines and patterns.

With this role CER is embedded within WHC to foster co-creativity. The aim is to seek an organic fusion that will provide WHC with additional structured techniques taking advantage of and further

[2]Chappell K., Craft A., Rolfe L. & Jobbins, V. (2013), "Humanising Creativity: valuing our journeys of becoming", *International Journal of Education and the Arts*, *13(8) 1*-35, retrieved 11.01.13 from http://www.ijea.org/v13n8/; Chappell K. (2008), "Towards Humanising Creativity", *UNESCO Observato*ry, E-Journal Special Issue on *Creativity, policy and practice discourses: productive tensions in the new millenium* Volume 1, Issue 3, http://www.abp.unimelb.edu.au/unesco/ejournal/vol-one-issue-three.html; Craft A. (2008), "Trusteeship, wisdom and the creative future of education?", *UNESCO Observatory*, E-Journal, Volume 1, Issue 3, Special Issue: *Creativity, policy and practice discourses: productive tensions in the new millennium*.

[3] For a definition and analysis of CER, as well as an exposition of its theoretical foundations, see Deliverable [2.1.1]: *Creative Emotional Reasoning*.

enabling WHC's creativity opportunities. And in return CER is housed within a much-needed ethical and cultural framework and the most appropriate conditions for fulfilling its potential.

Developed theoretically alongside WHC is the idea of Living Dialogic Space (LDS). These spaces are characterised by debate and difference, openness to action, working 'bottom up', and different modes of idea exchange, and have been connected in previous projects with the facilitation of WHC. LDS' will be embedded within C²Space and its subcomponents to offer users high participation and shared control, individually, in collaboration and/or as part of a communal endeavour. Within and outside the *C²Learn*'s C²Space, interactions will be facilitated through creative learning conversations. The purpose of these is to flatten hierarchies, reposition users in different roles and allow spaces that promote a sense of equality through 'listening' to other users and even allow users to change their mind by identifying with the space of dialogue.

As CER heavily relies on brainstorming activities structuring its core techniques, there is a particular relation with LDS. LDS' flattened hierarchies, manifested in an open space of dialogue, are an ideal environment within which to embed and evolve these brainstorming techniques, providing the opportunity to experiment with dynamic group management methods.

Within and outside of C²Space and its subcomponents, CER's set of core creative learning tools will thus support the manifestation of WHC which fuels the potential for ***quiet revolutions***[4]***,*** the ultimate intention of the *C²Learn* process. The relationships between WHC and CER and their contribution to quiet revolutions, is shown in the Figure below which is reproduced from the first iteration of the project's learning design deliverable (July 2013). This seeks to show how quiet revolutions are ethically grounded as well as critical, aligning personal with wider values. A quiet revolution, emerging in and beyond C²Space through collaborative and collective endeavour, is also grounded in excellence and engaged involvement from children and adults in the C²space.

Figure 1 (p. 9) shows ***C²Learn* Co-Creativity**, as emerging from the centre of the figure comprising the two related components discussed above, i.e. Wise Humanising Creativity (WHC) and Creative Emotional Reasoning (CER). As indicated in the learning design deliverable, co-creativity will manifest in five intertwined ways shown in the highlighted box within the WHC and CER sections of the graphic. C²Space-users will:

- Generate, explore and enact new ideas with a valuable impact on the community, discarding other ideas that lack such potential (**ethics and impact**)
- Pose questions, debate between new ideas, find ways to negotiate conflict or to go in a different direction to others if conflict is not resolved (**dialogue**)
- Take charge of different parts of the creative process, understanding the rules of the system[5] and how decisions have consequences, making decisions around new ideas and taking action(s)[6] through various scenarios and/or quests (**control**)

[4] Chappell, K., Craft, A., Rolfe, L. & Jobbins, V. (2011), "Not just surviving but thriving", in *Close Encounters: Dance Partners for Creativity*, pp. 143-159, Stoke on Trent: Trentham Books.

[5] Walsh, C.S. (2010), "Systems-based literacy practices: Digital games research, gameplay and design", *Australian Journal of Language and Literacy Education*, Vol 33, No 1, pp. 24-40. http://search.informit.com.au/documentSummary;dn=731555751906684;res=IELHSS ISSN: 1038-1562.

- Be immersed in C²Space, and possibly addicted to gameplay, exploration, quests, and fun and/or the interactive drama played out within C²Space and its subcomponents as well as real-world spaces. Such immersion will sometimes lead to taking risks and generating surprising individual or collaborative ideas (**engaged action**)

- Have their thinking and action disrupted by the C²Space's computational tools embedded within which are CER non-linear thinking techniques. This will them move them away from established routines and patterns (**intervention resulting in reframing)**

It is important to note that such activity is about these five elements in combination making more than the sum of their parts in order to generate co-creativity. This is about **new ideas** which are captured or selected because they are **valuable to the community**, and are generated with shared control in an immersed dialogic environment, fostering **ethical awareness** arising from the experience.

The key outstanding elements embedded within the environment are the 4Ps: pluralities (opportunities for learners to experiment with multiple pluralities of places, activities, personal identities, and people), possibilities (opportunities for possibility thinking, transitioning from what is to what might be, co- constructing with others through the *C²Learn* experience, designing, editing, extending and exploring content), participation (opportunities for learners to take action, make themselves visible on their own terms, and act as agents of change) and playfulness (opportunities for users to learn, create and self-create as active and connected users in their emotionally rich, virtual and actual play-worlds).

Over time, noticeable changes in users' dispositions, even small incremental personal changes, will result from their WHC. This is because there is a core reciprocal relationship within WHC between creativity and identity in which as creators make, they are also being made. And so users undertake **journeys of becoming**[7]. This is represented on the figure as an embedded on-going process from the 'how' of the enablers of co-creativity to the 'what' of the co-creativity.

[6] Apperley, T. & Walsh, C.S. (2012), "What digital games and literacy have in common: A heuristic for understanding pupils' gaming literacy", *Literacy*, Vol 46, pp. 115–122. DOI:10.1111/j.1741-4369.2012.00668.x ISSN: 1741-4369.

[7] Chappell K., Craft A., Rolfe L. & Jobbins, V. (2013), "Humanising Creativity: valuing our journeys of becoming", *International Journal of Education and the Arts*, *13(8) 1*-35, retrieved 11.01.13 from http://www.ijea.org/v13n8/.

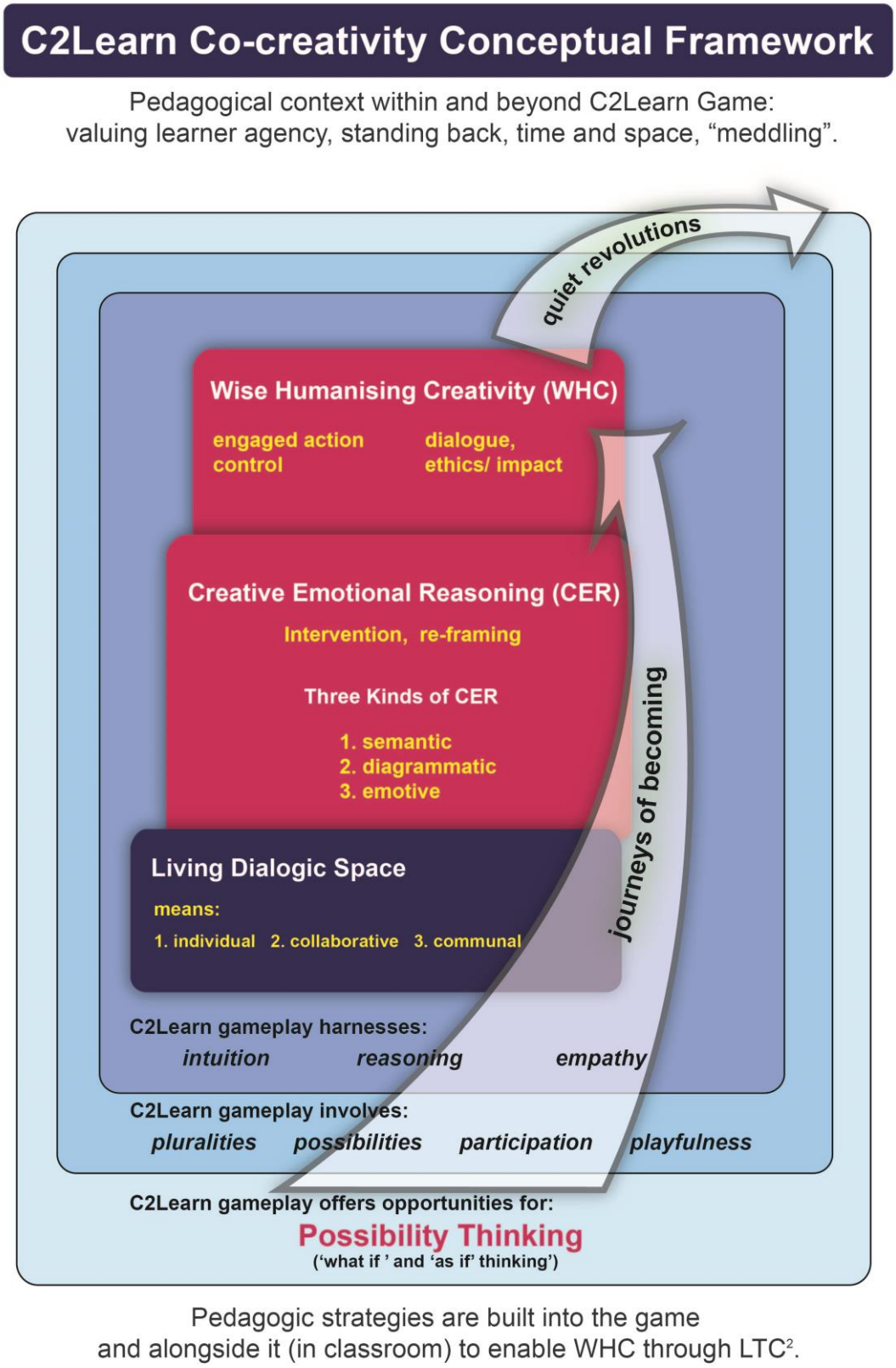


***Figure 2*: *C²Learn* Co-creativity Conceptual Framework**

1.2 EVALUATING *CHANGE* AND *LIVED EXPERIENCE*

One of the main challenges in creating *C²Learn*'s Assessment Methodology is to productively integrate a mixed methodology which seeks to document *change*, as well as *the lived experience* of engaging in the C²Space learning environment. The mixed methodology is informed by both the UEDIN team's experience in evaluation in cognitive science[8] and the OU team's experience in educational/arts informed evaluation[9]. It will be able to identify the changes and effects to students thinking habits, from their exposure to C²Space and its subcomponents, as well as facilitate an in-depth understanding of how participants interact with and experience this environment(s).

In particular:

- By ***change*** we refer to **specific changes** (following the protocol established in Deliverable [2.1.1] *Creative Emotional Reasoning*) to students' **thinking patterns** and **reasoning processes**, expressed primarily in **linguistic behavior** (but encompassing other modes as well) and manifested in their performance in *C²Learn*'s creative challenges/tasks.

- By ***lived experience*** we draw on qualitative research approaches which foreground meaning made by participants in living through something. In *C²Learn* we particularly refer to students' and teachers' **experience** and, in the case of students, **self-progression** (including the emergence of collaborative or communal ideas/identities) through *C²Learn*'s Educational Interventions, expressed through **dialogue**, **action** and **decision patterns**, in and around the C²Space and its subcomponents.

These two dimensions of evaluating co-creativity are integrated in the *C²Learn* approach to co-creativity evaluation, in reflecting the same fundamental understanding of our evaluation aim i.e. a focus on the ***evolution*** of participants, in terms of both habit acquisition and subjective experience/self-definition. This means, primarily, that participants' performance and products, which emerge through interaction with *C²Learn*'s creative challenges, are treated heuristically within the context of this evaluation methodology, as nodes *around which* our research takes place. We do not aim to evaluate end-results or products of creativity; we seek to employ these outcomes in evaluating our teaching methods/theories of co-creativity, through a precise documentation and analysis of their meaning and impact in relation to the ethical frame of the project which, as indicated earlier, seeks to foster wise, humanizing creativity through journeys of becoming and involving quiet revolutions.

The UEDIN and OU teams have developed a set of working principles common to both the documenting of *change* and that of *lived experience*. Both approaches require a number of data collection visits in order to track change and developing experience. Both approaches also need to seek data using a range of different methods including different kinds of interviews, observations and digital data capture. In terms of data collection both approaches need data to be sought in both open

[8] E.g. Stenning, K. & Michell, L. (1985), "Learning how to tell a good story: the development of content and language in the telling of one tale", *Discourse Processes*, 8 (3); Stenning, K. & van Lambalgen, M. (2004), "A little logic goes a long way: basing experiment on semantic theory in the cognitive science of conditional reasoning", *Cognitive Science*, 28 (4), pp. 481-530.

[9] E.g Craft, A., Chappell, K. & Best, P. (2007), *Analysis of the Creativity Action Research Awards Two Programme*, Leeds: CapeUK; Chappell, K., & Greenwood, M. (2013), "This is You", *Evaluation of Includance: English Strand* (Interreg funded), Attik Dance: Plymouth.

and closed ways. So, for example, within interviews, protocols will need to seek particular pieces of information whilst also being open enough to seek the emergent perspectives of participants.

Given these common principles to the two strands of evaluation of co-creativity the UEDIN and OU team have therefore sought to incorporate the needs of documenting *change* and *lived experience* within a unified research visit design and onsite data collection methods plan (see Sections [1.2] and [3.1] for an analysis of the tools to be used and an exposition of the overall evaluation plan, respectively).

The unified research design will also need to be context-sensitive and acknowledge a perspective on knowledge as situated and relative, acknowledging the potent role of the participant in field-evaluation[10] as well as dispositions associated with creativity[11] such as curiosity, imagination, persistence, collaboration and being disciplined. Standardization between cases studies is of course equally important, to ensure the highest possible objectivity and reliability of the data, which is why we have opted to use tools that can combine high-structure and openness in response.

In order to structure this unifying research design the two teams have designed 3 main research questions that express the core and guide the development/implementation of *C²Learn*'s Assessment Methodology.

1. **How do participants manifest co-creativity (WHC and CER) through C²Experiences?**
2. **How does manifesting of co-creativity (WHC and CER) in *C²Learn* change over time?**
    a. Assessment of the *change* in students' thinking patterns and reasoning processes along the CER dimension.
    b. Assessment of students' *lived-experience* in terms of co-creativity along the WHC dimension.
3. **What role is played by *C²Learn* technological tools and corresponding pedagogical interventions, focusing in particular on students' experience?**

The above research questions were complemented by a subsidiary aim, which was particularly prominent in the early phases of designing the evaluation methodology.

4. **Development and refinement of C2Learn's Assessment Methodology tools with particular focus on:**
    a. Tailoring of categories to *C²Learn*'s C²Space and its subcomponents.
    b. Developing the *Socratic Method* type interview protocol in relation to *C²Learn*'s C²Space and its subcomponents.
    c. Specifying the Computational Creativity metrics to be used[12]
    d. Refining the rest of the evaluation tools in relation to *C²Learn*'s C²Space and its subcomponents.

[10] Amabile, T. (1997), "Entrepreneurial creativity through motivational synergy", *Journal of Creative Behavior*, 31, 18-26.
[11] Claxton, G.L., Edwards, L. & Scale-Constantinou, V. (2006), "Cultivating creative mentalities: A framework for education", *Thinking Skills and Creativity*, 1, 57-61.
[12] This is a particularly interesting and challenging field of research as due to the nature of the game(s) being developed, the end products of the creative processes/challenges may not be wholly digital. An important question we are faced with is how we can use computational creativity metrics to evaluate these type of products. For an explanation of what type of evaluation is meant here see Section [2.3.5].

In carrying out the above unified research design, the project has been addressing long-existing tensions between diverse fields, the combination of which aims to offer new insights into creative thinking and co-creativity in connection with learning.

1.3 EVIDENCING PROCESSES OF *CHANGE* AND *LIVED EXPERIENCE*

Evaluation largely depends on the application of **categories** by the evaluator. In a great variety of *pre-determined* categorisation schemes, for example schemes dealing with arithmetic problems, it is easy to categorise right and wrong answers. It is far harder to categorise creative and non-creative (or to some degree creative) responses in more open-ended tasks and challenges. Apart from the difficulty in creating such categories, innovative educational research poses further problems as few people are likely to know the categorisations that are new to the educational intervention. This problem, though, can be put to good use.

In order to teach evaluators a pre-determined categorisation scheme, we collect data on how well we have succeeded by using **inter-rater reliability measures**[13], i.e. "Do they categorise the same events the same way as we do?" This methodology is particularly useful for those concepts that invite the retort: "I can't define it, but I know it when I see it" of which creativity is a succinct example. Inter-rater reliability tells you whether you can teach others to recognise it when they see it. To some extent these categories can be allowed to emerge as the teaching develops. But the theoretical positions already held should be translatable into categories.

We will use here an example of a scheme that has already been used in the cognitive literature[14], and can provide some basis for constructing our categories, although they would of course need to be significantly adapted to the material at hand. This example utilises Raymond Brigg's story *The Snowman*. To give a brief summary: The little boy builds a snowman in his garden and goes to bed. In the middle of the night the boy wakes up and looks out his window and the snowman beckons him to come down to the garden. They fly away on an adventure, and return, when the boy shows the snowman his house. When they realise the Snowman is melting in the warm house, they have to part ways.

The aim here was to use this `book-without-words' as a platform to explore children's creativity in story understanding and telling. The children first spent quite a bit of time studying the cartoon picture book, and then `told the story' to one of the experimenters. After the children had told their story, the experimenters also held a *Socratic Method* type of interview (see Section [2.2.1]) with the children, in order to probe their understanding and elicit more information from them. The interest here was in a classification of children as ***describers*** or ***explainers***, a categorisation that goes back through Peel (1971)[15] to Piaget (1964])[16], designed to find Piaget's cognitive categories in children's discourse (rather than by using `test situations' such as conservation experiments[17]).

[13] Kilem Li Gwet (2012), *Handbook of Inter-Rater Reliability* (3rd Edition), Advanced Analytics, LLC, Gaithersburg, MD.
[14] Michell, L. & Stenning, K. (1983). "Explanations in the story-telling of 7 to 11 year olds", *Educational Review*, 35 (2), pp. 187—194; Stenning, K. & Michell, L. (1985), "Learning how to tell a good story: the development of content and language in the telling of one tale", *Discourse Processes*, 8 (3).
[15] Peel, E. A. (1971), *The nature of adolescent judgment*, Staples, London.
[16] Piaget, J. (1964), "Development and learning", *Journal of Research into Science Education*, 3.
[17] Piaget, J. & Inhelder B. (1941), *Le développement des quantités chez l'enfant* (The development of the idea of quantity in the child), Delachaux & Niestle, Oxford, England.

Extracts from two children's retellings of the story serve to illustrate how this particular categorisation scheme functions:

The children reach one of the crucial points in the story when the boy and the snowman have to part because the Snowman is melting.

Extract 1 (5 year-old child): "…and he said goodbye and standed where he was again…he standed very still and very very still..."

Extract 2 (7 year-old child): "…and then the snowman walks the little boy to his house and the boy says goodbye and they wave goodbye…and the boy goes back into the house and the snowman stays outside...and the boy looks out of the window and waves…"

Even from these very brief extracts it is possible to tell quite bit. Of course, it is much more vivid (and easier to categorise) at first-hand experience, or from recording, than from just these sentences. The first, younger child has understood that this episode is one of the emotional cruxes of the story. Boy and snowman must part because they cannot inhabit the same world, and if the Snowman is not to melt, he must pretend to be inert in the garden. This 5 year-old has very little in the way of linguistic resources, but puts the point across brilliantly by emphasising the stillness the snowman must adopt by repetition. The older child has lots of words, but offers a more superficial description with no evidence of having understood the feelings involved.

Using the above categorisations, the younger child would be categorised as an *explainer* whereas the older child as a *describer*. This is, of course, not to say that these two children would be similarly categorised in other contexts. Of course, the describers are usually more common among 5 year-olds, and the explainers among 7 year-olds, but we chose the example exactly to make the point that the categorisation can cross-cut the averages.

The categories of *describer*/*explainer* can be reliably identified across children's telling of the story by teachers and researchers who have had some minimal explanation of what this means, and their judgments can be shown to correlate with all sorts of other, apparently distant, cognitive tasks (such as Piaget's conservation experiments[18]: "is there more water or less water when I pour it from this short fat glass into that long thin one?"). It thus ties into an important cognitive theory. The same distinction can be used for looking at adolescents' descriptions and explanations of road-traffic accident scenarios, for example.[19]

Although this example may seem far removed from the explicit aims of the *C²Learn* project, it is not actually so. An *explainer* is someone who can go beyond a habitual response, as opposed to the *describer* who works within the limits of such responses, merely reshuffling what is already provided in the question. Creativity is very much related to the ability of transcending what is habitual. Also, story-telling games are a very valuable and a common approach to designing educational games, an approach that has been taken up by the C²Space-design teams of this project. Nevertheless, a categorisation scheme for *C²Learn* has been developed in advance of the piloting (Section [2.3]). Its basis is *C²Learn*'s co-creativity theory, yet some tailoring to both the specific nature of the

[18] Ibid.
[19] Michell, L. & Lambourne (1979), R.D., "An association between high intellectual ability and an imaginative and analytic approach to the discussion of open questions", *British Journal of Educational Psychology*, 49.

educational scenarios and specific C²Experiences under development, is still necessary to ensure the categories' complete applicability to the task at hand.

2. METHODOLOGY

Based on the above considerations, we now define ***C²Learn*'s Co-Creativity Assessment Methodology**, by a detailed exposition of its constitutive elements.

We begin with a table correlating aims/indicators of creativity with evaluation tools (Section [2.1]) and provide *C²Learn*'s categorisation scheme (Section [2.2]). We then examine the different tools that comprise the evaluation method (Section [2.3]). Lastly we take a critical look at other possible categorisation schemes (taxonomies) and provide an argument for not using control groups (Section [2.4]).

2.1 GOALS/INDICATORS OF CO-CREATIVITY IN RELATION TO EVALUATION TOOLS

The following table is a concise statement of the **goals**, defining C2Learn's co-creativity dimension (see Section [1.1]), correlated with the **indicators**, i.e. the signs expressing that the aim has been met (within and outside the C2Space), and the evaluation **tools** we deem more appropriate to utilise in each case. In relation to each indicator, a number of tools are identified, to facilitate methodological triangulation and to anticipate the possibility of some tools being unexpectedly unusable.

Goals	Indicators	Tools
Attending to *ethics* and *impact of ideas*	Generating, exploring and enacting new ideas with valuable community impact (discarding other ideas that do not).	Socratic Dialogues with students Gameplay/Discussion data forms Video data capture Creativity wheels Researcher field notes and interviews with teachers
Engaging in *dialogue*	Posing questions, debating between ideas, finding ways to negotiate conflict or to go in a different direction to others if conflict not resolved.	*Across the remaining three categories three of the above four tools will be used:* Gameplay/Discussion data forms Video data capture Creativity wheels Researcher field notes and interviews with teachers
Being in *control*	Taking charge of parts of the creative process (understanding rules of the system, decisions have consequences, making decisions, taking action).	
***Engaged action* – being immersed in**	Being addicted, not able to stop, trying repeatedly. Such	

the experience	immersion sometimes leads to taking risks.	
Intervention* and *reframing	Specific changes in thinking patterns, and in particular reasoning processes. Changes in expression, primarily in linguistic terms, but also encompassing other modes as well.	Socratic Dialogues with students Gameplay/Discussion data forms Video-data capture Computational data Creativity Wheel
4Ps	Evidence of high participation (engagement and involvement), high pluralities (taking on many roles, personae, perspectives), high playfulness (operating in an as if and playful manner) and high possibilities (generating many ideas through what if and as if thinking).	Axes Researcher field notes Video data capture Gameplay/Discussion data forms
Undertaking a *journey of becoming*	Over time, noticeable changes in participants' dispositions and/or personalities. This may involve smaller incremental changes.	*In relation to 'journeys of becoming' and 'quiet revolutions', four types of data will be collected:* Video data capture Researchers' interviews with teachers Researcher field notes Gameplay/Discussion data forms
Generating *quiet revolutions*	Over time more noticeable changes in the creative community stemming from creative ideas generated; might comprise smaller incremental changes.	
***Pedagogic* strategies**	Evidence teachers: • proactively valuing learners' ideas and actions • enabling learners to take the initiative • ensuring sufficient space and time for ideas and actions to emerge • getting alongside the learner and learning as fellow collaborator	Researchers' interviews with teachers Researcher field notes Video data capture Gameplay/Discussion data forms

***Table 1*: Aims/indicators of co-creativity in relation to evaluation tools**

2.2 *C²LEARN* CO-CREATIVITY CATEGORISATION SCHEME

Table 2, below, presents the research team's approach to the categorisation scheme to be used throughout the evaluation process, to asses student's performance in their engagement within C²Experiences. They have been designed to mirror and exemplify the core goals of the WHC/CER integrated creativity framework. These categories are still being tailored to the specific curriculum that is emerging through the C²Experiences' ongoing design process.

Category	Characteristics
Attending to *ethics* and *impact of ideas*	[1] Creates new associations between ideas [2] Actively explores the consequences of the newly created associations between ideas [3] Exhibits awareness of and concern / interest for the impact of new ideas on the group's values [4] Actively promotes ideas that are deemed valuable by the group
Engaging in *dialogue*	[1] Engages in debate over ideas [2] Promotes dialogue within group (poses questions, respects different viewpoints and/or encourages members of the group to voice their ideas) [3] Actively negotiates conflict and/or seeks alternate paths
Being in *control*	[1] Takes a leading role during different phases of the creative process [2] Exhibits a firm grasp of the rules in the system underlying the challenges facing the groups [3] Takes decisions and instigates action
Engaged action	[1] Immerses him/herself in the experience of the creative process [2] Facilitates immersion in the experience of the creative process for the rest of the group [3] Willing to take risks and/or leaving his/her 'comfort zone'
Intervention* and *reframing	[1] Creates new analogies as building blocks of the creative process [2] Actively experiments with re-combining elements of the creative challenge [3] Actively facilitates a shift of perspective: [a]Uncovers hidden aspects of the creative challenge [b] Goes beyond the material provided by the description (elements) of the challenge, recasting the challenge in a new light (as a whole or through re-formulating elements of it)

Table 2*: Tentative Categorisation scheme for *C²Learn

All 5 Categories come in 5 levels: 1 [Lowest] – 5 [Highest]

Introducing levels will help ensure we capture *C²Learn*'s impact on students on a wider spectrum, and in more detail.

2.3 EVALUATION TOOLS

There are 5 primary evaluation tools. These are:

- Socratic Dialogues with students
- Interviews with teachers
- Video-data Capture
- Self and peer evaluation tools
- Use of computational data

In the following pages we describe the different tools in detail, with an emphasis on the principles that govern their use as well as their utility value for ***C²Learn*'s Co-Creativity Assessment Methodology**. Through selected use of the different tools (see Section [3.1] for more details on selection) throughout the evaluation process, we aim to collect extensive, reliable and interrelated data that will allow us to conduct a rigorous analysis on all the relevant aspects of the *C²Learn* project.

During Summer 2014 piloting, the research team have developed an extensive **Data Collection Protocol** (**Appendix 2)** which covers in detail the appropriate application of each evaluation tool, as well as the appropriate procedure for collecting and storing data. **Appendix 3** consists of a **Socratic Dialogue Manual** which focuses exclusively on this particular tool, created as a 'helpful' guide to teachers and researchers alike.

2.3.1 SOCRATIC DIALOGUES WITH STUDENTS

A ***Socratic Dialogue*** (SD) is a semi-structured **dialogue** with a **group/class of students**. The interviewer utilises **open-ended questioning**, in order to get a better understanding of the students' **reasoning processes** and **experiences** as regards a particular gameplay session.

A SD is meant to provide an **in-depth look into students' C²Experiences**, in order to facilitate the application of 2 Categories from ***C²Learn*'s Co-Creativity Categorization** scheme by the teacher. The categories in question are:

- **Ethics & Impact**
- **Intervention & Reframing**

Over the course of the first pilot we've found that SDs are more adept at exploring and revealing instances of these two particular categories, and thus decided to restrict their use to them.

The open-ended questioning is meant to **establish a dialogue** between interviewer and students, to facilitate the transmission of critical info pertaining to the student's **thinking** and **experience**. The interviewer's aim is to gently keep the students focused on revealing how their thinking proceeded, both while the incidents were taking place, and as the dialogue unfolds, and they have had some chance to reflect on these incidents. It is particularly important to try to **avoid disapproval** and to **encourage the students** to feel that their thinking is important and to express themselves even if they are not sure of being 'right'. (E.g. it might, for example, be appropriate to point out tensions between different statements/actions that a particular student has made/taken, but always with a view towards deeper understanding and clarification, never as a reprimand or correction.)

As the name indicates the originator of this particular style and method of inquiry is Socrates himself. The Greek philosopher was famous for what he called ***maieutic*** (the Socratic *elenchus*). The basic mechanism of this method is questioning meant to probe, coax and allow Socrates' interlocutor to verbalise any implicit knowledge, better organise his/her thoughts and reach conclusions and insights that would otherwise be unavailable. The paradigmatic case of the method is Socrates' questioning of a slave boy, in order to 'demonstrate' that the child has knowledge of geometry.[20] To do this he breaks the process down to a number of intuitive questions, thus bringing out the right units of knowledge. The key feature of the method is here evident: the method of ***maieutics*** seeks to help one become conscious of what is already there.

We can use the example of *The Snowman* story experiment[21] (see Section [1.3]) to give a brief illustration of how a SD would work. One can, for example, imagine asking the 5 year-old child, who produced that very moving account of the story, questions such as, "What was the Boy (or the Snowman) feeling at this point?" Or, "Why did the Snowman leave?". When the child says "The boy is sad because the Snowman has to leave" one could follow up with "Why was that?", or other lines of questioning revealing of the child's understanding. With an older student, even with the same material, one could ask more abstract questions "What is the author trying to achieve at this point?" and so on. These types of questions aim at making the child's understanding explicit and reveal the ground upon which the subsequent categorisation will take place.

Another illustrative example comes from a famous reasoning experiment from Wason (1968)[22]. The subjects are presented with four cards face down on the table (they see A, K, 4 and 7 respectively on the four cards). They are also presented with a rule: "If there is a vowel on one side, then there is an even number on the other", and the following information: "There is a letter on one side of each card, and a number on the other side. Your task is to turn the cards you must turn in order to find out whether the rule is true."

According to Wason, more than 90% of highly intelligent undergraduate subjects get the answer wrong. Whereas they should turn A and 7, most turn A and 4. The issue at stake in Stenning & van Lambalgen (2004)[23] was how the subjects interpret the rule. Wason assumes they interpret it as a classical logical material implication, for which a single counterexample is sufficient to falsify the rule. More than a hundred experiments had been run making this assumption. However, the most likely interpretation of a natural language conditional by logically naive subjects out of context is as a non-monotonic conditional which is robust to exceptions. "If the switch is down, the light is on" is not, as normally interpreted, falsified by a single instance of the switch being down and the light being off. There may be a power cut, a fuse or bulb blown, or numerous other abnormalities.

SD with the subjects revealed a large amount of evidence that the subjects do not interpret the rule as material implication. After completing the task as Wason conducted it, the subject was taken through their reasoning and asked to justify their choices, or revise them if they now felt they had been wrong. So the experimenter would point at the 3-card and ask "What could be on the other

[20] Plato, Tr. Grube, G.M.A. (1976), *Meno*, Hackett Pub. Co.
[21] Stenning, K. & Michell, L. (1985), "Learning how to tell a good story: the development of content and language in the telling of one tale", *Discourse Processes*, 8 (3).
[22] Wason, P. C. (1968), "Reasoning about a rule", *Quarterly Journal of Experimental Psychology*, 20, pp. 273-281.
[23] Stenning, K. & van Lambalgen, M. (2004), "A little logic goes a long way: basing experiment on semantic theory in the cognitive science of conditional reasoning", *Cognitive Science*, 28 (4), pp. 481-530.

side?". Subject 18, for example[24], replied (correctly) " There could be a K (consonant) or an A (vowel). The experimenter then asked "If it were an A, what would that mean?", and the subject replied "Well, it *might* mean that the rule was false, or it might just be an exception." When asked whether he would turn the 3, this subject reiterated that "No, it might be an exception". Here is immediate refutation (in this subject's case) of Wason's hypothesis about the classical logical interpretation of the rule.

It is common for experimental psychologists to dismiss such evidence as *post hoc* rationalisation which gives no evidence of why the subject acted as they did in the original task. But this is not adequate. They conflate such techniques as `Thinking aloud protocols' where the subject `externalises their thinking' during the task performance, with SD where they justify their reasoning in the dialogue. Externalising thinking allows for all sorts of complications about the relation between what they externalise and what they would do if they perform silently. But SDs are informative as reasoning in themselves. Were the subject who `failed' to turn 7 in the task itself then to change their response in SD to turning 7, we might pause and conclude that perhaps the dialogical situation was enabling `better reasoning'. But here the subject maintains exactly the stance they adopted in the task, in the dialogue. It is completely fanciful to say that this is not evidence that the subject adopted an interpretation of the conditional in which it is robust to exceptions, and therefore not falsifiable by a single counterexample. Exceptions are not counterexamples for this subject, and they reason perfectly rationally given their interpretation.

This is a very different application of the SD to the Snowman example. Here the focus of the task is more like Socrates' original concern with eliciting knowledge and its justification. It might seem very far from a focus on creativity, but that is perhaps misleading. These subjects who have not studied logic have very little explicit grasp of the interpretations they employ in using their native language. For them, finding an interpretation for instructions for a task in a complete vacuum is indeed a creative task. SDs reveal the complexity of the thinking that goes into this exercise.

Drawing from the above a SD, as will be utilised within the context of *C²Learn*, serves two primary and interrelated functions:

- Allow the student to become aware of reasoning processes and decisions that were implicit in the way he/she handled the creative challenge(s), by making them explicit through probing questions.
- Elicit the kind and amount of information that will allow the evaluator to implement the categorisation schema and use it as evaluation indexes.

The choice of this particular method reflects the overall aim of the *C²Learn* project, i.e. to foster co-creativity. The evaluation of creativity calls primarily for rigorous qualitative analysis[25] and multiple data collection tools. The type of questioning employed in an SD, is ideally suited as a key (although not the only) tool for this kind of endeavour. Creativity can often lie hidden in the implicit elements and structures of a reasoning process and even when made explicit it can appear in different guises. The versatility provided by the open-ended questions and overall dialogic form can facilitate the task

[24] Ibid, p. 502.
[25] Armstrong, D., Gosling, A., Weinman, J. & Marteau, T. (1997), *The Place of Inter-Rater Reliability in Qualitative Research: An Empirical Study*, 31 (3), pp. 597-606.

of unearthing the creativity moments in one's reasoning. Of course the method will be accompanied, complemented and supported, by other evaluation tools for the purposes of enhancement and triangulation.

As primarily implicit experience is the main target of the questioning, it is important in this respect that the interview happens soon after the event. The questions should focus on topics raised by the experience that the student(s) just had, taking advantage of the vividness and live interest of the student(s). This is one of the main reasons why we have chosen to integrate our evaluation method with the educational intervention itself.

The two key characteristics of a *Socratic Method* type of interview are [i] structure, and [ii] the use of open-ended questions.

[i] The emphasis on structure is meant to:

- Sufficiently standardise the process throughout the different educational interventions in respect to both the subject group and the evaluator.
- Facilitate the implementation of the categorisation schema (and inter-rater reliability measures).
- Facilitate the transcription and consequent analysis of the data acquired.

[ii] The questions comprising the method must be open-ended in order to:

- Provide the necessary space for the interviewee to fully express him/herself and explicitly articulate the reasoning processes structuring his/her decision making.
- Allow the interviewer to explore the reasoning processes, by creating opportunities for further questioning both vertically and horizontally.
- Facilitate the handling of any unforeseen contingencies and cases that do not fall under the categorisation schema. As the evaluation will take place at different stages throughout the project's duration, it is important that we acquire feedback on the evaluation method we use, especially as it concerns the categorisation schema we are developing. This form of interview will thus also allow us to further calibrate our initial schema, in view of the development of educational scenarios and creativity challenges.

The exact form and content of the *Socratic Method* is dependent upon the specifics of the context. This means that the method will have to be tailored to the specific challenges that the student(s) will face. As a helpful guide to teachers and researches we have created a Socratic Dialogue Manual, included here as **Appendix 3**

In order to further enrich our data we have added 2 complementary Data forms, i.e. the **Gameplay** and **Discussion Data Forms**, to be filled in by students at the end of each Immersive and Reflective session, respectively. The forms ask the students to identify what they found more interesting/important during the preceding session. We kept the question as open ended as possible in order to let the students draw from all levels of their particular experiences. The Gameplay Data forms will also serve as valuable guides for preparing and conducting the Reflective session.

2.3.2 INTERVIEWS WITH TEACHERS (ACCOMPANYING FIELD-NOTES)

So as to evaluate co-creativity and pedagogies, brief (10-15 minute) interviews (one at the beginning and one at the end of the piloting period) will be undertaken with the teachers themselves alongside a small set of field notes from lesson and C²Experience observations of their practice by OU/EA and BMKK researchers across the case study sites in England, Greece and Austria. These interviews will be audio-recorded. The interviews will be semi-structured and use both closed and open questions[26]. They will use the lesson and C²Experience observation(s) as a starting point to better understand aspects of the teachers' pedagogy and pedagogical strategies when using the playful C²Experiences within the C²Space, in particular:

- teachers' perceptions of their students' agency;
- teachers' perceptions of students'C²Experiences;
- extent to which teachers blend 'standing back' with 'stepping forward' and 'meddling in the middle' in this *C²Learn* pilot; and
- the role of time and space in how teachers support students' co-creativity in the C²Learn pilot.

The interviews will also help us better understand the teachers' perceptions of their students' co-creativity through their individual, collaborative and communal interactions within the C²Space, in particular their perceptions of:

- how actions taken by users, the design and redesign of C²Space and its subcomponents, situations and contexts of C²Experiences and individual game's system and rules help them assess their own and students' co-creative endeavours[27];
- how individual, collaborative and communal creativity have played out in the *C²Learn* pilot;
- how undertaking 'journeys of becoming' may be manifest in the *C²Learn* pilot; and
- what evidence there is of 'quiet revolutions' in the *C²Learn* pilot and the dynamics of these.

The finalised interview protocol is available within Appendix 3 as part of the Research Protocol document.

Following interview data collection and analysis protocols developed by Halcomb and Davidson (2006)[28] the interview data will be processed through 6 steps:

1. Audio-recording and concurrent note-taking of teachers' responses
2. Reflective journaling immediately post interview

[26] Cohen, L., Manion, L. & Morrison, K. (2007), *Research methods in Education*, 6th Ed. London: Routledge Falmer.
[27] Apperley, T. & Walsh, C.S. (2012), "What digital games and literacy have in common: A heuristic for understanding pupils' gaming literacy", *Literacy*, Vol 46, pp. 115–122. DOI:10.1111/j.1741-4369.2012.00668.x ISSN: 1741-4369.
[28] Halcomb E. & Davidson, P. (2006), "Is verbatime transcription of interview data always necessary?", *Applied nursing research,* 19 (1) 38-42.

3. Listening to audio and amending notes
4. Preliminary content analysis using the co-creativity criteria as a deductive coding frame
5. Secondary content analysis
6. Thematic review

The results of the analysis will be to offer evidence of co-creativity from the teacher's perspective. Details of this analysis procedure can also be found in Appendix 3.

The researchers will undertake field-notes during a minimum of two *C²Learn* sessions, capturing their own perceptions[29]. The fieldnotes will inform the interviews with teachers and therefore will capture aspects of both pedagogy and learning during *C²Learn* sessions. They will seek to capture evidence of the following aspects of pedagogy (and anything else which seems important to the nurturing of students' co-creativity):

- students' agency;
- teachers 'standing back' to allow students to take a lead, but also 'stepping forward' and 'meddling in the middle'; and
- use of time and space to enable students' co-creativity

Details of the Fieldnote Recording Sheet can be found in Appendix 3.

2.3.3 FILM AND VIDEO DATA CAPTURE

So as to evaluate co-creativity and pedagogies, it will be necessary to capture film and video of students and teachers using the C²Space. Researchers will use a video camera to capture at least 2 instances of students using the elements of the C²Space in each site:

- C²Exlorations
- C²Quests
- C²Games
- C²Fun

One when the teachers and students first use the C²Space then again once, at a later time when students and teachers have more experience with the various C²Experiences. The film data is crucial in documenting the artifacts students and teachers create/design during their interaction using the C²Explorations. Film data of this sort is necessary as often these artefacts are hard to see or analyse when capture through film alone. Also film data provides a secondary visual description of the research site, including the hardware available, participants and layout.

[29] Ely, M., Anzul, M., Friedman, T., Garner, D. & McCormack Steinmetz, A. (1991), *Doing qualitative research: Circles within circles*, London: Routledge Falmer; and Bogdan, R. & Biklen, S. (1992), *Qualitative research for education: An introduction to theory and* methods, Boston, MA: Allen & Bacon.

Additionally, researchers will film a sample of the dialogues between teachers and students in the classroom. These dialogues will include the *Socratic Method* type interviews (see Section [2.2.1]), that will take place in the course of *C²Learn*'s educational interventions.

Importantly all video data will be collected following strict ethical protocols that govern each institution where researchers work to protect the identity of research participants. Data will be collected by researchers at Ellinogermaniki Agogi (EA) in Greece and Bundesministerium für Unterricht, Kunst und Kultur (BMUKK, Austrian Federal Ministry of Education) following these countries', institutions' and schools ethics policies regarding human participants. Only researchers from these three institutions will have password protected access to the data colleted.

The data will be stored confidentially and until the end of the project (31/10/2015), then destroyed six months later (on or before 30/04/2016).

Data will be secured managed, held securely and downloaded securely across the project partners using the web-file server, OWNCLOUD, which is currently operational at Ellinogermaniki Agogi (EA) in Greece. OWNCLOUD has the following security precautions:

1. A: User Password Authentication
2. B. Encrypted Data Transfer
3. C. Backups every 12 hours
4. D. Replication every 4 hours
5. E. Firewall
6. Z. Regular Updates

OWNCLOUD is in use at the EA as it is a trusted, secure and safe software system for EA students to store and share their files remotely. OWNCLOUD is an open source software that has the following security features:

- access is controlled by way of user password authentication
- encrypted Data Transfer is used for additional security
- the integrity of the database is ensured by way of security backups every 12 hours
- the system is based on two file servers, set up to support each other through a replication process that runs every 4 hours. This redundancy safeguards the data stored in the servers against any unforeseen event that may cause the failure of one of the servers
- updates for OWNCLOUD and for its operating system (CENTOS) are run every 12 hours
- finally, our network system has firewall protection to detect and block intrusions or other potentially harmful external network traffic

There are three main reasons for video-data capture:

- As the categorisation of the students will take place during and through these dialogues, the teachers may want to refer back to them if they find a categorisation problematic;

- Video-data capture enables outside raters to make parallel categorisations of children's individual, collaborative and communal co-creativity. This will enable the research team to calculate inter-rater reliability kappa statistics. This is the main check for the project that the categories embodying the theory/teaching practice are communicable from teacher to teacher. It is, thus, the main check that we have on the objectivity of the results;

- The reason for video rather than simply audio recording is that the dual modality recordings are much easier to categorise. Classrooms tend to be quite noisy, and poor recording quality imposes a major cost in the time of those who have to make judgments based on them;

- Video capture will enable multimodal analysis to extend the social interpretation of language and its meanings to the whole range of modes of representation and communication employed in a culture (Kress, 2009[30]; van Leeuwen, 2005[31]). With the option of multimodal analysis, the team can focuses on teachers' and students' process of meaning making, a process in which they make choices from a network of alternatives: selecting one modal resource (meaning potential) over another (Halliday, 1978[32]); &

- Video data capture will provide the team data to analyse multimodal aspects of teacher and student interaction with C²Space and its subcomponents.

Needless to say, such recording will have to be subject to the required ethical confidentiality guarantees and permissions at the university and school levels. If permissions can be obtained, a small sample of video recordings will prove extremely important in disseminating the results of the project and encouraging teacher uptake of the findings.

Multi-modal data collection and analysis

Video data capture of 1-2 instances of gameplay or use of C²Space's various C²Experiences in each site (the first foray into *C²Learn*'s C²Space and then again at a later time when users have more experience with C²Space and its subcomponents) will allow the team to author a descriptive account of the lesson – a video log. The log will be a synopsis of what was going (gameplay and more proudly examples of the 5 elements of co-creativity) during the observations. We may include sketches of events, video stills, a map of the classroom layout and trails, and comments on the teacher and student movement and gameplay. Alongside, but separate from this account, we may also opt to undertake a Multimodal Interaction Analysis (MIA) of teacher and students' C²Experiences depending on the quality of the video data captures. MIA systematically examines multiple communication modes including gesture, proxemics, layout of hardware, body posture, head movement, gaze, handling of hardware, and talk[33]. Students' and teachers' perceptions of high intensity modes can possibly be identified through analysis of their reactions to modal shifts as a result of engaging within and outside C²Space and its subcomponents. This information, if analysed this way, can be used as additional evidence for inferring participants' moment-by-moment understandings of the affordances offered through the different tools and/or collaborative experiences made possible by C²Space.

[30] Kress, G. (2009), *Multimodality: A social semiotic approach to communication*, London, Routledge Falmer.
[31] van Leeuwen, T. (2005), *Introducing Social Semiotics*, London, Routledge.
[32] Halliday, M. (1978), *Language as a Social Semiotic*, London, Edward Arnold.
[33] See for example the work of Deborah Rowe (2012) who uses MIA to operationalize literacy learning events as not only linguistic and textual, but also as embodied, material, and spatial.

2.3.4 SELF AND PEER EVALUATION TOOLS

A] **Creativity Wheel**

Drawing on Redmond (2005)[34] and Spencer, Lucas and Claxton (2012)[35] – Appendix 1 - the OU team have developed a *C²Learn* specific co-creativity assessment wheel. Two forms have been created, one for younger and one for older students, the difference being the accessibility of language. The final versions of these are available in Appendix 3.

The aim is to encapsulate the key parts of the *C²Learn* goals from the co-creativity theoretical framework as defined above. This self and peer assessment tool uses a similar set of principles that underpin Redmond (2005) and Spencer et al's (2012) wheels. Collated together the following points can be said to characterise the creativity assessment wheels. They:

- Are not checklists;
- Are a way of involving pupils alongside teachers and/or facilitators in the creativity assessment process;
- Are a way of allowing students and teachers to reflect on their creative development;
- A way to better understand students' needs for appropriate experiences that will develop their creative behaviour;
- Are different for each participant e.g. one might be neat and handwritten, another might have examples of activity physically stuck to it, another might be digitally created;
- Are structured to represent a particular way of defining creativity (see above for *C²Learn* goals definition); and
- Are divided into sections or themes which represent different aspects of the creativity definition

These themes are in turn divided into indicators of creative development. These indicators are:

- Described in teacher/adult language;
- Described in participant appropriate language (in *C²Learn* case this needs to be adapted for different age ranges); and
- Drawn from theoretical and practical work focused on the creativity definition, as well as potential development from members of the *C²Learn* team.

Spencer et al's (2012) wheel also includes the capacity to capture progression for each participant which is not present in the Redmond (2005) version. This is done simply by dividing the triangle for

[34] Redmond, C. (2005), *The creativity wheel: assessing creative development teacher resource*, Creative Partnerships: Arts Council.
[35] Spencer, E., Lucas, B. & Claxton, G. (2012), *Progression in Creativity: developing new forms of assessment – Final Research Report*, Newcastle: Creativity Culture and Education.

each indicator into 3 or 4 sections where one section's completion can build on the one before it, building out from the centre.

In the first instance the OU team developed a hand-drawn 'mock up' of a *C²Learn* co-creativity assessment wheel as shown in *Figure 2* below. As above, the final versions of the C²Learn co-creativity assessment wheels are available in Appendix 3, with an example of one given below in Figure 3.

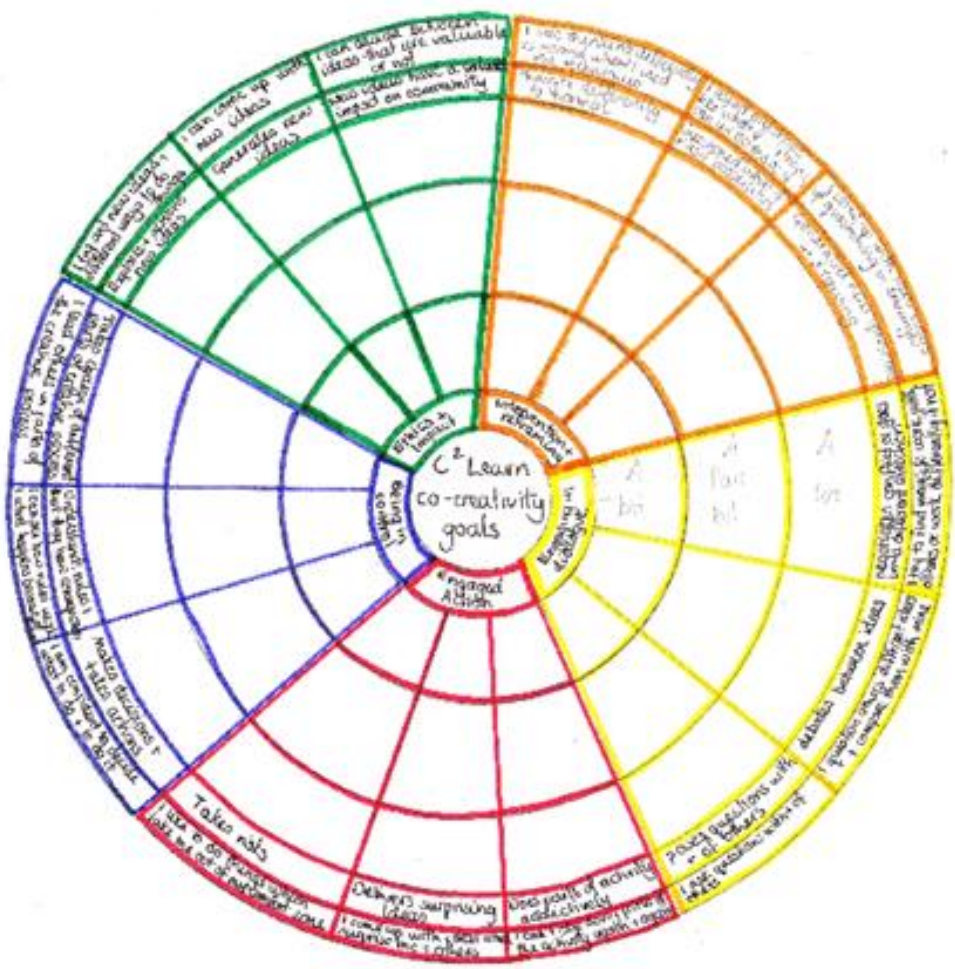
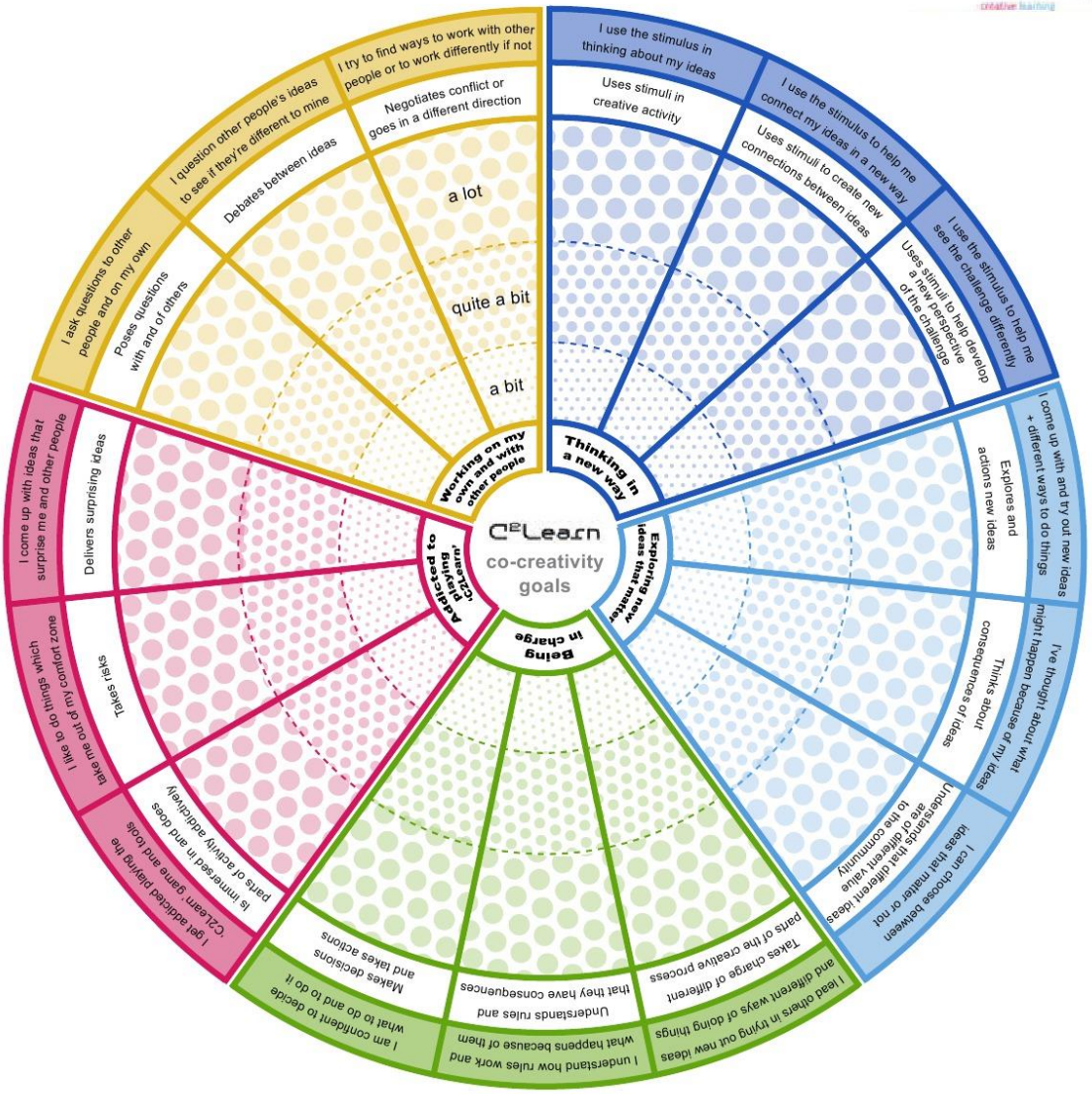


***Figure 3*: Exploratory *C²Learn* co-creativity assessment wheel**



Primary and younger secondary students
Put a tick mark (ˆ) in one box under the statement to show whether you agree a bit, quite a bit, or a lot.

***Figure 4*: Example of final digitised *C²Learn* co-creativity assessment wheel**

As can be seen in Figures 2 and 3, the wheel includes the five elements of co-creativity related to WHC and CER defined in Section [1.1] above. It is designed to represent the core characteristics of creativity wheels as detailed above with the additional option to show development in different elements over time as per Spencer et al's (2012) wheel.

This wheel was piloted in the UK pilots and during *The Creativity and Games in Education Summer School* early July 2013. In the pilots, 10-11 year olds and 11-14 year olds in four schools used the wheel individually and collaboratively in the format above as a colour copied A4 and A3 sheet. They used it to assess both their own co-creativity and as a tool to assess whether the serious games they were playing contained the *C²Learn* co-creativity characteristics in anyway. Their feedback has been compiled within the internal project analysis document[36]. Summer School participants used the wheel to evaluate their own co-creativity in small groups having chosen scenario seeds being explored by the *C²Learn* Consortium. Their feedback was compiled with that of the UK pilots to develop the final version.

During the same period the UEDIN team offered amendments to the 'intervention and reframing' questions, as well as the OU team having their own comments on the wheel from using it practically with the students. Drawing on all of this feedback, the text and format of the wheels have been finalised and the wheels digitised. The wheels have also been translated into Greek and Austrian for use in those sites.

B] **Axes**

In Section [1.1] above, it is proposed that the 4P's inherent in digital contexts (participation, pluralities, playfulness and possibilities)[37] (Craft, 2011) will be embedded within the C²Space. The assessment methodology has found ways to enable individual users and peers to self- and peer-evaluate the extent to which the *C²Learn* context allows for possibility and participation.

Axes (developed within the Exeter University Aspire project)[38] for plotting participation and possibilities (Figure 4) are being embedded within the environment, enabling students and staff to co-evaluate the opportunities offered and instantiated in C2Learn and ways to develop both where necessary.

[36] Chappell, K., Walsh, C. & Craft, A., *C²Learn* Pilot 1 Internal Project Document: Analysis of UK data.
[37] Craft, A. (2011), *Creativity and Education Futures*, Stoke on Trent: Trentham Books.
[38] Chappel, K. & Craft, A. (2011), "Creative Learning Conversations: producing Living Dialogic Space", *Educational Research*, 53 (3), 363-385.

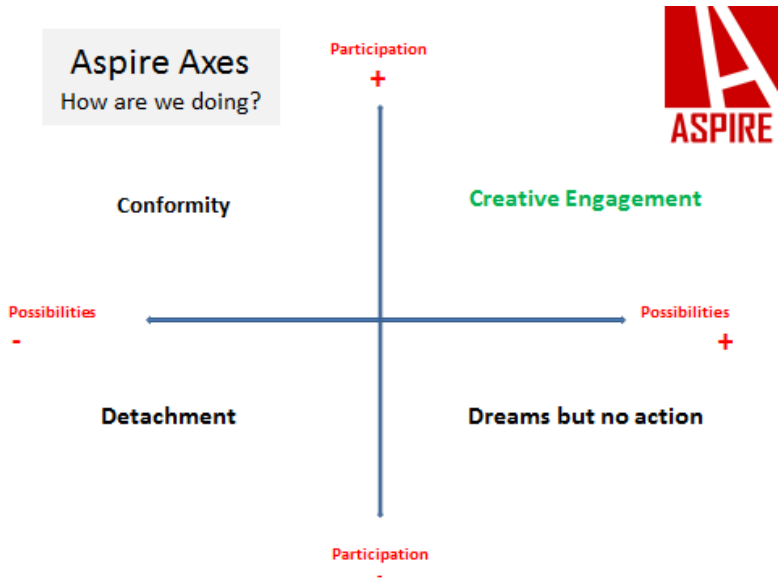


***Figure 5*: Examples of previous axes for documenting participation and possibilities**

The final version of this is available in the Protocol document in Appendix 3. Offering students a means by which to locate their lived experience of participating and generating possibilities by marking their position on the chart, the axes can be used as a prompt for dialogue between peers and also between peers and teachers. They also offer students and staff opportunities to chart change in lived experience over time.

Alongside the wheel, the axes were piloted in the UK pilots and during The Creativity and Games In Education Summer School in early July 2013. 10-11 year olds and 11-14 year olds in four schools used the axes individually as an A4 sheet and collaboratively as a giant axes marked on the floor on which they physically positioned themselves. They used it to assess their participation and capacity to explore possibilities within a task developed as part of the *C²Learn* Learning Design[39]. Their feedback has been compiled within the internal project analysis document[40] from which the axes have now been finalised.

In addition teachers participating in the *C²Learn* Summer School used the axes across a giant floor grid to evaluate digital games that they were devising for use with their own pupils as shown below.

[39] Craft, A., Chappell, K. & Walsh, C., Learning Design *C²Learn* Project Deliverable [2.2.1].
[40] Chappell, K., Walsh, C. & Craft, A., *C²Learn* Pilot 1 Internal Project Document: Analysis of UK data.

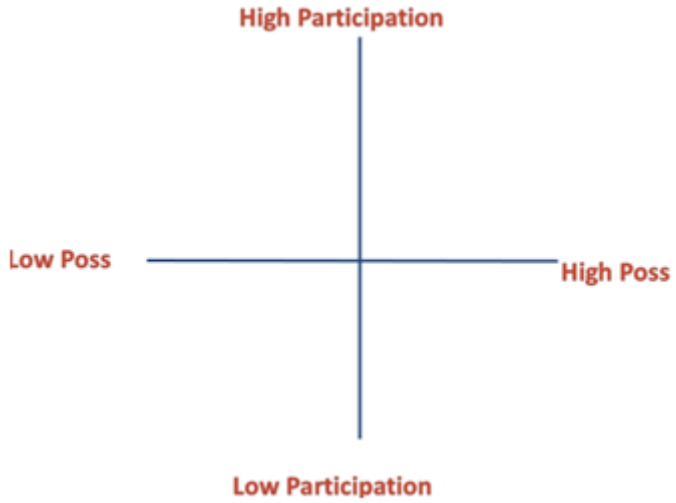


***Figure 6*: Axes grid**

Their reactions confirmed their usefulness in evaluating the extent to which these were designed to enable participation and possibilities.

2.3.5 LINKS OF THE METHODOLOGY TO *C²LEARN* TECHNOLOGIES

While the co-creativity assessment methodology described in the present document consists in the collection of information by human agents, our approach remains open to integrating system-generated and stored data that may support the task of evaluation. Thus the protocols developed for the collection of data to assess C²Experiences, complemented with relevant in-game statistics, will provide us with the necessary information to assess *C²Learn* technology's impact on users' creativity. In addition, the co-creativity assessment methodology is accommodating the interest of our consortium partners in the technological field for the collection of data such as: i) artifacts created during gameplay, ii) any possible rankings of these artifacts and iii) self-assessment results in relation to *C²Learn*'s classification scheme. Furthermore we are exploring the possibility of conducting more limited focus-group studies, in order to assess the impact of particular aspects of *C²Learn* technology upon users' creativity output and processes, making use of available possibilities to combine and interrelate the data collected by humans with data automatically generated and stored by the system.

Furthermore we are exploring the possibility of conducting more limited focus-group studies[41], in order to assess the impact of particular aspects of *C²Learn* technology upon users' creativity output and processes.

2.4 OTHER EVALUATION METHODOLOGICAL TOOLS CRITICALLY CONSIDERED

A] **Controlled experimental design**

The first requirement of any evaluation of ongoing research into a new educational intervention is that it establish that it makes some contribution to its stated goals---do the students get `better' at

[41] Yannakakis, G. N., Liapis, A, Alexopoulos, C., "Mixed-Initiative Co-Creativity", in Proceedings of the 9th Conference on the Foundations of Digital Games, 2014.

doing what the intervention sets out to `improve'. This is most obviously achieved by comparing the young people's responses to early `observations/interventions' with late ones, and hopefully observing a general improvement as captured in the categorisation scheme, based on the theory of what constitutes the desired goal. So the methodology proposed here is aimed at precisely this goal.

Controlled experimental comparisons are always highly focused in the questions they answer and the conclusions that can be drawn. *C²Learn* is very much exploratory research, and sharpening the questions to the degree required would almost certainly mean answering too narrow a question. For example, assessing the impact of teaching logic on thinking, with and without specific kinds of diagram, is a very different problem.[42] Even though it is also a study of an educational intervention not-unrelated to creativity, the logic curriculum is very highly developed, as are several alternative diagrammatic and sentential methods of teaching. There are well accepted tests of success, and ideas about how the skills learned should transfer to neighbouring material, as well as, a well-developed semantics for both diagrams and sentential formulae. It is possible to engineer random assignment of students to educational treatments (with and without diagrams). Highly developed software in support of teaching is already available, and can log and evaluate students' performances.

Experiments using control groups would require a rigorous creativity curriculum analogous to a mathematics or a logic curriculum (or any other analogous curriculum) , alongside the epistemologically appropriate theoretical ideas about what creativity is, how it might be taught/learned, and what part computers might play, etc. In light of the state of creativity curriculums, and the fact that *C²Learn* theoretical framework derive from a differently configured epistemological framing, any sharply focused experimental evaluation is wildly unlikely to be answering the right highly focused question or questions. Based on the above, we opted not to further encumber our assessment with a methodological and logistical burden, unsuited to our particular type of curriculum and research.

B] **Other methodological perspectives on studying creativity**

The approach to co-creativity developed in *C²Learn* builds on the cognitive and philosophical work of UEDIN and the critical theory-influenced educational, socially and ethically situated approach of OU, to generate an organic fusion of theory. The theory generated foregrounds Wise Humanising Creativity and Creative Emotional Reasoning in fostering journeys of becoming and quiet revolutions as discussed earlier in this deliverable.

The *C²Learn* co-creativity approach lends itself to applied work in the classroom and in digital worlds, and so may appear to share elements in common with models of learning associated with particular pedagogies. One of these is problem-based learning. In the *C²Learn* Learning Design deliverable (D2.2.2), however, the key differences between the efforts of this ethical creativity-focused study (*C²Learn*) and problem-based learning (which does not focus on ethical creativity though it does include communities of activity) were highlighted.

[42] Stenning, K., Cox, R. & Oberlander, J. (1995), "Contrasting the cognitive effects of graphical and sentential logic teaching: reasoning, representation and individual differences", *Language and Cognitive Processes*, 10 (3/4), pp. 333-354.

Other widely known work within learning science might also appear to overlap with the efforts of *C²Learn*. For example, examples of learning styles (such as models by Kolb[43], Honey and Mumford[44], Gregorc[45] and others), classifications of cognitive styles (such as Myers-Briggs Type Indicator[46], Kirton's[47] adaptors and innovators, Sternberg'[48]s triarchic model and others). There are also other well-known approaches which may appear relevant such as Bloom's[49] taxonomy of learning and Gardner's[50] theory of multiple intelligences.

In considering the possible relevance of any of these bodies of work, it is important to acknowledge the focus of *C²Learn*, on co-creativity and to consider whether any of these studies focuses on the same terrain. Not one of these studies has a particular focus on co-creativity, even though some include creativity (at an individual level) within them. *C²Learn* is therefore NOT anchored in these approaches but rather draws on the particular range of literatures which frame their work (ie philosophy, cognitive science, educational studies, critical theory-oriented social psychology, social anthropology and social geography), to create a shared delineation of **co-creativity.**

The approach to creativity developed in the *C²Learn* project is distinct from other approaches which encompass a range of epistemological, ontological and therefore methodological perspectives. Such approaches include psychodynamic approaches which foreground the role of the unconscious[51], cognitive approaches which seek the development of models[52], humanistic approaches concerned with human potential[53], psychometric approaches[54] concerned with testing, social-personality approaches concerned with personality trait[55], evolutionary approaches concerned with explanations of novelty in a wider system, and confluence approaches recognising the existence of concurrent influences in creativity. In addition there are a-theoretical approaches which foreground pragmatics.

The approaches to studying creativity delineated above are all concerned with the study of individual creativity although several lines acknowledge the social context. By contrast however, and situated in the interpretive paradigm with a focus on the transformation of lived experience in a social context, through generating novel and valuable outcomes, the approach developed in *C²Learn* acknowledges

[43] Kolb, D.A. (1976), *The Learning Style Inventory*, Boston, MA: McBer.
[44] Honey, P. & Mumford, A. (1982), *Manual of Learning Styles*, London: P Honey.
[45] Gregorc, A.F. (1982), *An adult's guide to style*, Maynard MA: Gabrial Systems Inc.
[46] For example, Myers-Briggs; McCaulley M.H., Quenk, N.L. & Hammer, A.L. (1998), *MBTI Manual (A guide to the development and use of the Myers Briggs type indicator)*, Consulting Psychologists Press, 3rd editon.
[47] Kirton, M. (1976), "Adaptors and innovators: a description and measure", *Journal of Applied Psychology* (61:5), pp. 622–629; Kirton, M.J. (2003), *Adaptation and innovation in the context of diversity and change* Routledge, London, p. 392.
[48] Sternberg, R. J. (1985), *Beyond IQ: A Triarchic Theory of Intelligence*, Cambridge: Cambridge University Press.
[49] As reviewed here: Bloom, Benjamin S., *Reflections on the development and use of the taxonomy* in Anderson, Lorin W. & Lauren A. Sosniak, eds. (1994), *Bloom's Taxonomy: A Forty-Year Retrospective*. Chicago National Society for the Study of Education.
[50] Gardner, H. (1983; 1993), *Frames of Mind: The theory of multiple intelligences,* New York: Basic Books.
[51]Freud, S. (1959), "Creative writers and daydreaming", in J. Strachey (Ed.), *Standard edition of the complete psychological works of Sigmund Freud*, volume 9, pp. 143–53, London: Hogarth Press; Winnicott, D. W. (1971), *Playing and reality*, New York: Routledge; Jung, C. J. (1995), *Memories, dreams and reflections* (recorded and edited by Aniela Jaffe, translated from the German by R. & C. Winston), London: Fontana.
[52] For example, Wallas, G. (1926), *The art of thought,* Hartcourt Brace, New York, NY.
[53] Maslow, A.H. (1943), "A theory of human motivation", *Psychological Review, 50*(4), 370–96; Rogers, C.R. (1954), "Towards a Theory of Creativity", *ETC: A Review of General Semantics*, 11: 249-260.
[54] For an overview, see Plucker, J. & Renzulli, J. (1999), "Psychometric Approaches to the Study of Creativity", in R. J. Sternberg (ed), *Handbook of Creativity*, Cambridge: Cambridge University Press.
[55] Some key social/personality approaches were summarised by Brolin, C. (1992), 'Kreativitet och kritiskt tandande. Redsckap for framtidsberedskap' [Creativity and critical thinking. Tools for preparedness for the future] in *Krut*, 53, pp. 64-71.

the interplay between individual, collaborative and communal creativity (grounded in Chappell, 2008[56], drawing on John-Steiner, 2001[57]). Chappell et al (2013[58]) clearly position humanising creativity and, by association wise humanising creativity, in relation to current theories of creativity ***in education***. The concept has connections to the notion of humane creativity (Fischman, 2007[59]) and wise creativity (Craft et al, 2008[60], Craft, 2009[61]), as well as the kind of democratic creativity described in Banaji, Burn and Buckingham (2010[62]). Focusing on everyday creativity (Craft[63], 2001), *C²Learn* reflects Beghetto and Kaufman's[64] (2007) notion of both 'mini-c' and 'little c' creativity, or Boden's[65] (2004) 'personal creativity'. It is quite distinct from Gardner's high-c (1993, ibid). Humanising creativity is embedded in an embodied understanding of an integrated thinking body-mind (Chappell, 2006[66]; Shusterman, 2008[67]) which is in contrast to creativity driven by dominant cognitive approaches that distinguish strongly between mind and body (eg Cropley, 2001[68]). Humanising creativity also exists in tension with conceptualisations of creativity with an economic imperative. These perspectives suggest advancing the economy through a creative workforce made up of flexible, personally responsible problem solvers (e.g. Seltzer and Bentley 1999[69]).

Grounded in this theoretical position and with its focus on co-creativity between humans and between humans and machines, *C²Learn* cannot, therefore, meaningfully draw on any of the existing tests of creativity – even if they were compatible with the epistemological and ontological perspectives that make up the fused creativity framework of WHC and CER at the heart of *C²Learn*. Thus, well known measures of creativity such as the Torrance Tests[70] developed in North America, or Lubart[71]'s tests developed in France both of which focus on individual creativity and the latter of which also seeks to identify creative giftedness, are not appropriate instruments for measuring the success of the *C²Learn* digital environment in fostering ethical everyday (or little c) co-creativity. It is

[56] Chappell K. (2008), "Towards Humanising Creativity", *UNESCO Observato*ry, E-Journal Special Issue on *Creativity, policy and practice discourses: productive tensions in the new millenium* Volume 1, Issue 3, http://www.abp.unimelb.edu.au/unesco/ejournal/vol-one-issue-three.html.

[57] John-Steiner, V. (2000), *Creative collaboration*, Oxford: Oxford University Press.

[58] Chappell K., Craft A., Rolfe L. & Jobbins, V. (2013), "Humanising Creativity: valuing our journeys of becoming", *International Journal of Education and the Arts*, *13(8) 1*-35, retrieved 11.01.13 from http://www.ijea.org/v13n8/.

[59] Fischman, W. (2007), "A call to serve: an exploration of humane creators", in Gardner H. (Ed.), *Responsibility at Work. How leading professionals act (or don't act) responsibly*, pp. 81-106, San Fransisco: Jossey-Bass.

[60] Craft, A., Gardner, H., Claxton, G. et al (2008), *Creativity, Wisdom and Trusteeship. exploring the role of education*, Thousand Oaks: Corwin Press.

[61] Craft A. (2008), "Trusteeship, wisdom and the creative future of education?", *UNESCO Observatory*, E-Journal, Volume 1, Issue 3, Special Issue: *Creativity, policy and practice discourses: productive tensions in the new millennium*.

[62] Banaji, S., Burn, A. & Buckingham, D. (2010), *The rhetorics of creativity: A review of the literature*, London: Arts Council England (2nd edition).

[63] Craft, A. (2001), "Little c creativity", in A. Craft, B. Jeffrey, & M. Leibling (Eds.), *Creativity in education*, London: Continuum.

[64] Beghetto, R. A. & Kaufman, J. C. (2007), "Toward a broader conception of creativity: A case for 'mini-c' creativity", *Psychology of Aesthetics, Creativity and the Arts*, 12, 73-79

[65] Boden, M.A. (2003), *The Creative Mind - Myths and Mechanisms* (2. ed.), Routledge.

[66] Chappell, K. (2006), "Creativity as individual, collaborative & communal", in *Proceedings of dance and the Child international conference*, The Hague, pp. 42-53.

[67] Shusterman, R. (2008), *Body Consciousness: A philosophy of mindfulness and* somaesthetics, New York: Cambridge University Press.

[68] Cropley, A. J. (2001), *Creativity in education & learning. A guide for teachers and educators*, London: Kogan Page.

[69] Seltzer, K. & Bentley, T. (1999), *The creative age: Knowledge and skills for the new economy*, DEMOS.

[70] E.g. Torrance, E.P. (1974), *Torrance Tests of Creative Thinking*, Scholastic Testing Service, Inc.

[71] Lubart, T., Besançon, M., & Barbot, B. (2011), *EPoC: Evaluation du Pötentiel Créatif*, Paris: Hogrefe. See more at: http://www.mic-conference.org/lubart#sthash.pw0RzqQM.dpuf.

the hope of the project team that by identifying and refining criteria for the evaluation of such co-creativity the basis of a future assessment tool or tools may emerge from the study.

3. OPERATIONALISATION

Having examined in detail the tools that comprise the basic elements of our methodology, we seek in this part to bring everything together in a concrete evaluation plan (Section [3.1]), by addressing the different operationalisation dimensions: We examine the role of teachers in more detail (Section [3.2]), and then proceed to explicate our approach to analysis and synthesis of the data to be gathered (Section [3.3]). Finally we address the issue of training the teachers/researchers for the task at hand (Section [3.4]) and the relevant ethical considerations (Section [3.5]).

3.1 EVALUATION PLAN

The evaluation process will consist of 4 in-depth case studies, realized in 3 pilot cycles, and divided amongst the 3 countries that comprise *C²Learns*'s core testing focus.

The time frame for the 3 pilot cycles is as follows:

- 1st pilot cycle from M(onth)16 to M21 (i.e. 6 months duration)
- 2nd pilot cycle from M25 to M30 (i.e. 6 months duration)
- 3rd pilot cycle from M34 to M36 (i.e. 3 months duration)

For each pilot cycle all 4 case studies will take place concurrently. Of the 4 case studies, 2 will be held in Greece, 1 in Austria and 1 in the UK.

The evaluation data will be collected by C2Learn researchers, supporting specially trained teachers where appropriate (the same teachers responsible for administering the *C²Learn* Educational Interventions) (see Sections [3.2] and [3.4]). The data will be analysed by the researcher teams in each country though in the case of the Socratic interviews, teachers will categorise the initial data collected for each interview before passing these to the researchers.

Each case study will consist of a group of about 20 students (30 maximum-20 minimum), which will be further divided into smaller subgroups groups.

For the two longer cycles we aim for the students to have around 18-24 hours of exposure in total to the *C²Learn* Educational Interventions and unified gaming and creative learning environment, spread throughout the 6-month period. We believe this will be adequate time for the to test the use of the designed technology and corresponding pedagogical interventions and evaluate their impact in real-life educational settings, provided of coursed the group remains as constant as possible although logistics of and other commitments of staff and students in individual sites and the nature of what is available from the C²Space to pilot at each point will to some extent determine this in practice. The third shorter pilot cycle will most likely function as a much more focused, subsidiary/complementary to the second one since it starts during the summer holiday and ends with the end of the project.

Standard approach for the first pilot cycle:

The evaluation for the first pilot consisted of 2 phases, taking place at the beginning and the end of the pilot cycle. The first phase seeks to establish a base of comparison for each group, whereas the second phase seeks to record and evidence the progression/evolution of the group, within *C²Learn*'s co-creativity dimensions.

In the first phase of the evaluation process we utilizez:

- *Socratic Method* type interviews with students by the teachers;
- Video data capture;
- Self and peer evaluation tools; and
- Field-notes by the researcher,

In the second phase all the different evaluation tools were used to obtain the widest and most complete set of data:

- *Socratic Method* type interviews with students by the teachers;
- Interviews with teachers (and accompanying field-notes) by the researchers;
- Video-data capture; and
- Self and peer evaluation tools

Standard approach for the second pilot cycle:

As with the first pilot, the evaluation for the second pilot will also consist of 2 phases, taking place at the beginning and the end of the pilot cycle, adapted though to the model below. The first phase seeks to establish a base of comparison for each group, whereas the second phase seeks to record and evidence the progression/evolution of the group, within *C²Learn*'s co-creativity dimensions.

As above, the evaluation for the second pilot features both the tools generated by the OU team and those generated by the Edinburgh team. In both phases researchers will utilize all the OU tools:

- Interview with teacher
- Video data capture
- Self and peer evaluation tools
- Field-notes by the researcher

In relation to the UEDIN piloting tools, there will be two kinds of *C²Learn* sessions within which data will be collected:

- **Immersive (C²Experience) sessions**
- **Reflective (SD) sessions**

In an **Immersive session** students may engage in *C²Learn* explorations (gameplay). A **Reflective session** is set up as a class-wide SD (but with particular focus on specific groups). In the interim between an Immersive and Reflective session the teacher with the help of the researcher(s) prepare the ground for the following Reflective session.

We expect **a minimum of 2 Reflective sessions**, one at the beginning of the pilot and one towards the end. (In an 8-week pilot that would correspond to weeks 2 and 8.) If more Reflective sessions can be conducted then an alternating scheme should be followed, i.e. Week 1: Immersive, Week 2: Reflective, Week 3: Immersive, Week 4: Reflective etc.

SDs will take the form of Reflective sessions, i.e. class-wide SDs, but with particular focus on specific groups. The amount of Reflective sessions will inevitable vary between sites (due to curriculum choices, specific needs/restrictions etc.), but we at maximizing them, with a minimum number of 2.

We expect the use of Computational data to be ubiquitous throughout the process.

All the data gathered will be subsequently analyzed by the *C²Learn* research team (see Section [3.3]) as indicated above (protocols for OU data analysis can be found within the Protocol document in Appendix 3), with the local research team taking a lead in each case and a system for triangulation and also calibration across sites, in place. In relation to the OU data strand, this has been developed in the first pilot phase to a point where local teams create an analysis document for their site structured in relation to the C2Learn research questions, each of which is uploaded onto the C2Learn online storage system. This structure can then be used to synthesis analytic outcomes across sites as appropriate. The first outcome of this process is available in Deliverable 5.4.1.

3.2 TEACHERS' ROLE

Teachers have an integral role in *C²Learn*'s Co-Creativity Assessment Methodology, as already indicated. There are a number of key interrelated functions that teachers will be responsible for:

- **Teachers will be responsible for administering *C²Learn*'s educational interventions.** This means that they will inevitably develop a solid grasp of the underlying theories and methodologies driving creativity within the context of the project, which coupled with their pedagogic expertise, makes them ideal candidates for evaluating students.

- In order to capitalise on teachers' natural pedagogic role, but also facilitate the evaluation process (both logistically and in terms of quality of data, see Section [2.2.1]), **the evaluation will essentially be embedded within the educational intervention**.

- **Teachers' may also conduct Socratic Dialogues with the students.** Their familiarity with the students (as we aim to keep the groups constant throughout each pilot), supported by their long experience in communicating with students (which includes helping children absorb and verbalise information) will greatly facilitate the administration of the interviews, and provide for better results. But if logistics do not allow it, this role can also be taken up by the researcher.

- Corollary to the above is **teachers' application of the categorisation scheme** which we are developing, which forms our main evaluation index and expression (see Section [1.3]).

- **Teachers will also be administering the self and peer evaluation tools**
- At the beginning and end of each pilot, **teachers will be interviewed by the researchers** in order to evaluate the co-creativity and pedagogic dimension of the intervention using the C²Space (see Section [2.2.2]).
- Finally we count on **teachers' invaluable feedback** both on the applicability/utility of the educational interventions, and *C²Learn*'s Co-Creativity Assessment Methodology throughout the project's duration.

In order to prepare teachers for their role they will remain in close consultation with their main C²Learn research contact and either be trained in the evaluation techniques appropriate to them within group meetings or in one to one meetings in their school. We will, of course, be in close collaboration, providing constant assistance and support to every teacher engaged in *C²Learn*, throughout the evaluation process.

3.3 *ANALYSIS* AND *SYNTHESIS*

Data analysis for *C²Learn*'s Co-Creativity Assessment methodology will use the qualitative constant comparative method[72]. This allows for both a *deductive* and an *inductive* process. Deductively analysis is shaped by the core elements of the *C²Learn* co-creativity framework (see Sections [1.1 and [1.3]).Inductively themes are allowed to emerge from the data. The constant comparative method involves a 'conversation' between these two processes which will allow analysts to offer insight into how *change* and *lived experience* are reflected within *C²Learn* dimensions of co-creativity, as well as allow for other creativity features to emerge in action.

In particular, the core deductive process centres on the application of the categorisation scheme. The categorisation scheme tailored to *C²Learn*'s Educational Interventions will yield data of teachers' categorisations of students' dialogues, indexed to student, date, and teaching intervention. These will be passed back to researchers for data entry and analysis. The central deductive analysis will be of time series of children's categories of dialogue. This core data will be enhanced by many complementary inductive analyses, which will also grow from the application of the different evaluation tools (see Section [2.2]), both independently and in response to the deductive analysis results.

Trustworthiness, quality and rigour will be ensured via adherence to the principles of credibility, transferability, dependability and confirmability[73], with particular attention paid to data and colleague triangulation techniques, negative case analysis and evidence of clear data trails for all coding and categorisation. The constant comparative analysis will involve cycles of open, selective and axial data coding and categorisation (similar to Halcomb and Davidson's preliminary content analysis, secondary content analysis and thematic review) integrated with triangulation. This will result in the deductively and inductively derived findings in relation to the experience of creativity within C²Space and its subcomponents.

[72] Strauss, A. & Corbin, J. (1990), *Basics of qualitative research. Grounded theory procedures and* techniques, London: Sage.
[73] Lincoln, Y.S. & Guba E.G. (1985), *Naturalistic* inquiry, Beverly Hills, CA: Sage; Ely, M., Anzul, M., Friedman, T., Garner, D. & McCormack Steinmetz, A. (1991), *Doing qualitative research: Circles within circles*, London: Routledge Falmer.

3.4 DATA COLLECTION/ANALYSIS TRAINING FOR RESEARCHERS AND TEACHERS

Prior to the implementation of the first cycle of co-creativity evaluation a training workshop was held (5th-6th February 2014) for the key researchers involved in the data collection and analysis, from BMUKK, EA, OU and also UEDIN. Led by UEDIN and OU, it afforded all core research staff the opportunity to use and refine the draft data collection instruments and approaches to analysis, by trialling these with teachers and students in a school environment in EA in Athens. Afterwards the research teams trailed all of the tools and engaged in an analysis using *C²Learn*'s Co-Creativity Assessment Methodology. Then the research teams conducted a calibration exercise to ensure the approach to the data analysis was consistent across all three research sites (England, Greece and Austria).

Following the training workshop and other testing across the year, the format of each instrument was finalised and a written protocol for each developed. These are collated together in the Protocol document in Appendix 3.

Core staff in EA, OU and BMUKK are in the process of training the teachers with whom they are working, on how to use the instruments which require teacher leadership i.e. the *Socratic Method* type interviews with audio-recording and subsequent categorisation. Teachers are also being briefed on the other instruments including how the creativity wheel and 4Ps axes are to be used by students in their classrooms. Instruments to be used by the researchers will also be introduced in such teacher training, i.e. the field notes, semi-structured interviews of teachers and video data of a small sample of students interacting with C²Space and its subcomponents, so that the teachers are aware of what other tools the researchers will be using at the beginning and throughout the pilot phase.

3.5 ETHICS

The assessment methodology was underpinned by a clear set of ethical principles. These were in part derived from Data Protection Regulations and complied with Directive 95/46/EC to ensure correct handling of data and privacy. The consortium members involved in the assessment took all the necessary steps to ensure that all participants, teachers and students, understood the objectives of this project and the processes employed during *C²Learn* to achieve them.

All assessment activities explicitly followed local and national regulations regarding data protection and obtained necessary approval from the local/national authority in charge of data protection when applicable/required. The members of the consortium has copies to provide to the European Commission of written confirmation that it has received favourable opinions of the relevant ethics committees and if applicable, the regulatory approvals of the competent national or local authorities in the country in which the research was carried out. Copies of the official approvals from the relevant national or local ethics committees will be provided to the EC prior to the start of the respective research.

In practice, at a minimum, this will mean that where research took place with *C²Learn* project participants, parents were informed and authorization from the head of the school or institution was obtained. In instances where data was collected for use by the Open University team, British ethical procedures were fully followed. These followed the guidelines of the British Educational Research

Association (2011)[74]. In brief this means that all evaluation procedures were carried out subject to voluntary informed consent gained using participant-specific letters and informed consent forms. For any young people under the age of 16 years this means seeking informed parental consent as well as the consent of the young people themselves. The *C²Learn* team operated in an open way at all times and disclosed what purposes collected data will be used for. Participants all had the right to withdraw their participation in the assessment at any time – they were assured that if this occurs data relating to them will be destroyed. The *C²Learn* team also aimed for complete anonymity and confidentiality. This means we only used pseudonyms in publications and securely stored all evaluation data, particularly digital data on password protected servers where only authorised staff have access.

The guidelines also mean that these ethical procedures, including copies of all information letters and informed consent forms were submitted to the Open University Ethics Committee for approval before they were implemented.

All copies of consent forms and information sheets are also then be available, if required by the EC, prior to the commencement of the relevant part of the research, or afterwards. Detailed information on privacy/confidentiality of data collected can be provided to the EC and was clearly explained to participants.

[74] http://www.bera.ac.uk/publications/Ethical%20Guidelines

APPENDIX 1: CREATIVITY ASSESSMENT WHEELS DRAWN ON TO DESIGN THE *C²LEARN* CO-CREATIVITY WHEEL

***Figure 7*: Redmond (2005) Creativity Wheel**

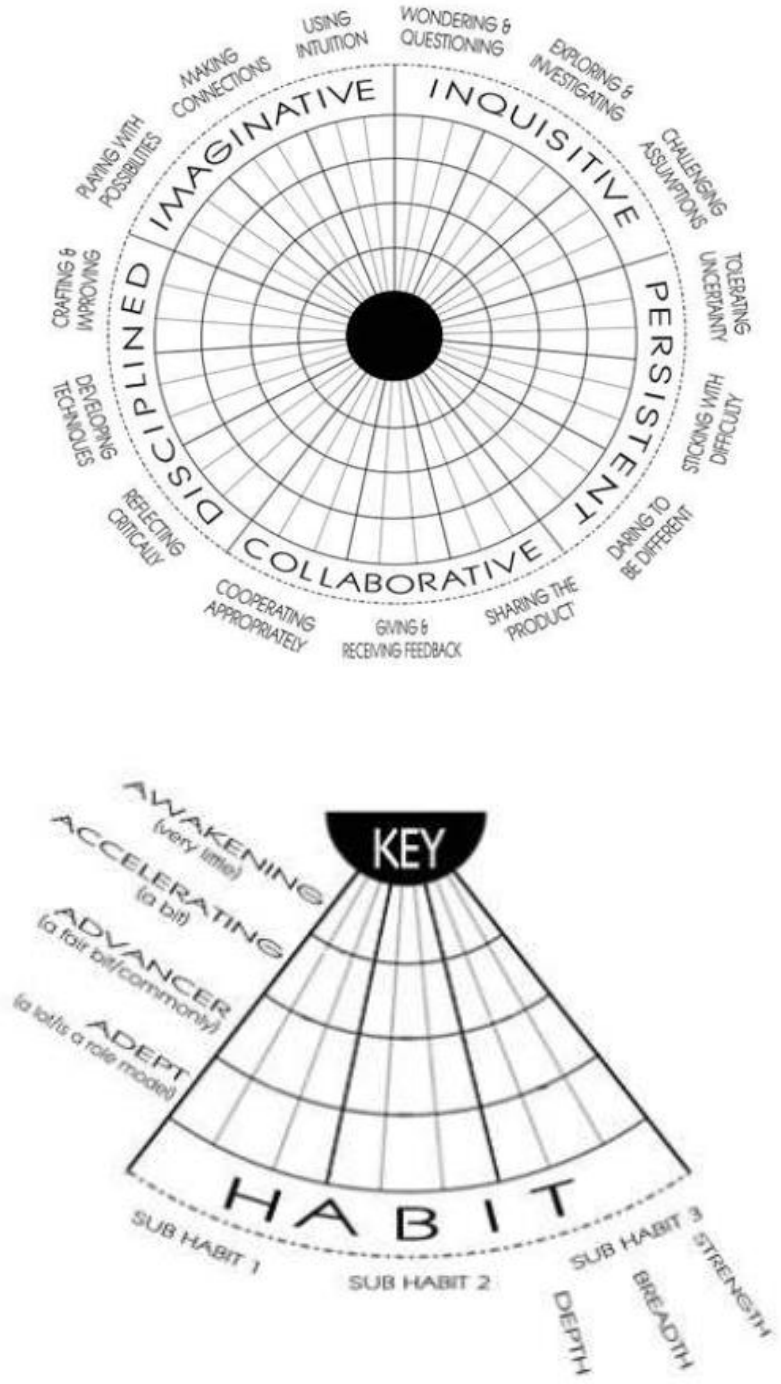


***Figure 8*: Spencer, Lucas and Claxton (2012) Creativity assessment wheel**

APPENDIX 2: *C²LEARN* DATA COLLECTION PROTOCOLS FOR RESEARCHERS

Key to being able to go into your sites and collect this data is making sure that your teachers are confident with the available C2Learn tools, are ready to use them before your first visit and that they have easy access to all the resources they will need to run them. This might involve major things like web addresses to download tools that have been checked against school fire walls etc; it might also include very minor things like making sure teachers have e.g. dice available for the 4scribes game.

There are six main tools for collecting data in the C2Learn pilots and what follows in this document is an explanation of the protocol for each. Four of the tools (protocols 1, 2, 3 and 6) are for use by the C2Learn Researcher, on a minimum of two visits to the site; one at the very start and one when the students have had more experience (toward the end of the pilot) playing the C2Learn game prototypes. Two of the protocols (4 and 5) are for use by teachers and students in between the Researcher visits to the site.

This document is divided into 2 sections. The first section covers data collection protocols, for use in the field. The second section covers data analysis protocols.

These notes have been produced for the C2Learn researchers in Austria, England and Greece. Regular Skype meetings will be set up by the OU team with one representative of each of these teams, together with a representative of the UEDIN team, to share progress with piloting, data collection, analysis and findings.

Please ensure you have read these notes thoroughly and give yourself time to pilot the use of the instruments in particular recording equipment to ensure that this is all in working order. If you are unsure about how to use any of the protocols, please contact one of the appropriate researchers below:

Lead research design teams – Open University and University of Edinburgh.

Any questions for protocols 1 – 5 please contact the OU team:

Kerry Chappell, kerry.chappell@open.ac.uk OR

Christopher Walsh Christopher.walsh@open.ac.uk

Any questions for protocol 6 please contact the UEdin team:

Kostis Alexopoulos oblivious.idiom@gmail.com

SECTION 1 – COLLECTING DATA

On a field visit you need to collect data as follows:

Film and Photo data – protocol 1

Field note data – protocol 2

Teacher interview data – protocol 3

Creativity wheel and axis data – protocols 4 & 5

Socratic dialogue data – protocol 6

It is useful to print the co-creativity categories for analysis (Appendix 7), and have them to hand during the site visit for reference during data collection.

PROTOCOL 1: FILM AND PHOTO DATA CAPTURE

(To be set up prior to gameplay activity.)

The features you need to cover in your film and photo data capture in each of your two research visits are:

1. 4 WHC features;
2. Intervention and reframing
3. 4Ps
4. Journeys of becoming
5. Quiet revolutions
6. Pedagogic strategies

Film data

You will need to use a video camera to capture at least 2 instances of the students and teachers using the C²Space One when the teachers and students first play one of *C²Learn*'s games and use the computational tools and then again once, at a later time when students have more experience with the game and/or tools. Please make sure you note down what element(s) of the C²Space the students and teachers are using.

Have students choose pseudonym and record this on initial viewing notes, along with details of session – date, school, research and date of analysis. Note game scenario, setting and theme. (Ensure there are no duplicates within the classroom and ask students to be creative and invent a name rather than choose an action figure or star's name, e.g. Darth Vader, Miley Cirus, etc.) (Use the ***C²Learn* FIELDNOTE RECORDING SHEET (Keeping track of students)** sheet.

As it is likely there will be different groups playing the game simultaneously in the classroom, it would be good to focus the camera first on the teacher who explains the task and then introduces the question or dilemma. Second focus the camera on one group of students (3 to 5) and film their gameplay of the C2Learn prototype (and use of the computational tools) from beginning until the end. It may be a good idea to choose a group who is farther away from the other groups, or suggest to the teacher to film them in a spare classroom. Another good idea is to please use a digital recorder as well as a camera so you can record everything they are saying. Chances are in a classroom with groups playing the game; the background noise will make it difficult to get a clear audio recording using just a video camera.

We cannot underestimate the challenge or importance of collecting this film data in the most comprehensive way. The UK researchers learned from experience when we discovered a stationary camera is not sufficient to capture the 'complete' aspects of gameplay when there are 3-5 players. For example the voice recordings were compromised and not all gameplayers' actions/expressions were recorded even though they sat in a horseshoe formation.

Also in a crowded classroom, the audio was compromised and this made transcription difficult. As a result, if at all possible the person with camera should try to use a tripod and move the camera on the tripod to capture what gameplayers say and do with the game assets and their bodies/faces. This is most likely less disruptive than holding the camera and moving around the gameplayers. A good idea is still to have the gameplayers sit in a horseshoe formation. Then with a tripod, the researcher can simply move the camera from left to right as the gameplayers interact with the assets, tools through their gameplay. Please do not zoom in on individuals, just capture what their group gameplay by moving the camera form left to right on the tripod and vice cersa.

Additionally, because the gameplayers' linguistic transcript will be the primary and most critical data set, it is a good idea to put the voice recorder on the table to make sure you capture everything the gameplayers say during gameplay.

It is expected that you will collect 20 to 30 minutes of film footage with the still images and audio recorded gameplay simultaneously. But this will depend on how long the game is played.

After gameplay focus the camera on the teacher and whole class to record the discussion and wrap-up. It is also a good idea, if not too disruptive to pass/move the voice recorder to capture what is said during the wrap-up discussion. It might a good idea to recruit a student to do this e.g. Have him/her move with the recorder nearby to where the students or teacher are saying something. Alternatively you could have 3-4 recorders placed strategically around the room.

Once you have captured gameplay on film, please pause the recording and set the camera up to capture the Socratic Interviews (see Protocol 6) if it is scheduled to be captured on the day you are filming. Please follow the same recording principles and directions outlined above. You and the student should sit next to each other, rather than face to face to capture what you say and any body movements. Also please voice record the Socratic dialogue.

We need the data captured to be maximised to the highest quality, particularly the audio to facilitate transcription, which will then facilitate data analysis.

Film Data Once the gameplay is recorded, before it is analyzed, it must be transferred to a computer. The best way of organizing film data is by transferring one instance of gameplay as one separate clip and naming it this way:

Clip_Date_timeofrecording_ResearcherFullInitials_CountryInitials_School#_Teacher#_Group#_C2learnlement(s)captured[75]

This way it will always be possible to match the **Clip** with the **Fieldnotes** and with the **Photos** (see below) and other data from that site visit. It is also a good idea to keep a backup copy on an external thumb drive in a locked cabinet until the data collection period is over.

a) Save the film **Clip** as soon as possible to the OWNCLOUD folder labeled '**Film Data Capture'**, then remove the film file from your recording device. Please label the film clip file as instructed above.

[75] It is possible that in one film session multiple elements will be used. In that case please label the clip in the order the elements are used)e.g. c2creat_4scribes_elementcreationtool

Still image photographic data

Please take digital photographs of the following:

1. The layout of the classroom as it will be used for gameplay
2. Any handouts or instructions (on the board) etc.
3. All of the game assets prior to gameplay
4. Any additional documents or texts students or you design during gameplay (e,g, sheets of paper, new cards, etc.)

When you have exited the site:

a) Save the photo files as soon as possible to a **folder** on your own computer with this name:

Photo#_Date_timeofrecording_ResearcherFullInitiatls_CountryInitials_School#

_Teacher#

b) then label each photo this way consecutively:

Photo1_Date_timeofrecording_ResearcherFullInitiatls_CountryInitiatls_School# _Teacher#

Photo2_Date_timeofrecording_ResearcherFullInitiatls_CountryInitiatls_School# _Teacher#

Photo3_Date_timeofrecording_ResearcherFullInitiatls_CountryInitiatls_School# _Teacher#

Etc.

Save the photo files as soon as possible to the OWNCLOUD folder labeled '**Photos'**, then remove the photo file from your recording device. It is also a good idea to keep a backup copy on an external thumb drive in a locked cabinet until the data collection period is over.

PROTOCOL 2: FIELDNOTES

The features you need to cover in your fieldnotes within each of your two research visits are:

1. 4 WHC features;
2. 4Ps;
3. Intervention and reframing;
4. Pedagogic strategies.

Please try to make your fieldnotes as unobtrusively as possible, and perhaps write them up in quiet moments in between other activities that are happening within your site visit. It is not expected that the fieldnotes will be very long, but they are a way for you to provide insights into your research sites that may not be covered by the other data collection you are carrying out. Please write your fieldnotes digitally.

Please always fill in the first box on the recording sheet to provide descriptive details of the working space etc. As much as possible in your ensuing fieldnotes provide examples and as much descriptive detail of what you have seen. Distinguish between the descriptive detail of examples and incidents you are recording and any analytic thoughts by using the first two columns on the fieldnote sheet. So description in the left hand column and any abstracted, analytic thoughts that occur to you during the site visit in the second column. This, in effect will evidence to other members in the research team why you think what you have described is important in terms of the C2Learn framework.

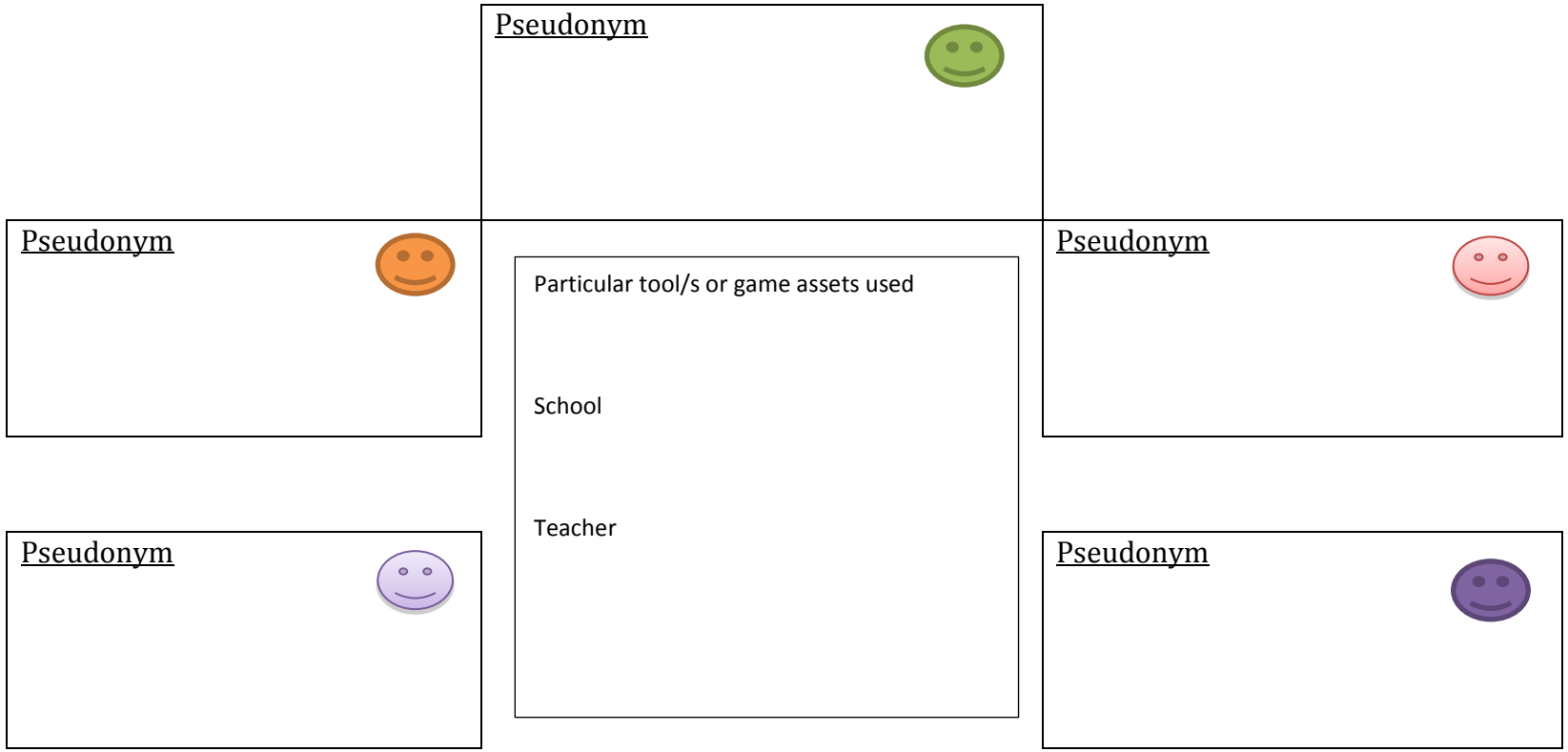
When you have exited the site:

a) Carry out the preliminary content analysis on the digital notes using the co-creativity criteria as a deductive coding frame. Please insert this analysis into the third column of the recording sheet.

b) Save the file as soon as possible after the visit and analysis into the OWNCLOUD folder called '**Fieldnotes'**. Please label the file

Fieldnote_date_timeofrecording_ResearcherFullInitials_CountryInitial_School# _Teacher#

C²Learn FIELDNOTE RECORDING SHEET 1 (Keeping track of students)



C²Learn FIELDNOTE RECORDING SHEET 2 (FOR USE DURING SITE VISIT OUTSIDE OF GAMEPLAY ACTIVITY)

Researcher initials: Date: Time:

Number of staff present: Number of students present: Observable student demographics:

Fieldnotes	**Immediate analytic thoughts**	**Post site visit analysis**
Brief description of working space, atmosphere, environment across the site visit		
Fieldnotes (Game students are playing, dilemma/question introduced by the teacher/facilitator for tool, premise or stimulus introduced as a result of using computational tools)		
Fieldnotes (Ethics and impact)		
Fieldnotes (Engaging in dialogue)		

Fieldnotes (engaged action)		
Fieldnotes (Being in control)		
Fieldnotes (intervention and reframing)		
Fieldnotes (Brainstorming solutions evidenced, different endings for game, interesting details about the debate over solutions and how consensus is reached)		
Fieldnotes (evidence of teachers standing back or stepping forward, using time and space to enable creativity, 4Ps)		

PROTOCOL 3: RESEARCHER INTERVIEWS WITH TEACHERS

On each of your two visits you need to interview the teacher. Please schedule a convenient time to conduct their interview; it will need to happen after the gameplay. The purpose of the interview is to gather information from the teachers about their perceptions of how their learners have shifted in relation to the following co-creativity features:

1. 4 WHC features;
2. Journeys of becoming;
3. Quiet revolutions;

and their perceptions of how they have been using pedagogic strategies when engaging in C2Learn activities with their students. If there are other issues that have emerged for the teachers whilst they have been running C2Learn activities please also allow them time to talk about these. If they do not offer thoughts along these lines, the last question of the interview is designed to trigger this conversation.

When you interview the teachers, you do not need to rigidly follow the question order but please make sure you cover the context of all the questions during the interview.

It is important to also encourage the teachers to provide as much detail as possible when they answer a question. A good way to do this is to ask them to explain their responses in greater detail. This is especially true if they provide 'yes/no' responses. If this happens, ask them to explain mean by 'yes' or 'no' and ask for examples that provide a rich description.

Please audio-record the interview and while you are carrying out the interview take concurrent digital notes which are as detailed as possible.

When you have exited the site

a) Save the file as soon as possible after the interview to the OWNCLOUD folder called '**Teacher Interviews'**, using the name **Interview_date__ResearcherFullInitials_CountryInitial_School# _Teacher#** Then remove the interview file from your recording device.

b) Listen to the audio and supplement your notes with as many quotes as possible as soon after leaving the site as you can. Please use " " to indicate direct quotes from the interviewee. Save the interview notes to the OWNCLOUD folder called '**Teacher Interviews' using the name:**

Interviewnotes_date__ResearcherFullInitials_CountryInitial_School# _Teacher#

c) Carry out the preliminary content analysis on the digital notes using the co-creativity criteria as a deductive coding frame and store this coding in a clearly labeled file in OWNCLOUD using the name:

Interviewanalysis_date__ResearcherFullInitials_CountryInitial_School# _Teacher#

***C²Learn* INTERVIEW QUESTIONS (Researcher interviewing teacher)**

FOR USE DURING SITE VISIT

Researcher initials: **Date:** **Time:**

Teacher pseudonym initials:

Ethics Please begin the interview by reassuring the teacher that their responses will be anonymised, any data collected from them will be stored confidentially in a locked filling cabinet or in a password protected digital file storage system. Also assure them any data collected will only be used for the purposes of the project. Remind them they can withdraw at anytime from the data collection process and that their withdrawal will not affect their relationship with the researchers.

1. Warm up

Can you talk about how you feel the *C²Learn* game activity went with your students?

Probe – what were the successes and challenges for you?; did students enjoy playing the game?

2. Attending to ethics and impact of ideas

Did you feel that the students were making any new associations between ideas?

Probe – can you give examples

Can you talk about any ways in which they were thinking about the consequences and/or impact of their actions?

If they were thinking about impact who were they thinking about the impact on?

3. Engaging in dialogue

Can you give any examples of students debating their ideas?

If they were doing this, did you feel they were respectful of each others' viewpoints and allowed each other to speak?

Were there any instances where conflicts occurred?

Probe: If yes, did students go off in different directions or come to a conclusion or some other outcome?

4. Being in Control

Did you notice particular students taking a leading role at different times?

Probe: Can you describe what happened?

Do you think the students understand the rules of the C2Learn games?

Probe: Which parts do they understand better/worse?

Were the students taking decisions and acting upon them?

Probe: Can you give an example.

5. Engaged action

How much were the students immersed in the C2Learn experience?

Do you think they helped each other to become more immersed at any point?

Probe: Can you give an example?

Were any students taking risks?

Probe: What made you think this was the case?

6 Journeys of becoming

What changes if any have you noticed in how students are, either in their C2Learn activities or more generally?

7 Quiet revolutions

What recent changes if any have you noticed in how the class is either in their C2Learn activities or more generally?

8.Pedagogic strategies

Have you found yourself teaching in particular ways during C2Learn?

Does this reflect the way you normally teach?

Are there any particular features of your teaching in C2Learn you would like to talk about?

NOTE TO INTERVIEWER: we need to avoid leading questions, but we are particularly interested in:

- proactively valuing learners' ideas and actions
- enabling learners to take the initiative
- ensuring sufficient space and time for ideas and actions to emerge
- getting alongside the learner and learning as fellow collaborator

Probe: examples

Are students learning differently to normal?

9. Scenario seeds

Can you explain how the scenario for gameplay developed through curriculum.

10. Tools

Do you have any feedback on the digital tools? What did you and the students think about the game resources?

11. Any other thoughts?

PROTOCOLS 4 & 5: CREATIVITY WHEEL AND AXES

(For use by teachers and students in between your site visits.)

The purpose of the creativity wheel and axes is as self-assessment tools for students to fill out in conversation with their teacher, their peers or on their own. The wheel covers the four WHC features, and Intervention and reframing, and the axes cover the participation and possibility features of the 4Ps.

They can be used within *C²Learn* activity to assess how students are developing in terms of co-creativity.

Please provide the teachers with digital and hard copies of the creativity wheel (please print these *in colour*, and for the wheels from the provided .pdf files rather than from this Word file as the quality will be better and the wheel more readable) and axes. Please print a set of A4 sized wheels and axes for individual student use and 2 or 3 A3 sized wheels and axes that can be used as a poster or for tabletop sharing.

You will need to negotiate with each teacher the best way for each of them to integrate their use into their *C²Learn* activities. They might want to use them on a weekly basis with students filling them in independently; they may wish to fill them in in consultation with the student twice (the creativity wheel particularly has statements for teacher thoughts to help them have a dialogue with students about their progress). But it is important that each student fills them in at least once at the beginning and once at the end of the whole stretch of the *C²Learn* weeks of activity.

You will obviously need to make sure that the teacher understands the terminology on the wheels so that they can work with the students on this. (Training the teachers on the Socratic Dialogues, and its more limited categorization system, can be of some help in this regard.)

In their current format teachers need to ask students to fill in the wheel by ticking the sections that they agree with. They need to ask the students to fill in the axes by marking on the hard copies what the students think they were experiencing in terms of possibility and participation when they took part in the *C²Learn* activity, and therefore where they should position themselves.

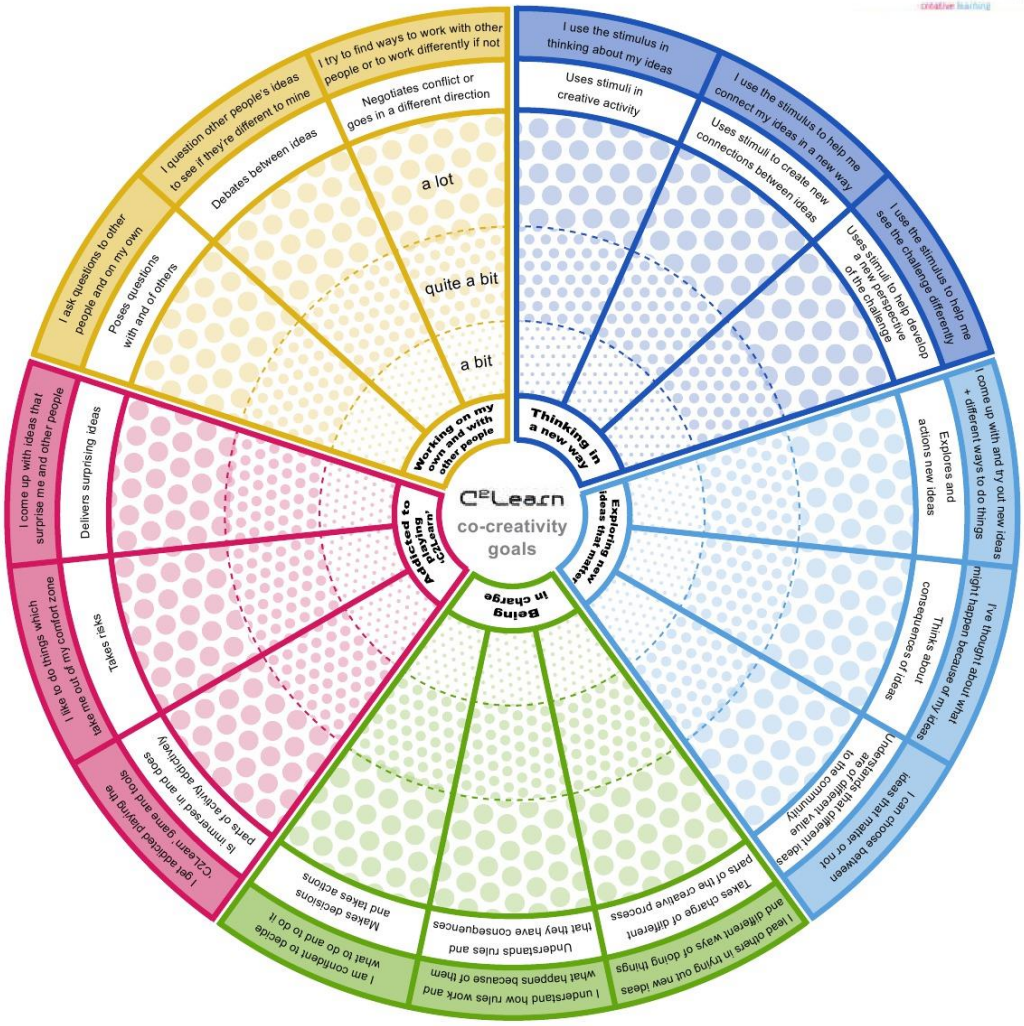
You will also need to arrange to collect these at agreed points in the project. Please ask teachers to make sure that the data is not marked with students' names (you may need to find a way to mark the wheels and axes to recognize particular students but this should not be using initials which could identify the students).

When you have the hard copies of the wheels and axes:

a) Scan each wheel and axes individually and save the file as soon as possible to the OWNCLOUD folders called **'Axes'** and **'Creativity Wheels'**, using the name **Wheel1_date__ResearcherFullInitials_CountryInitial_School# _Teacher# _Student# Wheel2_date__ResearcherFullInitials_CountryInitial_School# _Teacher# _Student# Axes1_date__ResearcherFullInitials_CountryInitial_School# _Teacher# _Student# etc.**

***C²Learn* CREATIVITY WHEEL: YOUNGER STUDENTS (FOR USE BY TEACHERS AND STUDENTS IN BETWEEN RESEARCHER SITE VISITS)**

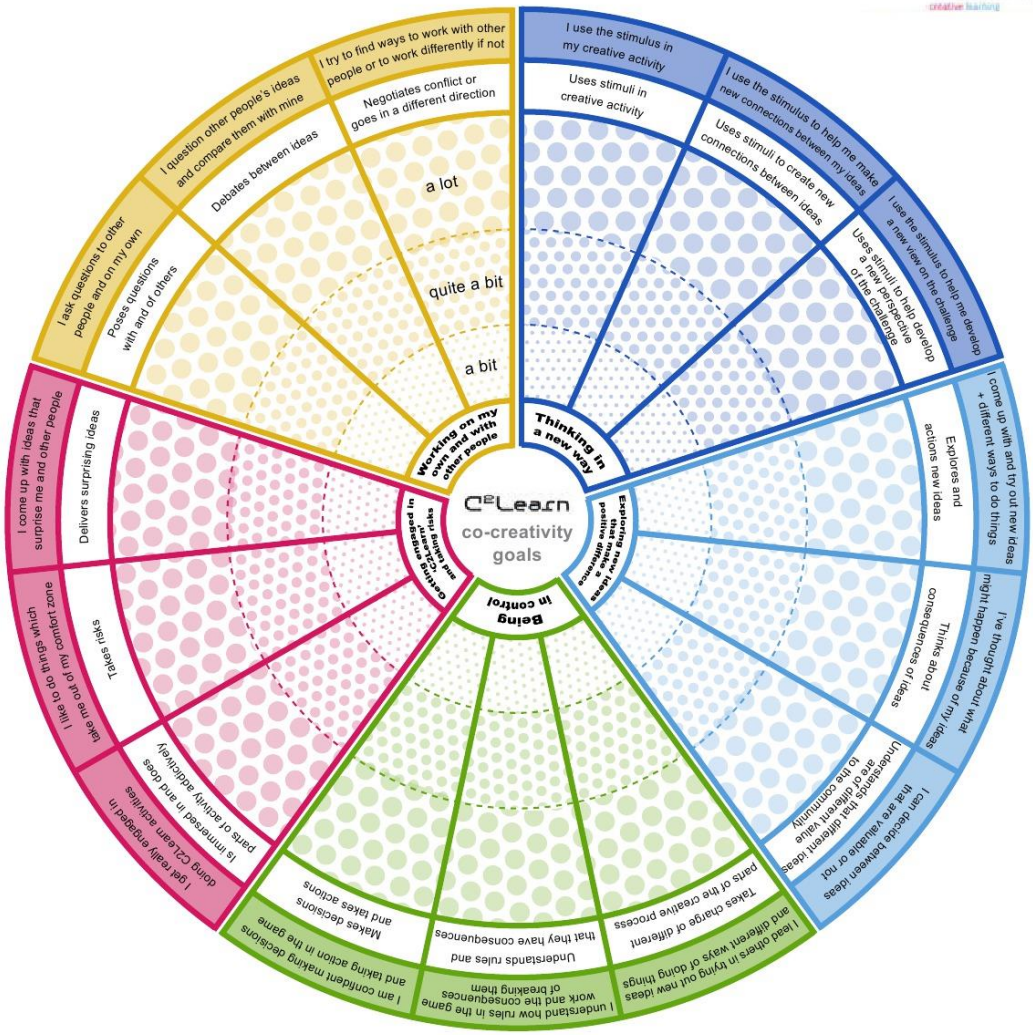
Student number/pseudonym: **Date:**



Primary and younger secondary students
Put a tick mark (ˆ) in one box under the statement to show whether you agree a bit, quite a bit, or a lot.

C²Learn CREATIVITY WHEEL: OLDER STUDENTS (FOR USE BY TEACHERS AND STUDENTS IN BETWEEN RESEARCHER SITE VISITS)

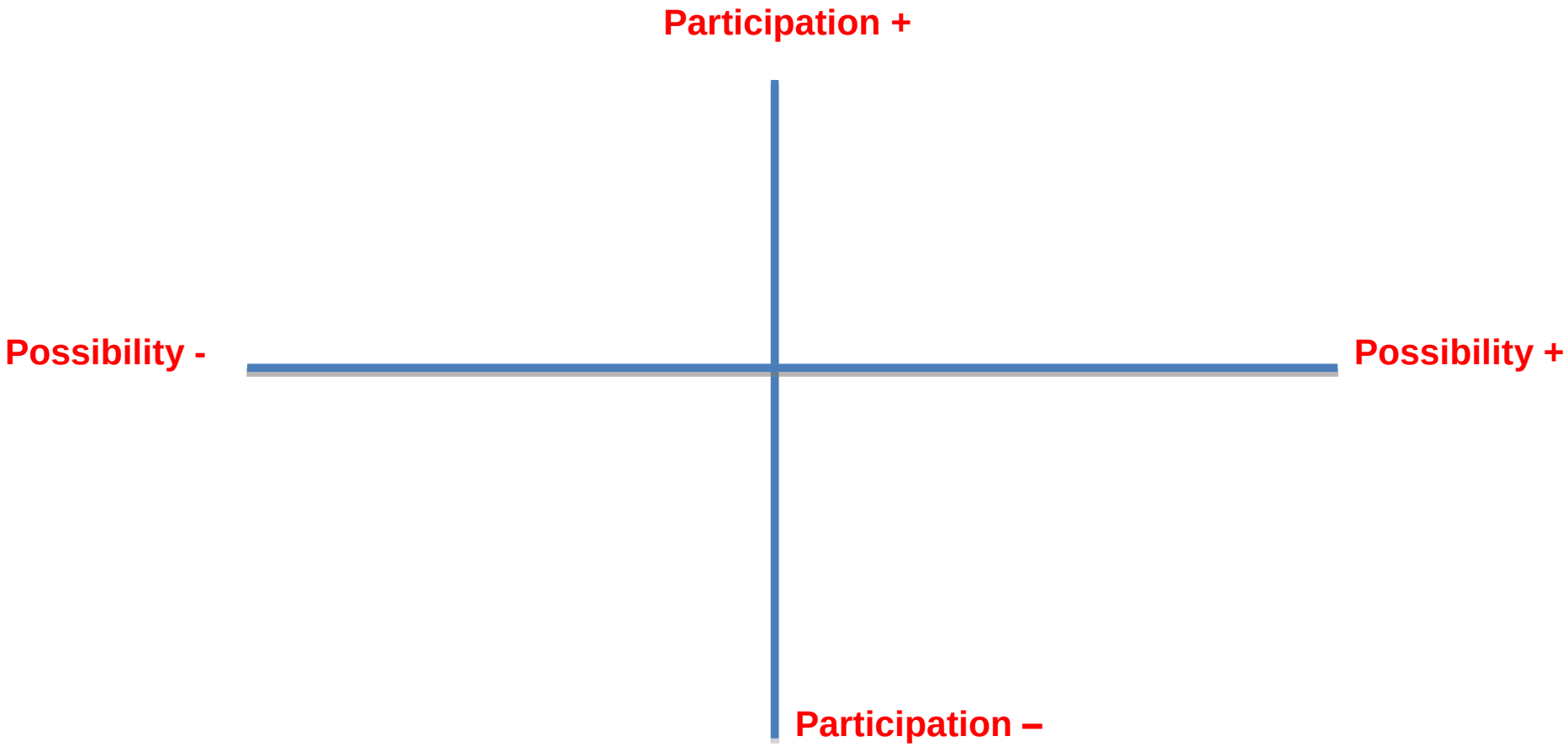
Student number/pseudonym: **Date:**



Older secondary students and over 18s
Put a tick mark (˚) in one box under the statement to show whether you agree a bit, quite a bit, or a lot.

***C²Learn* Axes (F OR USE BY TEACHERS AND STUDENTS IN BETWEEN RESEARCHER SITE VISITS)**

Student number/pseudonym: Date:



PROTOCOL 6: SOCRATIC DIALOGUES

A **Socratic Dialogue** (SD) is a semi-structured **dialogue** with a **group/class of students**. The interviewer utilises **open-ended questioning**, in order to get a better understanding of the students' **reasoning processes** and **experiences** as regards a particular gameplay session.

A SD is meant to provide an **in-depth look into students' experience of gameplay**, in order to facilitate the application of 2 Categories from ***C²Learn*'s Co-Creativity Categorization** scheme by the teacher. The categories in question are:

- **Ethics& Impact**
- **Intervention & Reframing**

Either the teacher or a researcher can conduct the SD, **but** it is the teacher that will carry out the actual categorization. It is thus required that the teacher adequately familiarizes him/herself with the relevant categories, before the application of a SD.

The exact nature of the open-ended questioning will heavily depend on the particular gameplay experience (the rules of the game, the particular context of gameplay, specific game-related events etc.). There is no reason that the students have to be aware of the separation between gameplay and SD, or indeed of the name SD for the activity or that it is an evaluative activity.

The open-ended questioning is meant to **establish a dialogue** between interviewer and students, to facilitate the transmission of critical info pertaining to the student's **thinking** and **experience**. The interviewer's aim is to gently keep the students focused on revealing how their thinking proceeded, both while the incidents were taking place, and as the dialogue unfolds, and they have had some chance to reflect on these incidents. It is particularly important to try to **avoid disapproval** and to **encourage the students** to feel that their thinking is important and to express themselves even if they are not sure of being 'right'. (E.g. it might, for example, be appropriate to point out tensions between different statements/actions that a particular student has made/taken, but always with a view towards deeper understanding and clarification, never as a reprimand or correction.)

The pilot will consist of two types of *C²Learn* sessions:

- **Immersive (Gameplay) sessions**
- **Reflective (SD) sessions**

The SD will be carried out during the Reflective session and will take the form of a **class discussion**, but with a particular focus on **2 groups** already chosen by the teacher (and researchers) from the start of the pilot.

During or after the Reflective session, the teacher is to fill in the **Socratic Dialogue Co-Creativity Categorisation Form**. It is up to the teacher to decide when it is most efficient for the categorization to take place. In our experience we found that going over the gameplay and SD footage, as well as consulting any props/data from the actual gameplay, greatly facilitated categorisation. The teacher is of course free to categorise the students during the SD if he/she sees fit. (Instructions for the form's

use can be found on the form.). Please print the form, preferably in colour, as it may better aid the teacher in distinguishing between the categories.

Note: There are **2 scores** that the teacher has to fill in. One addresses **each student individually**, and assesses the student's performance in the relevant category. The other is a **group score**, assessing the group's overall performance in the relevant category. Both should be filled in.

We expect each group to consist of 4 to 5 students (max). As the *C²Learn* games or activities will require the separation of the class into groups, this is the most natural and efficient system to organize data collection too. Each group should be assigned a number, to be used throughout the pilot as a means of identification. Keeping the initial division of groups as intact as possible throughout the pilot is essential.

We expect **a minimum of 2 Reflective sessions**, one at the beginning of the pilot and one towards the end. (In an 8-week pilot that would correspond to weeks 2 and 8.) the same two groups are to be evaluated at the beginning and end of the pilot. This means that the same 2 groups will be the focus of the Reflective sessions.

If more Reflective sessions can be conducted then an alternating scheme should be followed, i.e. Week 1: Immersive, Week 2: Reflective, Week 3: Immersive, Week 4: Reflective etc. In this case the groups should be **expanded to 4**. (Groups 1-2 Weeks 2 and 6; Groups 3-4 weeks 4 and 8)

If possible, an extra group should be interviewed/rated only once at the end of the pilot.

Immersive Session:

In an **Immersive session** students engage in *C²Learn* gaming. During gameplay the teacher and researcher(s) try to focus their attention on 2 groups, chosen beforehand. These 2 groups will later be evaluated using the **Socratic Dialogue: Co-Creativity Categorisation Form**.

In the interim between an Immersive and Reflective session the teacher with the help of the researcher(s) prepare the ground for the following Reflective session. This may require viewing the gameplay footage, game-products etc.

Before starting a Reflective session with students, the interviewer is advised to identify a relatively small number of particularly **interesting incidents** in the preceding *C²Learn* gameplay session. (If it helps the interviewer he/she may take notes during gameplay, as regards these interesting incidents, to be used later during the SD.) These incidents will help **structure the dialogue** and **provide focus** for both the interviewer and the students. It is of course expected that the dialogue will branch out to other parts of gameplay.

By ***incidence*** we mean a particular event within gameplay. It usually would be something one of the students being interviewed did/contributed, but might also be something prominent done/contributed by the group as a whole, or (very rarely) by the teacher/creativity assistant.

By ***interesting*** we mean an incidence with any/some/all of the following characteristics:

[a] An event that seems to exemplify 2 of the relevant co-creativity categories (Ethics&Impact, Intervention&Reframing) to very high or very low degree. (As defined in *C²Learn*'s Co-Creativity Categorization.)

[b] A crucial/key event during gameplay. (An event with a significant impact on gameplay.)

[c] An event that attracted a lot of attention by the group.

Towards the end of an Immersive session the teacher hands out the **Gameplay Data Form**, to be filled in by the students. It is important that we are able to track the Group ID on these forms. So the teacher or researcher should have already filled in the relevant field **before** handing them out to the students. These forms can also be used by the teacher and researcher to help prepare for the SD, as they contain valuable information on what the students found more interesting.

(Note: It is also possible to let the students identify interesting incidents, through questioning during the SD.)

Immersive session (possible) breakdown:

1. Introduction (5 minutes)

2. Division in Groups / Gameplay (30 minutes)

3. Fill in **Gameplay Data Form** (5 minutes)

Reflective session:

A **Reflective session** is set up as a **class-wide SD**, but with particular focus on the same 1-2 groups that were the focus of the Immersive session. The teacher (or researcher) leads the class (and the students of the 2 groups in particular) through a reflective process, with the aim of eliciting more information and deeper insights as regards the students experience and thought processes during gameplay. Any part of gameplay (including products, props etc.) can be used to further this goal.

We recommend that the interviewer starts the session with a **presentation** of one of the 2 focus groups' gameplay products (stories, icons etc.), created in the previous Immersive session. This can be performed by the interviewer or the students themselves. It is best to get the students as involved as possible. With the presentation as a basis, the interviewer can start addressing questions to the students belonging to the particular focus group, but also opening up the discussion to the rest of the class. There should be a strict time limit to this process. After completing the discussion on the first presentation the interviewer should proceed with the second's group presentation, followed by a similar discussion.

As mentioned above an SD's particular content heavily relies upon the particular game and gameplay experience. Below we include some indicative questions in regards to two of *C²Learn*'s games:

4Scribes

The presentation could consist of the stories created by the 2 focus groups.

Indicative questions include:

- What did you think the story was about?
- What did you find more interesting? What was the most important thing that happened?
- What created the most change? How?
- Can you explain event *X*? How did it come about?
- Why did you do *Z*? Why do you think player *A* did *R*?
- How did you use your cards? What was your favourite card? Why?
- What card was the most difficult/easy to use? Why?

Iconoscope

The presentation could consist of 4-6 icons selected by the teacher/researcher, half of which were successful and half that weren't.

Indicative questions include:

- Can you explain the connection between icon *X* and the concept you chose?
- What other concept were you alluding to? How?
- What do you think makes icon *X* successful (not successful)?
- What did you think of icon *X*? (What do you think of icon X now?)
- How does icon X relate to the different concepts?
- Icons *X* and *Y* both were aiming for the same concept(s)? Why do you think one failed and the other succeeded?
- What other icons, apart from the ones presented, did you find interesting?
- Which round did you find the most difficult? Why?
- What kinds of things came up for you when you were considering concepts XYZ together?

Towards the end of an Immersive session the teacher hands out the **Discussion Data Form**, to be filled in by the students. It is important that we are able to track the Group ID on these forms. So the teacher or researcher should have already filled in the relevant field **before** handing them out to the students.

Reflective session (possible) breakdown:

1. Introduction (5 minutes)

2. 1st Group Presentation / SD focused on 1st Group (15 minutes)

3. 2nd Group Presentation / SD focused on 2nd Group (15 minutes)

4. Fill in **Discussion Data Form** (5 minutes)

All Reflective sessions should be **audio and video recorded**. We would also advise that the 2 Groups under focus are audio/video recorded during the Immersive session (Note: This may require the use of 2 cameras.) The researcher(s) responsible for each site should arrange to collect these audio/video recordings at agreed points in the project. The researcher(s) should then **file** them, as soon as possible to the relevant OWNCLOUD folder (see Protocol 1), for future referencing by the interviewer him/herself, other teachers during inter-rater reliability tests and the research teams. Any screenshots (or film) pertaining to the gameplay incidents under focus, must also be gathered as referencing material (see Protocol 1). (The recordings and any relevant photos of gameplay should be filed as instructed in Protocol 1.)

There are 3 types of SD forms to be collected. When the researcher(s) has acquired the hard copies of the SD forms:

Scan the front page and save the file as soon as possible to the OWNCLOUD folder:

C2Learn Pilot Data\CountryName\Socratic Dialog Forms

using the names:

Socratic Dialogue: Co-Creativity Categorisation Form:

SD_Clip_Date_timeofrecording_ResearcherFullInitials_CountryInitials_School#_Teacher#_Group#

(Please make sure that the date on this file is the same as the date of the corresponding recording.)

Gameplay Data Form:

GD_Date_ ResearcherFullInitials_CountryInitials_School#_Teacher#_Group#

Discussion Data Form:

DD_Date_ ResearcherFullInitials_CountryInitials_School#_Teacher#_Group#

Inter-rater Reliability testing scheme:

At another time, the above recordings (i.e. a group's gameplay + SD) will be observed by colleagues (either teachers or researchers) not involved in the actual teaching period, who will make comparable judgments of the students' contributions, record them in a similar way, and file them as inter-rater reliability tests. The purpose of this second observation is to allow us to assess the degree to which it is possible for colleagues to achieve **reliable judgments** of the students in this context. It is obvious that the judgments should be made independently and recorded separately. There is no reason at all why colleagues should not discuss the process of judgment (for example questions and difficulties that arise) **after** they have been recorded. In fact this would be a beneficial part of the teaching experience, and help future judgments converge. (Obviously the research team will be interested to hear about problems experienced and questions and comments arising.) They can discuss how to localise the categories before their evaluations, but **only for clarification and stage-setting** purposes; they must not influence each other's categorisation.

Given the number of students taking part in this pilot, it is necessary that inter-rater reliability tests are conducted for **every group** participating.

The inter-rater tester is also to fill in a **Socratic Dialogue: Co-Creativity Categorisation Form** for each group they review.

When you have the hard copies of the SD forms:

Scan the front page and save the file as soon as possible to the OWNCLOUD folder:

C2Learn Pilot Data\CountryName\Socratic Dialog Forms\2nd Evaluation (Inter-rater reliability test)

using the name:

SDRT_Clip_Date_timeofrecording_ResearcherFullInitials_CountryInitials_School#_Teacher#_Group #

(Please make sure that the date on this file is the same as the date of the corresponding recording. Also please make sure that the Group# is the same as the corresponding SD file.)

Socratic Dialogue: Co-Creativity Categorisation Form

Date: Country: School ID: Game played:

Class ID: Teacher ID: Group ID:

	Category	
Student Name	Ethics & Impact	Intervention & Reframing

	Category	
Group Name	Ethics & Impact	Intervention & Reframing

Instructions:

1. Fill in all the relevant details, in the fields provided.
2. Categorisation Table:

Fill in the Student ID for each student in the group. Fill in the evaluation score for each student, using a number from 1 (lowest) to 5 (highest), in the relevant cell for each category. Use N/A if not-applicable.

Fill in the Group ID. Fill in the evaluation score for the group, using a number from 1 (lowest) to 5 (highest), in the relevant cell for each category. Use N/A if not-applicable.

For more information on the categories please refer to the *Socratic Dialogue Manual*.

Thank you!

Gameplay Data Form

Date: Country: School ID: Game played:

Class ID: Teacher ID: Group ID:

What are the 3 most interesting/important things that happened during gameplay?		

Discussion Data Form

Date: Country: School ID: Game played:

Class ID: Teacher ID: Group ID:

What are the 3 most interesting/important things that happened during the discussion?		

SECTION 2 – ANALYSIS

Low level analysis of data – simplified protocol

As soon as possible after collection, you need to analyse the data according to the protocols:

- Film and Photo data – protocol 1
- Field note data – protocol 2
- Teacher interview data – protocol 3
- Creativity wheel and axis data – protocols 4 & 5
- Socratic dialogue data – protocol 6

The 3 research questions for the ***C2Learn*** pilots are:

1. How do participants manifest co-creativity (WHC and CER) through C²Experiences?
2. How does manifesting of co-creativity (WHC and CER) in *C²Learn* change over time?

[a] Assessment of the change in students' thinking patterns and reasoning processes along the CER dimension.

[b] Assessment of students' lived-experience in terms of co-creativity along the WHC dimension.

What role is played by *C²Learn* technological tools and corresponding pedagogical interventions, focusing in particular on students' experience?

FILM DATA ANALYSIS GUIDE FOR FIELD RESEARCHERS

Print the analysis documents –

Appendix 1: Transcription and 1st stage analysis of activity: identifying rich instances

Appendix 2: Transcription and 2nd stage analysis of activity: rich instances (strong only)

Appendix 3: Recording pedagogic strategies

Appendix 4: Reflections on pupils' journeys of becoming

Appendix 5: Reflections on pupils engaging in quiet revolutions

In your workspace, lay out the co creativity categories, stills images of the teaching space from your field notes and stills of the game as it unfolded.

Watch the game footage through once, using *C2Learn FIELDNOTE RECORDING SHEET 1 (Keeping track of students)* to note the time of instances of game play which are RICH – ie players are exhibiting one or more of the co-creativity behaviours.

Watch the game footage again, in order to fully document each rich instance on the *Transcription and 1st stage analysis of activity: identifying rich instances.* You will need to pause and rewind to ensure you capture each instance as fully as possible. When finished, assess each instance as strong, medium or weak. Upload the document to OWNCLOUD, in the folder called **'Rich Instances'**.

Using Transcription and 2nd stage analysis of activity: rich instances (strong only) where you provide further analysis using the co-creativity categories and behaviours. At this point you expand on the preliminary analysis you have already completed. Here you may make more detailed reference to the chain of events resulting from the gameplay action of the instigator, clarify what was said and or any physical actions/expressions or interactions between gameplays, etc. Upload the document to OWNCLOUD, in the folder called **'Rich Instances'**.

Using *Recording pedagogic strategies* focus on the teacher's introduction to the session, and interaction during gameplay.

FOR SECOND AND SUBSEQUENT FIELD VISITS ONLY

Following the analysis outlined above, it is also necessary to analyse changes over time.

Using the *Reflections on pupils' journeys of becoming.* For this focus on noticeable changes in ***gameplayers' dispositions*** over time. This is only completed for the second filmed gameplay session. These may also emerge from the Socratic Dialogues and teacher interviews.

Using the *Reflections on pupils engaging in quiet revolutions.* For this focus on noticeable changes in the ***creative community*** stemming from creative ideas generated through gameplay. This is only completed for the second filmed gameplay session. These may also emerge from the Socratic Dialogues and teacher interviews.

Upload both documents to OWNCLOUD.

FIELD NOTE ANALYSIS GUIDE FOR FIELD RESEARCHERS

Revisit your Fieldnote recording sheet 2– and complete post visit analysis referring to the co-creativity categories (Appendix 6).

Teacher Interview data analysis guide for field researchers

Preliminary content analysis

a) Listen to the audio and supplement your notes with as many quotes as possible as soon after leaving the site as you can. Please use " " to indicate direct quotes from the interviewee.

Save the interview notes to the OWNCLOUD folder called Teacher Interviews using the name:

Interviewnotes_date__ResearcherFullInitials_CountryInitial_School# _Teacher#

b) Carry out the preliminary content analysis on the digital notes using the co-creativity criteria as a deductive coding frame. Cross reference to the preliminary notes.

You can clearly show your analytic process by inserting comment boxes into your initial word document augmented with quotes. Key quotes can then be cut and pasted into an interview analysis document structured using the co-creativity categories – see Appendix X for an example.

Store this coding in a clearly labeled file in OWNCLOUD using the name:

Interviewanalysis_date__ResearcherFullInitials_CountryInitial_School# _Teacher#

Creativity wheel data analysis guide for field researchers

Create a spreadsheet to record responses alongside pseudonyms

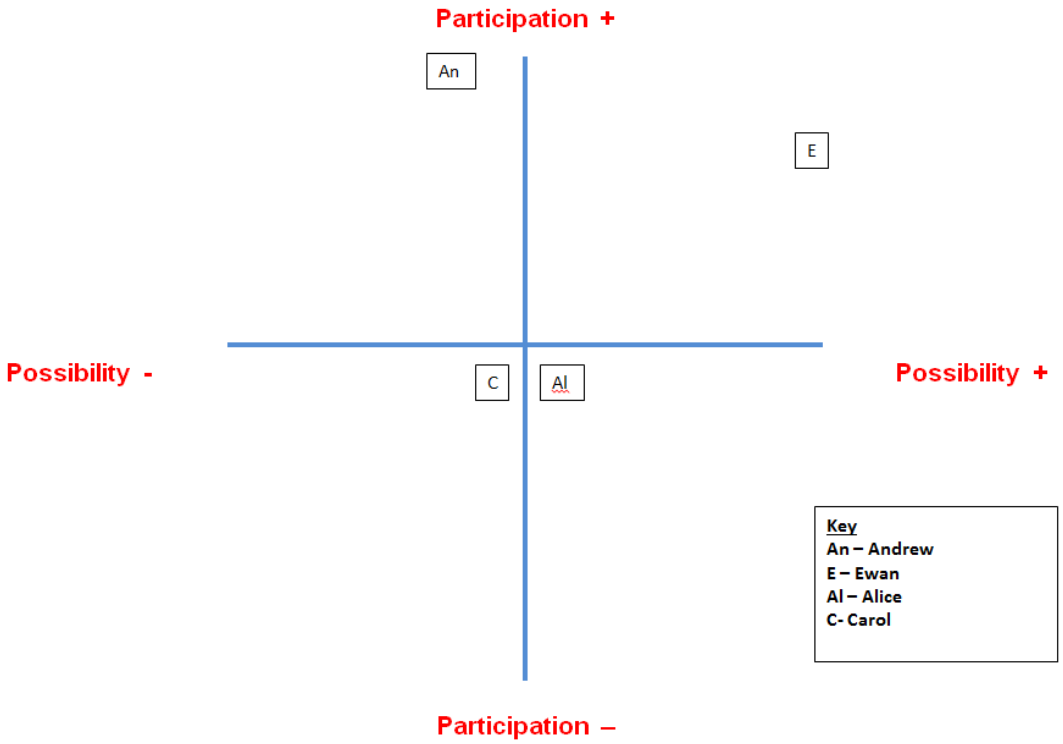
		Thinking in a new way			Exploring new ideas that make a positive difference			Being in control			Getting engaged in C2Learn and taking risks			Working on my own and with other people		
Pseudonym	question	I use the stimulus in my creative activity	I use the stimulus to help me make new connections between my ideas	I use the stimulus to help me develop a new view on the challenge	I come up with and try out new ideas and different ways to do things	I've thought about what might happen because of my ideas	I can decide between ideas that are valuable or not	I lead others in trying out new ideas and different ways of doing things	I understand how rules in the game work and the consequences of breaking them	I am confident making decisions and taking action in the game	I get really engaged in doing C2Learn activities	I like to do things which take me out of my comfort zone	I come up with ideas that surprise me and other people	I ask questions to other people and on my own	I question other people's ideas and compare them with mine	I try to find ways to work with other people or to work differently if not
Ewan	a lot						1							1		
	quite a lot	1		1	1	1			1	1	1		1			1
	a bit		1					1				1			1	
Carol	a lot					1	1			1						
	quite a lot	1	1	1		1	1	1	1		1		1		1	
	a bit		1		1			1	1		1	1		1		1
Alice	a lot			1	1	1			1	1	1	1	1			
	quite a lot	1	1				1	1						1		1
	a bit														1	
Andrew	a lot								1		1					
	quite a lot	1	1	1	1	1	1	1		1		1		1		
	a bit												1		1	

Store this coding in a clearly labeled file in OWNCLOUD using the name:

Wheels_date__ResearcherFullInitials_CountryInitial_School# _Teacher#

Axes data analysis guide for field researchers

Create an axis showing combined class responses. (NB names and initials are pseudonyms)



Store this coding in a clearly labeled file in OWNCLOUD using the name:

Axes_date__ResearcherFullInitials_CountryInitial_School# _Teacher#

Appendix 1: Transcription and 1st stage analysis of activity: identifying rich instances

Date of Clip: School: Researcher: Analysis Date:

Time	Player or Instigator	Player's/Student's action (reading or narrative and/or suggestion that steers towards his/her preferred ending) or response to another player's action	Card played or Hexagon concept(s) used (record)	Category (Circle)	Behaviour documented (record using behaviours from categories table)	4Ps Behaviour documented (circle)	Description of 4Ps (what is the detailed evidence?)	Categorising the rich instance Strong Medium Weak
0.53	F1	"Suddenly someone is speaking loudly, the skies open up and it is God"	Judgement	Ethics/impact Dialogue Control Engaged Action Intervention	Exploring/actioning new ideas. Understanding diff ideas are of diff value to community	high participation high pluralities high playfulness high possibilities	*student took on a different role as the gameplay was waning and her actions put it back on track* *Her actioning of new ideas was game changer…shifting gameplay*	Strong Medium Weak
				Ethics/impact Dialogue Control Engaged Action Intervention		high participation high pluralities high playfulness high possibilities		Strong Medium Weak
				Ethics/impact Dialogue Control Engaged Action Intervention		high participation high pluralities high playfulness high possibilities		Strong Medium Weak
Add more rows as necessary								

Upload this file to the OWNCLOUD folder entitled '**rich instances'** for your country and label it like this:

Transcription_ClipDate_timeofrecording_ResearcherFullInitials_CountryInitials_School#_Teacher#

Appendix 2: Transcription and 2nd stage analysis of activity: rich instances (strong only)

Date of Clip: School: Researcher: Analysis Date:

Time	Player	Player's/Student's action (reading or narrative and/or suggestion that steers towards his/her preferred ending) or response to another player's action	Card played or Hexagon concept(s) used (record)	Category (Circle)	Behaviour documented (record using behaviours from categories table)	4Ps Behaviour documented (circle)	Description of 4Ps (what is the detailed evidence?)
0.53				Ethics/impact Dialogue Control Engaged Action Intervention		high participation high pluralities high playfulness high possibilities	
				Ethics/impact Dialogue Control Engaged Action Intervention		high participation high pluralities high playfulness high possibilities	
Add more rows as necessary							

Upload this file to the OWNCLOUD folder entitled '**rich instances'** for your country and label it like this:
RichInstnaces_ClipDate_timeofrecording_ResearcherFullInitials_CountryInitials_School#_Teacher#

Appendix 3: Recording pedagogic strategies

Date of Clip/School Visit: School: Researcher: Analysis Date:

Time	Behaviour documented	Behaviour documented description (e.g. what exactly did you observe the teacher do?)	4Ps behaviour documented (circle)
22.03	proactively valuing learners' ideas and actions enabling learners to take the initiative ensuring sufficient space and time for ideas and actions to emerge getting alongside the learner and learning as fellow collaborator encourage gameplay activities that students get immersed in encourage students to challenge 'taken-for-granted' assumption or usual conventions		high participation high pluralities high playfulness high possibilities
	proactively valuing learners' ideas and actions enabling learners to take the initiative ensuring sufficient space and time for ideas and actions to emerge getting alongside the learner and learning as fellow collaborator encourage gameplay activities that students get immersed in encourage students to challenge 'taken-for-granted' assumption or usual conventions		high participation high pluralities high playfulness high possibilities
Add rows as needed			

Upload this file to the OWNCLOUD folder entitled 'Pedagogic Strategies' for your country and label it like this:
PedagogicStrategies_ClipDate_timeofrecording_ResearcherFullInitials_CountryInitials_School#_Teacher#

Appendix 4: Reflections on pupils' journeys of becoming

Date of Clip/School Visit: School: Researcher: Analysis Date:

Over time (after playing the game a number of times), are there noticeable changes in different gameplayers' dispositions? What are these changes?

Journeys of Becoming What evidence do you see of this?	Source (tick): fieldnotes	Source (tick): Still images	Source (tick): Teachers' Socratic interviews	Source (tick): Teacher interviews	Source (tick): Other (say what)
Add more rows as needed					

Upload this file to the OWNCLOUD folder entitled 'Journeys of Becoming' for your country and label it like this:

Journeyofbecoming_ClipDate_timeofrecording_ResearcherFullInitials_CountryInitials_School#_Teacher#

Appendix 5: Reflections on pupils engaging in quiet revolutions

Over time (after playing the game a number of times), are there noticeable changes in the creative community stemming from creative ideas generated through gameplay? What are these changes?

Quiet revolutions What evidence do you see of this?	Source (tick): fieldnotes	Source (tick): Still images	Source (tick): Teachers' Socratic interviews	Source (tick): Teacher interviews	Source (tick): Other (say what)
Add more rows as needed					

Upload this file to the OWNCLOUD folder entitled 'Quiet Revolutions' for your country and label it like this:

QuietRevolutions_ClipDate_timeofrecording_ResearcherFullInitials_CountryInitials_School#_Teacher#

Appendix 6: Teacher interview analysis example

Interviewnotes_30jun2014__kk_uk_sw1_mp

1. Warm up

Can you talk about how you feel the *C²Learn* game activity went with your students?

Keen before, and enjoyed the process. Children enjoyed it, and modified the rules. Stuck to premise – randomized premise

Reflect – would have chosen premise differently – with more time. Children may find it easier to develop premise.

Used children with ethical approval – logistically easier to use them. They were keen to see the follow up of their ideas.

Children pleased with results. They could see their ideas coming through. They liked the idea of themes – that had been their idea. Positive for them.

They've asked to keep playing. Handy for prep for next year.

Began playing basic – random setting and theme. Strength of game – engages students they can be quite creative with what they say in their stories.

1 session had more continuity – first session the story was not disjointed but a bit random – 'jostling for control of the story'. If tied into WW1 Broadclyst – that that would have focused the story.

Genetic modification lab and war – odd

Bullying/in school [their culture] = more continuity. Children took more care in developing a story – could have been experience as well as better theme/premise

Children keen, but rules and play and use of cards, complicated this slightly. Cards good idea, but need modification. Some characters made things tricky.

Competitive instinct – engaged action.

Comment [KK1]: Reflection on pedagogic strategies

Comment [KK2]: Engaged action The children became engaged in the play. They enjoyed the game, and want to continue.

Comment [KK3]: COntrol

Comment [KK4]: Pedagogic strategies Possible curriculum focus

Comment [KK5]: Being in control

Comment [KK6]: Engaged action

Interviewanalysis_30jun2014__kk_uk_sw1_mp

4 WHC features

a) Attending to the ethics and impact of ideas

KK21 " One of their characters, Bob, develops throughout…He has a realization about the young woman of emotions, Linda, that she is the cause of another character's bullying"[T]
KK7 "In the second game…there is a greater emphasis on that. That's possibly because I know that one of the myth cards that went around the second game was the theme of justice, and so there was a definite attempt by at least one of the players to have the character that was the bully get what was coming to them" [T]

b) Being in control

KK3 [T] children "jostling for control of the story"
The cards need modification – they made things tricky – in particular some of the vocab, and the character cards. [T] "The use of the cards…probably was something that may have complicated it slightly for them."[T]
KK10 "The
Re is the boy that is always the loudest and he was the loudest in that game and amongst the girls there's always girls that start ideas of…" [T]
KK11 "If you watch them in the playground their rules are very dynamic in the games that they play" [T]
KK12 "They were taking decisions because they were funny or a bit creative. I think one of the priorities amongst the boys, apart from the competitive nature, was to get a bit of a laugh."[T]
KK13 "Decision making was almost driven by either the, one of three things it was the desire to win; the desire to interact socially, to get a laugh do things that were humorous; or to develop a story." [T]

Appendix 7 – Co-Creativity Categories for Analysis

Attending to ***ethics*** and ***impact of ideas***	
Gameplayers generate, explore and enact new ideas with valuable community impact (discarding other ideas that do not).	Exploring and actioning new ideas Thinking about consequences of ideas Understanding different ideas are of different value to the community Creates new associations between ideas Actively explores the consequences of the newly created associations between ideas Exhibits awareness of and concern / interest for the impact of new ideas on the group's values Actively promotes ideas deemed valuable by group
Engaging in ***dialogue***	
Gameplayers pose questions, debate between ideas, find ways to negotiate conflict or to go in a different direction to others if conflict not resolved.	Posing questions with and of others (respects different viewpoints and/or encourages members of the group to voice their ideas) Debating between ideas Negotiating conflict or going in a different direction
Being in ***control***	
Gameplayer is confident to take the lead, trying new ideas, manipulating the rules and making decisions	Taking charge of different parts of the creative process Understanding the rules and that they have consequences Making decisions and takes actions
Engaged action – being immersed in the experience	
Gameplayers show signs of being 'addicted' to gameplay (e.g. not able to stop, trying repeatedly where such immersion sometimes leads to taking risks.)	Immersion in and does parts of the game/activities addictively Taking risks and leave his/her comfort zone Coming up with surprising ideas Facilitates immersion in the gaming experience for the rest of the group
Intervention and ***reframing***	
Gameplayer evidence specific changes in thinking patterns, and in particular reasoning processes. This includes changes in expression, primarily in linguistic terms, but also encompassing other modes as well.	Using *stimuli* in creative activity (e.g. Creates new analogies as building blocks of the creative process) Using *stimuli* to create new connections between ideas (e.g. Actively experiments with re-combining elements of the creative challenge or dilemma presented) Using *stimuli* to help develop a new perspective of the challenge (e.g. shift of perspective) Using stimuli to uncovers hidden aspects of the creative challenge Using stimuli to go beyond the material provided by the description (elements) of the challenge, recasting the challenge in a new light (as a whole or through re-formulating elements of it)

4Ps	
• high participation (engagement and involvement) • high pluralities (taking on many roles, personae, perspectives), • high playfulness (operating in an as if and playful manner) • high possibilities (generating many ideas through 'what if' and 'as if' thinking).	
Undertaking a ***journey of becoming***	
Over time (after playing the game a number of times), there are noticeable changes in different gameplayers' dispositions and/or personalities. This may involve smaller incremental changes.	
Generating ***quiet revolutions***	
Over time (after playing the game a number of times), there is noticeable changes in the creative community stemming from creative ideas generated through gameplay. This might comprise smaller incremental changes.	
Behaviours relating to teaching	
Pedagogic **strategies**	**Evidence of teachers:** proactively valuing learners' ideas and actions enabling learners to take the initiative ensuring sufficient space and time for ideas and actions to emerge getting alongside the learner and learning as fellow collaborator encourage gameplay activities that students get immersed in encourage students to challenge 'taken-for-granted' assumption or usual conventions

APPENDIX 3: SOCRATIC DIALOGUE MANUAL

1. INTRODUCTION

This document is a guide[76], a manual to be used in order to facilitate the use of one of *C²Learn*'s Co-Creativity Assessment tools: the **Socratic Dialogue** (SD). This manual represents one of the major outcomes of the **Co-Creativity Assessment Workshop** (5th-6th February 2014).

Section 1 provides a basic definition for a SD, and delineates its main process and features. **Section 2** deals with operationalisation. **Section 3** presents *C²Learn*'s Co-Creativity Categorisation scheme, in relation to the SD process. **Section 4** provides a comprehensive example of an SD[77], as well as the results of an evaluation conducted by 3 members of *C²Learn*'s research team of the group featured in that SD.

2. DEFINITION

A **Socratic Dialogue** (SD) is a semi-structured **dialogue** with a **group of students**. The interviewer utilises **open-ended questioning**, in order to get a better understanding of the students' **reasoning processes** and **experiences** as regards a particular**C²Experience**.

A SD is meant to provide an **in-depth look into students' C²Experience**, in order to facilitate the application of ***C²Learn*'s Co-Creativity Categorization** scheme by the interviewer (teacher). It is thus required that the interviewer adequately familiarizes him/herself with the categorization scheme, before the application of a SD.

Before starting a SD with students, the interviewer is advised to identify a relatively small number of particularly **interesting incidents** in the preceding *C²Learn* Immersive session. (If it helps the interviewer he/she may take notes during the C²Experience, as regards these interesting incidents, to be used later during the SD.) These incidents will help **structure the dialogue** and **provide focus** for both the interviewer and the students. It is of course expected that the dialogue will branch out to other parts of the C²Experience.

By ***incidence*** we mean a particular event within C²Experience. It usually would be something one of the students being interviewed did/contributed, but might also be something prominent done/contributed by the group as a whole, or (very rarely) by the teacher/creativity assistant.

By ***interesting*** we mean an incidence with any/some/all of the following characteristics:

[a] An event that seems to exemplify any/some/all of the co-creativity categories to very high or very low degree. (As defined in *C²Learn*'s Co-Creativity Categorization.)

[b] A crucial/key event during a C²Experience. (An event with a significant impact particularly on gameplay.)

[c] An event that attracted a lot of attention by the group.

[76] **NOTE:** This guide was the result of an earlier version of C2Learn's Assessment Methodology and was use during the first pilot. We have revised our methodology, specifically as concerns the range of categories applicable to an SD evaluation, i.e. reduced them to only 2: Ethics&Impact and Intervention&Reframing. Consequently some parts of this guide our somewhat outdated.

[77] Section 4 in particular is structured around the *Socratic Dialogue Instructional Video* and serves as commentary and guide to that video.

It is also possible to let the students identify interesting incidents, through questioning during the SD.

The exact nature of the questioning will heavily depend on the particular C²Experience (the rules of the game played, the particular context of gameplay, specific game-related events etc.). There is no reason that the students have to be aware of the separation between a C²Experience and SD, or indeed of the name SD for the activity or that it is an evaluative activity. All questioning is meant to **establish a dialogue** between interviewer and students, to facilitate the transmission of critical info pertaining to the student's **thinking** and **experience**. The interviewer's aim is to gently keep the students focused on revealing their thinking, both when the s were taking place, and as the dialogue unfolds, and they have had some chance to reflect on these incidences. When one is succeeding in conducting an SD, one is talking rather little, and the students are talking a lot! It is particularly important to try to **avoid disapproval** and to **encourage the students** to feel that their thinking is important and to express themselves even if they are not sure of being 'right'. (E.g. it might, for example, be appropriate to point out tensions between different statements/actions that a particular student has made/taken, but always with a view towards deeper understanding and clarification, never as a reprimand or correction.) There is no `right' or `wrong' - there is only their expressions of their experience!

SDs are more than merely discussions. An important part of learning to think, and especially think creatively, is learning to ask yourself good questions; questions that elicit implicit or inactive knowledge that you already possessed. Socrates demonstrated this by enabling a slave-boy to realize he 'knew' geometry, by addressing him with simple non-directive questions. The boy came to know what he already 'knew without knowing it'! One of the aims of using SD in a curriculum on creativity is to get students to **internalise this kind of self-questioning**, so they can use it when faced by novel situations. You may or may not want to make this point to the students themselves at some point in the process. We leave that up to your judgment.

2.1. ABSTRACT PARADIGM

Below we provide an abstracted SD paradigm. This is to be taken as a **loose guide** rather than a check-list or strictly defined process. The indicative questions and overall process presented here are abstract and thus localisation to the particular C²Experience will definitely be required.

Step 1: One easy way to start would be to ask one of the students to briefly sum up the C²Experience.

Asking the students if they have any questions, and then trying to get them to answer their own questions (by turning the question around) is also a good way to begin.

Step 2: Try to find some focal points which the students found particularly informative/surprising/exciting/worth talking about. It is best to focus on specific incidents that are vivid rather than getting them to talk about abstractions.

It is also possible to ask the students to identify the incidents to be used. One way of doing that is by asking questions such as: "What did you find most striking/interesting? Why was it interesting?" (Note that this may lead to an identification of incidents, or it may lead the students to reflect upon the process itself. Both paths can be exploited further.)

In addition or alternatively the interviewer can choose to focus the dialogue on interesting incidences that he/she had already identified as interesting candidates during the C²Experience.[78]

Step 3: Having identified the incidences, the interviewer would need first to establish mutual focus with the students: "Do you remember when you said/did X?", for example. The interviewer may need to add additional information until it is clear that the students are focused on the same incidences.

Step 4: Having established rapport, the interviewer then asks questions which are as open-ended (and encouraging) as possible, designed to get the students to reveal why their contributions went the way it did. Indicative questions include:

[a] "Can you explain to me why you said/did that?"

[b] "Were you surprised about X?"

[c] "What do you think about Y now? Would you still say the same?"

[d] "What did you feel about Y? What would you say if it happened now?"

[e] "Was X or Y easier/harder? Why?"

When the students do respond, further interviewer responses are designed to encourage the group to develop their answers in whatever direction they take them.

Step 5: The interviewer continues probing the students with further questions, drawing more connections amongst the group's actions as a whole. Indicative questions include:

[a] "What do you make of student A saying/doing Z?"

[b] "What do you make of the group's decision to do Z? What would you have done differently?"

[c] "You said/did X in connection to student A saying/doing Z? Why?"

[d] "You said/did X? How do you think this affected the other students?"

Step 6: If there is time towards the end of the dialogue the interviewer can finish the dialogue by asking the students if they have any more questions, and again try to get the students to answer them themselves.

3. *C²LEARN*'S CO-CREATIVITY CATEGORISATION SCHEME

Below are presented the **5 categories** exemplifying *C²Learn*'s core creativity framework[79] with a list of indicative conditions that characterise each category.

It is important to note that **the categories will require localization**, i.e. limited re-interpretation in order to be fully applicable to all the different co-creative activities that make up C²Space. (We provide an example of such a localization in Section 4, where we present an actual SD case with, an accompanying categorization.)

[78] There may also be suggestions available from the computer about what candidate incidents it can identify, in which case the interviewer should note whether or not they find the computer's proposals credible (with any qualitiative comments being very useful for refinement of the software's design). The interviewers can always keep to their own judgment about the most informative incidence to pick, but they are also free take up the computer's proposal if they see that as possibly interesting.

[79] There is also a more extended version which pertains to a different part of *C²Learn*'s Co-Creativity Assessment Methodology.

Category	Characteristics
Attending to *ethics* and *impact of ideas*	1] Creates new associations between ideas 2] Actively explores the consequences of the newly created associations between ideas 3] Exhibits awareness of and concern / interest for the impact of new ideas on the group's values 4] Actively promotes ideas that are deemed valuable by the group
Engaging in *dialogue*	1] Engages in debate over ideas 2] Promotes dialogue within group (poses questions, respects different viewpoints and/or encourages members of the group to voice their ideas) 3] Actively negotiates conflict and/or seeks alternate paths
Being in *control*	1] Takes a leading role during different phases of the creative process 2] Exhibits a firm grasp of the rules in the system underlying the challenges facing the groups 3] Takes decisions and instigates action
Engaged action	1] Immerses him/herself in the experience of the creative process 2] Facilitates immersion in the experience of the creative process for the rest of the group 3] Willing to take risks and/or leaving his/her 'comfort zone'
Intervention* and *reframing	1] Creates new analogies as building blocks of the creative process 2] Actively experiments with re-combining elements of the creative challenge 3] Actively facilitates a shift of perspective: a]Uncovers hidden aspects of the creative challenge b] Goes beyond the material provided by the description (elements) of the challenge, recasting the challenge in a new light (as a whole or through re-formulating elements of it)

Table 1: *C²Learn*'s Categorisation Scheme

Each student is evaluated through a score, which is based on his/her performance in each of these categories, throughout the C²Experience. The identification of interesting gameplay incidences, helps structure and guide the evaluation process, and facilitates the attribution of scores.

We use a **5 degree** scoring system: **1**-**2** for **low**, **3** for **medium** and **4**-**5** for **high** performance. Each student receives a score from 1 to 5 for each of the 5 categories. The interviewer fills in the scores in the appropriate cells of the **Socratic Dialogue Co-Creativity Categorisation Form**.[80]

If the interviewer can find no evidence for a particular category, the student receives a **N/A** (Not-Applicable) score for that category. If the interviewer cannot distinguish between 2 or more categories, i.e. if the evidence points indistinguishably to 2 or more categories, then the student receives **the same score** for both (or all) categories.

[80] Which can be found in *C²Learn*'s Data Collection Protocols.

The SD is a window to C²Experiences. It is particularly useful in providing (or adding to/clarifying) direct evidence for the **Ethics/Impact of ideas** category as well as the **Intervention/Reframing** category. A SD can provide primarily indirect evidence (or clarifications) for the other 3 categories, i.e. **Dialogue**, **Control** and **Engaged Action**. (This should not be underestimated though, as sometimes the difference between a 4 and 5 in one of these categories, can largely depend on extra information/insight the interviewer receives during the SD.)

Below we provide indicative questions that can help you approach these categories both conceptually and in practice during a SD and subsequent evaluation.

Category	Indicative Questions
Attending to *ethics* and *impact of ideas*	a] Does the student pay appropriate attention to ethical issues arising from his/her creative thinking? Do they comment on them during gameplay or the SD? b] Do his/her actions explicitly show ethical concerns? Do they do so implicitly? c] Hoe does the student react to the group's values and ethical explorations?
Engaging in *dialogue*	a] Does the student engage in dialogue in a helpful way, complementing what others do, and responding to others' ideas? Or jut 'does his/her own thing' regardless?[81] b] Does the student's actions promote cooperation and negotiation or rivalry and separatism?
Being in *control*	a] Does the student take responsibility for the groups' thinking and influence the way things go, or is he/she passive, responding to the others' leadership? b] Do his/her actions have a deep impact to the progression of the gameplay or are they largely inconsequential? c] Does the student show a firm understanding of the challenge facing the group? Do his/her actions reflect this understanding?
Engaged action	a] Does the student immerse him/herself in the process? Or treat it with complete detachment? b] What do his/her actions show? What does his/her comments in the SD reveal?
Intervention* and *reframing	a] Does the student engage in changing the way the activity is 'framed'? b] Do the student's reframing interventions change the way the group handles the challenge? Are new pathways opened for the other students? c] Does the student make interesting use of the game's elements? How would you judge the reframing intervention in terms of novelty, subtlety, surprise, etc.?

Table 2: Indicative Questions for each category

[81] As we will see in Section 4, and as indicated above, categories may require some localization to be fully applicable in a particular C²Experience. Dialogue is a good example. We can conceive of any action as dialogic, not only a speech act. An action can be dialogic if it is e.g. responsive to other students' actions, promotes further responses from them, helps shape a group agenda etc.

5. A CASE STUDY

What follows is an analysis of an actual SD conducted during *C²Learn*'s **Co-Creativity Assessment Workshop** (5th-6th February 2014). The SD was conducted right after a play-session, by two members of UEDIN's research team, one acting as the main interviewer and the other assisting.

The game we played was new to the students, and had to be played with paper cards as the computer version was not ready. Needless to say, the students had to operate in English as a foreign language. (They did remarkably!) We are not holding this up as a 'model' of how to conduct the perfect SD. In fact we will comment on some places where it is not done as well as it might have been. **We are confident you can quickly learn to do it much better!** Even with all these problems, we think that having an example helps to understand the aims and possibilities of the technique.

In connection to the above, it is important to note the duration of this recording. It is about 34 minutes, much longer than the recommended time of 15-20 minutes suggested above (Section 2). This was due to a number of reasons, most prominent of which was that as this was intended to be used for demonstration purposes we wanted to showcase different questioning techniques, and often returned to the same issues. Also there is a long explanation towards the end of the SD from the main interviewer on the nature and merits of an SD, which we wanted to include in this recording.

At a later date 3 members of *C²Learn*'s research team used the gameplay footage, the SD footage and data/props used during gameplay, to evaluate the students that took part in this exercise. We present the results of this evaluation, with some commentary and tips to guide your own evaluations.

5.1 PREMISING

In order to premise the SD it is best to begin by briefly explaining the preceding play-session. There were 6 participants, of which 5 were students from EA (ages 16-17) and 1 was the interviewer assistant. The game session was facilitated by a member of EA's research team, who acted as the creativity assistant/educator.

The game we played was a variation of one of C2Learn's games in development: ***4Scribes***. This is a story-telling game utilising cards. Each user receives a number of cards and each round he/she uses this card to further the story, by writing his/her continuation on a piece of paper. There are three kinds of cards: *Character cards* (which in this version contained socially/ethically significant archetypes and famous personalities), *Action cards* (which contain action related concepts, e.g. help, fight, travel etc.) and Myth cards (which contain more abstract concepts, e.g. Rules, Death, Magic etc. accompanied by a tarot-like image). The continuation the user contributes each round is related to (inspired by, dependent on etc.) the card he/she is using.

In the version we played the users were given a challenge: there's been a plane crash. 12 people are in the water (2 per user × 6 users). There is a life-boat nearby, which though has room on-board for only 11 people. The users must decide how to resolve the stuation. (The resolution takes the form of a story.)

5.2 ANALYSIS OF SD FOOTAGE

What follows are comments/notes on the video file *Socratic Dialogue Instructional Video.flv*. Each group of comments has a heading corresponding to one of the headings used in the video. We suggest you pause the video often, and use the comments below as helpful guides in analyzing the footage. We've tried our best to improve the quality of sound, but it's still far from optimal. This is a good reminder that trying to get good recordings is worth the effort (positioning the camera, using secondary audio capturing devices, trying to keep classroom noise to a minimum etc.). The transcriptions included in the comments are very rough and are only meant to premise the comment and help you find the video segment under discussion. To that end we also provide the times (mm:ss) the headings appear in the video.

Starting from the student to the far left, and going clockwise we shall refer to each student as follows: **S1**, **S2**, **S3**, **S4** and **S5**. At the bottom of the screen you can see the main interviewer (**I1**), and immediately to his right, at the edge of the screen, the assistant interviewer (**I2**).

COMMENTARY

A1. Introduction

- Describe what happened [00:30]

A useful way to get things going. It focuses the students and provides opportunities to identify rich incidences.

A2. Establishing Connections

- Any questions? [01:50]

I1: "Do you have any questions before we go further?"

S3: "What has this to do with education?"

- Turn the question around [02:28]

This is a good opportunity to try and turn the question around: "Can you think of any connection?", "Would this help with anything?"

- Clarify the question [03:22]

I1: "Would any of this procedure help if you had to write a story?" The group, not surprisingly, has trouble answering the previous question, so the interviewer clarifies it.

The first answer we get is a resounding: "No". But this is not the end of the matter…

- Make it more concrete [04:10]

I1: "Would you have done the same on your own?" Making the question more concrete again, focusing on the interactions in the group - this elicits some recognition in the group.

A bit later:

I2: “Is there anything in the method (that would help learn about other things)?" More clarification offered. Students had been focusing on the content of the gameplay. Now we want to know their comments on

- Focus on particular incidents [06:14]

I1: "What was going through your mind when…?" To get the best responses, it is often helpful to focus on particular incidents which are vivid for the students (often things they themselves bring up.

B1. Exploring Creativity (Premising)

- Ethics / Emotional impact [07:08]

S1: "I was sitting across the room so I couldn't hear the details of what you were saying, but what I could hear was your laughter all the way through. You are told you have to drown someone in the next half hour, and all you do is laugh! What is going on? "

Commenting on the emotional tone is a way of engaging them in what they were feeling. This can be important for focusing the dialogue. Notice that the tone of the interviewer is not negative, but of surprise or curiosity.

- What was most striking? [08:07]

I1: "What was the most striking thing that happened …?"

Which after a little while gets the response:

S1: "You don't know what the others are going to do…unpredictability" This might have been followed up by a question about unpredictability and creativity - perhaps a missed opportunity..?

- Reframing [09:31]

I2: "You played the God thing…changed the rules…" A particular observation of the general issue of `reframing' that is an important part of creativity. Explicitly changing the rules is just an example of reframing that is particularly easy to pick up. Notice that the students themselves list the places that this happens at various points in the recording. The word `reframing' is our term, but the concept is not new to the students, or to you.

S2: "In the end the whole thing turned into an experiment that had been staged by the Chinese President” (one of the character cards which one of the group used for this reframing). Another small example of a reframing action.

Parenthetical remark: ["I liked the story…we talked about lots of issues " A comment from one of the group, possibly referring back to their early question about what's this got to do with education? As in any dialogue there is some going back and forth.]

- Breakthrough! [13:19]

Finally we get a contribution from the shy student (S4) who does have something to say! Later on it will come out that his contributions, although quieter than the others’, were actually crucial for the story. SDs are a good way to get the more quiet students to express themselves and reveal their thinking processes and creativity more fully.

B2. Exploring Creativity (Going deeper)

- Back to Ethics [13:50]

I1: "You think the laughter is important? It's supposed to be a sad story." An attempt to return to the emotional content.

A bit later one of the group (S1) mentions some of the social issues that get drawn in by the group: communes and gay rights. Again, perhaps a reflection that their initial question right at the beginning about "What has this got to do with education?" is still rumbling on in their minds, and producing their own beginnings of answers..?

- Connections to story structure [15:40]

I2: "Did you find some characters easier to drown than others?" A return to the emotional/ethical issues about the setting: with a comment that poses the 'question' in a vivid way, and elicits a lot of specifics.

A bit later:

I2: "Some characters got a lot more attention" Apparently the farmer started off as villain and wound up as hero. The group reflects on why some characters were ignored and others dominated. I2's double role as both interviewer and user, sometimes leads him to talk too much; the best SD' are the ones we are the most silent!

- Game mechanics [18:40]

I2: "Which cards are easiest to use?"

We immediately get (what seems like) a group reaction "Character cards easiest"; S1 continues: "Action cards next. Myth cards are the hardest", which seems to be echoed by the whole group. (The relevance emerges just below.)

- Second breakthrough! [19:57]

Suddenly the quiet student wakes up!

S4: "Personally, I find the myth cards the easiest." He goes on to explain how to manipulate the game through the myth cards.

There is an amusing interchange between him, trying to shake things up and make it more interesting, and the girl on his right (S3) who has scruples about drowning the whole lot. This incidence is a good illustration of the problems of the 'silent student' who we all know sometimes turns out to be the one who understands most. If it weren't for this contribution, we would know very little about his understanding.

One of the criticisms we would make of this dialogue session is that the interviewers do not do a very good job of equalising the speaking of the different members. The two boys (S4 and S5) are, needless to say, under represented (though S5, mostly off camera here, was a vocal contributor during gameplay). One can try to share out the time better than achieved on this SD.

- Reframing revisited [21:22]

I2: "Why did you sink the boat?" asked of the 'quiet' student (S4).

His answer is that things need widening out from the question how to fit 12 people into an 11-person boat. He wanted to make things more interesting, and force the group to come up with different solutions to the challenge, other than the boat. And this is in fact one crucial turning point in the gameplay.

C. Concluding

- What it's all about… [22:37]

I1: "Anything you want to ask before we finish off?"

S2: "How will this game help you…what was the purpose of it?" A return to a version of the original question or at least one closely related to it.

- Essence of Socratic Dialogues [25:56]

I1: "Socratic Dialogue is not just about us learning about what you are doing: it's about learning to ask yourself the right questions yourself. This is absolutely at the centre of what education is about."

So perhaps we got some little way towards answering their own question that they asked at the very beginning, about what this has to do with education..?

- Hidden structure [28:38]

I2: "There is more structure, even in a nonsense story, than one thinks…" An effort to draw the group's attention to the structures and patterns, evident even in a story like this where anything and everything could happen. The group's actions made much more sense than even they would be willing to accept.

- Experience of Reframing [29:25]

I2: "What was you experience of playing with the rules? Can you identify such moments?"

This elicits examples of rule changing, and strongly reflects the fact that the group were aware of the different trajectories the story took and the ambivalent relationship of these trajectories to the rules of the challenge. It is important that by the end of the SD the students are very competent in identifying incidences of rule-changing or actions that addressed/challenged the very rules of the challenge (a species of reframing). This alone is an important educational gain!

5.3 CATEGORISATION

Below we present the results of 3 categorisations, undertaken by 3 members of *C²Learn*'s research team.[82] In order to complete this categorization we consulted the gameplay footage, the SD footage and had recourse to some props used in game, specifically the sticky-notes upon which each user was recording his/her continuation of the story.[83]

We have included brief commentary on 2 of the students categorized (S2 and S4), as we feel they presented the most interesting score variations. The purpose of the comments is to highlight the main reason for scoring the student the way we did.

In the score tables you will also find the letters **G** and/or **D** in parentheses. They indicate where the evidence supporting the score predominantly came from.

- G: Evidence predominantly from gameplay
- D: Evidence predominantly from SD.
- GD: Evidence from both.

[82] One of them is I2 from above, and another the team member that acted as creativity assistant/educator during gameplay.

[83] Although I2 was involved in making the story his performance was not categorised – not least because he was also involved in the categorization process.

It is important before we move on to the scores that we briefly touch upon the issue of **category localization**. In order proceed with the categorization we had to come to a shared understanding of what is meant by each category, in the context of this particular gaming experience; i.e. a variation of the *4Scribes* game. As indicated earlier (Section 2) this can happen **before** each interviewer commences with their categorization, with the provision that this exercise is undertaken **only for clarification and stage-setting** purposes; the interviewers must not influence each other's categorisation.

In our case some categories were more straight-forward than others:

Ethics & Impact: We focused primarily on whether the user exhibited awareness of and concern/interest for the impact of his/her ideas on the group's values, and ethical sensibilities.

Engage in Dialogue: Due to the nature of the game this category required the most localization. We decided to allow any action (and not just speech acts) to be understood as potentially dialogic, if it was primarily responsive to other user actions, promoted further responses from them and/or built upon the contributions of others.

Being in Control: We focused primarily on whether the user exhibited a firm grasp of the rules, whether he/she showed initiative and whether the user's actions had a leading impact to the trajectory of the story.

Engaged Action: We focused primarily on whether and how the user was immersed in the experience.

Intervention & Reframing: We focused primarily on whether the user actively facilitates a shift of perspective (as regards how the group understood/treated the challenge), through reframing actions.

CATEGORISATION TABLES

Interviewer 1	S1	S2	S3	S4	S5
Ethics & Impact	4 (G)	4 (G) By playing the God card, she changes the ethical outlook to the problem from 'whom will we leave behind/drawn' to 'who will offer to sacrifice in order to save others".	3 (G)	N/A There are no indications that any of his moves in the game were motivated by ethical considerations.	2 (G)
Engage in Dialogue	3 (GD)	3 (G) Responsive to others, building upon others' contributions.	3 (G)	1 (G) Least engaged with others contributions. E.g. repeatedly started preparing his next addition to the story without seeming to follow the developments to the story	3 (G)

				contributed by others.	
Being in Control	4 (G)	3 (G) Overall awareness of goals and rules in the game.	5 (G)	5 (GD) In the SD he talks about the effect of the different cards, esp. the magic cards to the gameplay, which reinforces the intentionality behind the way he plays his cards in the game.	3 (G)
Engaged Action	3 (GD)	3 (G) She adds colorful details to the narrative and she cares for her characters.	4 (G)	4 (G) Every one of his contributions to the story is an intentional twist.	3 (G)
Intervention & Reframing	3 (G)	5 (G) Playing the God Card and introducing the rule: "Whoever offers the biggest sacrifice can save two people of their choosing" is the major game-changing event in the session.	2 (G)	5 (GD) He sinks the boat! This is a major reframing event, because it eliminates one of the major constraints that were set up for the storytelling situation, indeed the one element on which the whole definition of the problem so far was predicated. In the SD he gives an interesting justification as to why he did it, namely, that he wanted the group to consider other solutions to the problem by not focusing on the boat.	2 (G)

Table 3: 1st Evaluator Categorisation Table

Interviewer 2	S1	S2	S3	S4	S5
Ethics & Impact	4 (G)	4 (-) Her intervention changes the ethical "balance' of the game.	4 (G)	N/A No indications on the matter.	2 (G)
Engage in Dialogue	4 (G)	4 (G) She was engaged in the dialog and responsive to the contributions of the others.	3 (G)	2 (G) The least engaged from the group. His contributions were not based on the actions of the other users.	3 (G)
Being in Control	4 (G)	4 (-) Solid awareness of the rules and aims of the game.	3 (G)	4 (GD) He seems very aware of the rules and the aims of the game.	3 (G)
Engaged Action	4 (G)	4 (G)	4 (G)	3 (G)	3 (G)

		She is very engaged.			
Intervention & Reframing	4 (G)	5 (G) Her intervention (the God card) is changing the drastically the whole game.	3 (G)	5 (GD) He sinks the boat! And during the Socratic dialogue, he explains that he sinks it in order that the users find alternative ways to save the persons.	4 (G)

Table 4: 2nd Evaluator Categorisation Table

Interviewer 3	S1	S2	S3	S4	S5
Ethics & Impact	3 (GD)	4 (G) Seemed quite preoccupied with the ethical dimension. Her reframing action had ethical consequences.	4 (GD)	N/A No indications of ethical concerns.	1 (G)
Engage in Dialogue	4 (G)	3 (G) Relatively dialogic actions.	4 (G)	2 (GD) Solitary frame of mind. Was interested in the group but not in a dialogic fashion – his actions were more like strong statements.	4 (G)
Being in Control	4 (G)	4 (G) Excellent awareness of rules. Significant impacts on story.	4 (G)	5 (GD) Excellent understanding of the rules, and very heavy impact on the story!	4 (G)
Engaged Action	4 (G)	3 (G) Relatively engaged.	5 (G)	4 (GD) Gameplay alone would have suggested a 3. But his explanations of his actions during the SD showed a deeper engagement than glimpsed at first.	2 (GD)
Intervention & Reframing	3 (G)	5 (GD) Very interesting reframing action and use of the card! In the SD she reveals that she was inspired both by the words on the myth card and the tarot like image.	2 (G)	4 (GD) Powerful reframing action: Sinking the boat – deep impact on the trajectory of the game and the other user's understanding of the challenge. The only reason I am not giving a 5 is that it lacked somewhat in subtlety.	3 (G)

Table 5: 3rd Evaluator Categorisation Table

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