Evidence-Based Practice using Formative Assessment in Library Research Support

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Keywords: *Library research support, researchers, teaching, formative assessment, One Minute Paper, Polling One Minute Paper, POMP, Reflective One Minute Paper, ROMP*

* This is the Accepted Version of a paper to be published in the journal *Evidence Based Library and Information Practice*:
Wolstenholme, J. K. (in press) Evidence-Based Practice using Formative Assessment in Library Research Support. *Evidence Based Library and Information Practice* **xx**(x): xx-xx.

Title
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Abstract
Objective – To develop and investigate the effectiveness of a new evidence-based approach for teaching library research support.

Methods – Formative assessment, through two variations of the One Minute Paper, is used to assess the learning of university researchers in library research support sessions. Prior to a session, Polling One Minute Papers (POMPs) assess what researchers know about topics that will be covered in the session. After a session, Reflective One Minute Papers (ROMPs) assess whether researchers achieved the intended learning outcomes of the session. POMPs are used for 16 sessions and ROMPs are used for a subset of 11 of these sessions. Examples of responses from the POMPs and ROMPs are presented to describe and analyse the effectiveness of this approach to research support.

Results – POMP and ROMP responses were remarkably informative given their simplicity and the little effort required on the part of the librarian or researchers. The completion rate of POMPs was 72.7% and gave researchers the opportunity to self-assess their current level of knowledge or skills about the topic to be covered in the upcoming session. Session content could then be tailored to this level by the librarian. POMP responses were shared as part of the session content, enabling researchers to benchmark themselves against their peers. Completion rate of ROMPs was 20.9%, with the level of reflection in the individual researchers' responses varying from shallow to insightful. Deeper responses stated how the researcher would use what they learnt or asked new questions which emerged from their learning.

Conclusions – Polling One minute Papers (POMPs) and Reflective One Minute Papers (ROMPs) are an effective and efficient approach for guiding and assessing the learning of researchers. These tools extend the opportunity for librarians to engage with researchers and, through tailoring of session content, assist to maximize the benefit of library research support sessions for both librarians and researchers. Sharing of POMP and ROMP responses can assist librarians to coordinate the teaching of the researchers that they support. At an institutional level, evidence in POMPs and ROMPs can be used to demonstrate the value that the library has contributed to improving the performance of its researchers.

Keywords
Library research support, researchers, teaching, formative assessment, One Minute Paper, Polling One Minute Paper, POMP, Reflective One Minute Paper, ROMP

Introduction

Researchers in universities are working in an increasingly complex and competitive environment (e.g. Frances, Fletcher, & Harmer, 2011; Kennan, Corrall, & Afzal, 2014; Richardson, Nolan-Brown, Loria, & Bradbury, 2012). Factors driving these changes include Internet and digital technologies, and greater accountability through performance management and institutional benchmarking. These changes are requiring researchers to adapt faster than most would achieve through their traditional discipline-based networks, including information sharing amongst colleagues.

The Internet and digital technologies have transformed scholarly communication. Research outputs although still published as books and journals are now also made available in an array of other digital options including blogs and other social media, multimedia formats, and data files which may be displayed through sophisticated visualization tools. The numbers of research outputs have vastly increased and are distributed through a growing range of publishing models, many offering some form of Open Access. Researchers, as creators of research outputs need to consider copyright and licensing for managing their rights, in balance with maximizing accessibility to their research outputs. The quality of publishers also needs to be assessed, ensuring that predatory publishers are avoided (e.g. see Beall, 2014).

To measure and benchmark performance, researchers and their institutions rely on citation ranking metrics. Researchers need to understand how these metrics are calculated and how citation indexes (e.g. the h-Index) are calculated. Researchers are also expected to have an online presence ideally as a professional profile to promote their interests and achievements. Altmetrics tools are emerging as an alternative measure of impact, by measuring the online activity of a researcher or their outputs (Priem, Taraborelli, Groth, & Neylon, 2010).

University libraries can assist researchers to work in this environment and make the most of emerging opportunities. To provide this support, university libraries are moving their core business from provision of information resources to provision of information services and information solutions (Association of College and Research Libraries, 2010; Kaufman, 2009; Parsons, 2010). Information resources have traditionally involved the development and management of collections. In contrast, information services and solutions include infrastructure such as repositories (Simons & Richardson, 2013) and instructional support on topics such as scholarly and open access publishing, managing research data, maximising research visibility and measuring research performance (e.g. Auckland, 2012; Haddow, 2012; Kennan, et al., 2014).

Effective communication skills are essential for building a rapport with researchers and providing a valued service (Auckland, 2012; Creaser & Spezi, 2013; Parker, 2012). Research support librarians need to be confident in talking about the range of topics that researchers need to learn, match the information they provide with the skill level of the researcher, and explain the information in a way that is understandable for the researcher. This study investigates a teaching and learning approach which can assist librarians to achieve this.

Literature Review

Teaching and Learning in Library Research Support

Teaching and learning for researchers is best suited to the learning theory of andragogy. This theory is based on the assumption that adults are self-directed learners who are interested in immediate application of knowledge (Merriam, 2001). According to this theory, adults take the initiative in diagnosing their learning needs which includes formulating objectives, identifying resources, implementing strategies and evaluating outcomes (Knowles, 1975). Other learning theories of relevance to library research support include problem-based learning (Knowles, 1975), experiential learning (Kolb, 1984) and informed learning (Hughes & Bruce, 2012). In problem-based and experiential learning, learners draw on their prior knowledge and experience (Brodie, 2012), enabling learning to be built on a researcher's existing practices. Informed learning describes how learners develop flexibility and confidence to use information in constantly evolving information environments, shifting the focus of information literacy education from mastering skills, to learning to use information critically, ethically and creatively (Hughes & Bruce, 2012).

Assessment in Library Research Support

Library research support needs to contribute to improving research performance without adding additional burden to a researcher's workload. Researchers operate in a constant environment of research performance assessment (Parker, 2012) e.g. through funding or promotion applications, performance management acquittal, or as part of institutional assessment exercises such as Excellence in Research for Australia (Australian Research Council, 2014; REF2014, 2014). Research librarians need to be acutely aware of this research assessment landscape (Parker, 2012). The learning needs of researchers must form the core content of library research support material, both in terms of what researchers need to know as well as their current status of understanding a particular topic.

Within a teaching and learning framework, performance of researchers corresponds with summative assessment and library support can provide formative assessment. Summative assessment occurs after the learning process for the purpose of certification (Sadler, 1989). In contrast, formative assessment occurs as part of the learning process. Through formative assessment, the learner gains feedback which is intended to shape and improve their learning, leading to independent learners who are able to self-monitor their learning needs (Sadler, 1989). Summative assessment tasks focuses a student's learning on 'what counts' while formative assessment provides a fine tuning mechanism which guides the learner's learning progress (Boud, 2000).

Learning is a cyclical process, as explained in experiential learning theory (Kolb, 1984). In the context of library research support, there is no starting point in the researcher's learning process but rather, they build on what they already know or have experienced. Within the learning cycle of assessment (Figure 1, Crisp, 2009), there may be many feedback loops between the phases of diagnostic, learning and formative assessment (Sadler, 1989). As part of this process, peer interaction can enhance learning by stimulating the production of deeper thought, through the desire to know what a colleague knows, prompting self-assessment and

clarification of uncertainties (Draper, 2009). Eventually, formative assessment leads to summative assessment, as the researcher takes on tasks to advance their career or to meet institutional requirements.

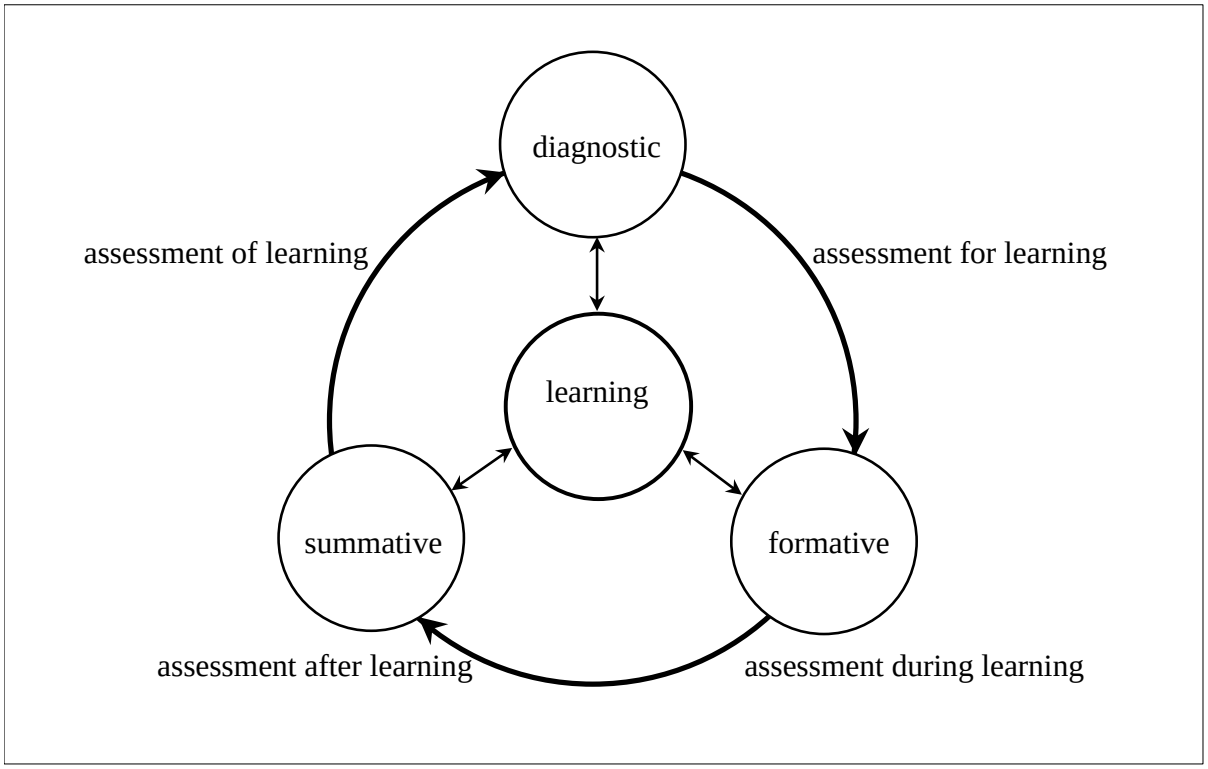

Figure 1: Relationship between diagnostic, formative and summative assessments (redrawn from Crisp, 2009)

Research Framework: formative assessment of researchers

The One Minute Paper (OMP) is a formative assessment tool that has been successful in improving the teaching of, and learning by, undergraduate students (Bartlett & Morrow, 2001; Chizmar & Ostrosky, 1998). OMPs are effective for gaining student feedback in return for a modest amount of student and instructor effort (Bartlett & Morrow, 2001; Chizmar & Ostrosky, 1998; Drummond, 2007; Stead, 2005). The OMP is a questionnaire which asks:

(1) What was the most important thing you learnt today?

(2) What was the most confusing point in today's lecture?

The addition of a third question was recommended by Bartlett and Morrow (2001) i.e.:

(3) What was the most interesting fact that you learned today?

The OMP benefits both instructors and students, regardless of their teaching or learning ability (Chizmar & Ostrosky, 1998). OMPs can provide specific and immediate feedback to the instructor about student learning, helping to set the pace and content of future instruction. This is useful for inexperienced instructors or instructors of new material (Stead, 2005), as is often the case in library research support. Instructors can also use the feedback to identify and then address misconceptions (Bartlett & Morrow, 2001). This closing of the feedback loop

demonstrates that the instructor values student opinion and encourages students to actively contribute to their own learning experience (Stead, 2005). Class discussion of issues raised in OMP's have reassured students by enabling them to benchmark their learning against their classmates, often revealing that the problems that others are experiencing are the same as their own (Bartlett & Morrow, 2001).

The simplicity of the OMP makes it an ideal tool for identifying the learning needs and learning outcomes of researchers. Content of library research support sessions can then be tailored accordingly. The OMP is typically assigned at the end of a class but could also be adapted for implementation prior to a class (Stead, 2005). Pre-class formative quizzes encourage students to think critically about course content prior to a session (Dobson, 2008), offering the benefits of identifying current learning needs or learning gaps, providing an indication of what will be covered in the upcoming session, and creating an opportunity for self-assessment.

Aims

This study describes a teaching and learning approach to assist research librarians in developing an evidence-based foundation to support their teaching. Two variations of the One Minute Paper (OMP), Polling OMPs and Reflective OMPs were developed to investigate whether they are effective models of formative assessment in Library Research Support. Questions asked are:

1. Do POMPs stimulate researcher engagement and interest?
2. Can POMPs identify learning needs of researchers?
3. Are POMPs or ROMPs effective tools for gaining feedback about researcher learning?

Methods

Two variations of the One Minute Paper (OMP) were developed and used in this study. Polling One Minute Papers (POMPs) were distributed prior to a session and Reflective One Minute Papers (ROMPs) were distributed after a session. The OMPs described in this study were developed for library research support sessions at James Cook University (JCU) (http://www.jcu.edu.au).

Polling One Minute Papers (POMPs)

POMPs are a self-assessment tool. The questions asked in a POMP were structured around the topic of a library research support session, polling researchers to gauge their understanding of the topic. Session content was then tailored for this level of understanding. The questions asked in POMPs are listed in the Appendix. POMPs were also designed to promote a session and stimulate interest about the content that would be covered in that session.

Sessions were organised in collaboration with research leaders, e.g. key researchers or research managers. This strategy helped to increase attendance and facilitate discussion

because participants shared common research interests and usually knew each other prior to the session. POMPs were distributed approximately one week prior to a session in an email from the research leader. Participants were required to complete the POMP prior to the session. A summary of the POMP results were shared during the corresponding session to enable peer benchmarking and therefore further self-assessment.

Reflective One Minute Papers (ROMPs)
ROMPs are a feedback tool which encouraged reflection about a session. The same three questions were asked in all ROMPs i.e.:

1. What was the most important thing you learnt?
2. What was the most confusing thing I covered?
3. What was the most interesting thing you learnt?

By responding to these three questions, ROMPs enabled researchers to provide feedback about the session and their learning to the librarian. ROMPs were developed partway through this project in order to close the formative assessment loop. ROMPs were used for 11 sessions, as listed in Table 1. A link to the three ROMP questions was usually distributed on the last slide of a session presentation or immediately after a session. In one exception (Session 16), the ROMP link was sent out 2 weeks after the session.

Data Collection
POMPs and ROMPs were created in Google Forms (Google, 2014). The selection of Google Forms was based on a number of criteria. Google Forms is a free service with no limit on the number of questions that can be asked. Checklists of multiple options per question can be selected, enabling quick standardized responses. The OMPs could be shared through an online link, enabling participation by both local and remote researchers.

POMPs and ROMPs were anonymous, a decision based on the presumption that anonymity would make researchers more likely to provide honest responses and therefore enable more realistic benchmarking amongst peers (Dillman, Smyth, & Christian, 2009). Respondents were also not required to log in using Google Forms, building researcher confidence that the OMPs were anonymous.

Researchers were from the disciplines of Life and Environmental Science, Health Science, Social Science and Humanities, and Mixed (Table 1). The librarian was present in the same room with participants for sessions 1-10, 15 and 16. Sessions 11-14 were conducted remotely via videoconference (Table 1). Sessions 1 – 15 were presented by the author. Session 16 was presented by another research support librarian who provided peer feedback about the value of OMPs.

Results

Response rates of POMPs and ROMPs
The number of researchers attending each session for which POMPs and ROMPs were distributed are summarised in Table 1.

The completion rate of POMPs was high at 72.7%. The number of POMPs submitted was 136 from a pool of 187 researchers who attended the 16 sessions. A factor contributing to this high rate of completion was the simplicity of the POMP form. In one click from a link in an email, it was immediately evident what the researcher needed to respond to. The entire POMP could be viewed on a desktop screen without scrolling, visually emphasizing that the form would be quick to complete, with the format of all or most responses being checklists. Promoting the POMP as a "1 minute quiz" with endorsement from a research leader was also effective e.g. the Director of a research centre for one of the Life and Environmental Science sessions included the following statement of support in his email:

> As part of the prep for the planning day, and to help with our understanding of the use of Research Profiles, can I ask you to take this 1 minute quiz? I took it and it took even less than 1 minute.

The completion rate of ROMPs was lower at 20.9%. The number of ROMPs submitted was 23 from a pool of 110 researchers who attended the 11 sessions for which ROMPs were distributed. A major factor contributing to this low response rate may have been due to the response format being free text.

Table 1: Summary of attendance, POMPs and ROMPs for each session

Session #	Discipline / Client Group	Session Topic	Remote*	Session date	Attendance	# POMPs submitted	% POMPs submitted	# ROMPs submitted	% ROMPs submitted
1	Life and Environmental Sciences: Post-Docs	Altmetrics	No	9 October 2013	23	17	73.9	----	----
2	Life and Environmental Sciences	Managing research profiles	No	11 October 2013	28	28	100.0	----	----
3	Life and Environmental Sciences	Research profile update and management	No	12 August 2014	8	9	112.5	6	75.0
4	Life and Environmental Sciences	Research profile update and management	No	29 August 2014	8	6	75.0	1	12.5
5	Life and Environmental Sciences	Research profile update and management	No	19 September 2014	5	4	80.0	1	20.0
6	Life and Environmental Sciences	Research profile update and management	No	9 October 2014	4	4	100.0	0	0.0
7	Life and Environmental Sciences	Research profile update and management	No	10 October 2014	4	2	50.0	0	0.0
8	Life and Environmental Sciences	Research profile update and management	No	24 November 2014	9	8	88.9	0	0.0
9	Health Sciences	Publishing academic research	No	23 October 2013	11	6	54.5	----	----
10	Health Sciences	Research and social media	No	27 August 2014	14	15	107.1	4	28.6
11	Health Sciences	Quality publishing	Yes	28 August 2014	3	2	66.7	3	100.0
12	Social Sciences and Humanities	Researcher identifiers	Yes	9 September 2014	2	3	150.0	2	100.0
13	Social Sciences and Humanities	Altmetrics	Yes	18 September 2014	5	4	80.0	4	80.0
14	Social Sciences and Humanities	Promoting and maximising research impact	Yes	2 December 2013	2	6	300.0	----	----
15	Mixed disciplines: Academic teaching staff	Research impact and publishing	No	13 February 2014	13	9	69.2	----	----
16	Mixed disciplines: Higher Degree Research students	Intellectual Property & Copyright	No	2 and 9 October 2014**	48	13	27.1	2	4.2

*Remote sessions were presented by videoconference due to the librarian being on a different campus to the researchers and unlikely to meet in person. ** Two sessions were grouped together because the same POMP and ROMP links were sent to all registrants.

Do POMPs stimulate researcher engagement and interest?

POMPs enhanced the engagement of researchers. Completion of a POMP and then the sharing of POMP results (e.g. Figure 2) provided researchers with two opportunities for self-assessment. POMPs could provide additional incentives to go to a session if researchers identified gaps in their knowledge or skills based on questions asked in the POMP. In at least one case, a researcher started to use some of the tools listed in the POMP prior to the session. In sessions, researchers showed great interest in the activities and tools being used by their peers. The opportunity to benchmark against peers and resulting discussion gave endorsement to the advice provided by the librarian e.g. one researcher reported that he had established a new international collaboration with substantial funding through a LinkedIn connection. Hearing how their peers were using such tools gave context-relevant evidence, making it easier to sell the concept of using social media tools in a research context. Researchers were also able to see which tools were widely used by their peers, giving an indication of where to get started or a confidence boost if they were already using those tools. Learning about lesser used tools such as The Conversation (http://theconversation.com/au) gave researchers ideas about how they could increase awareness about their research.

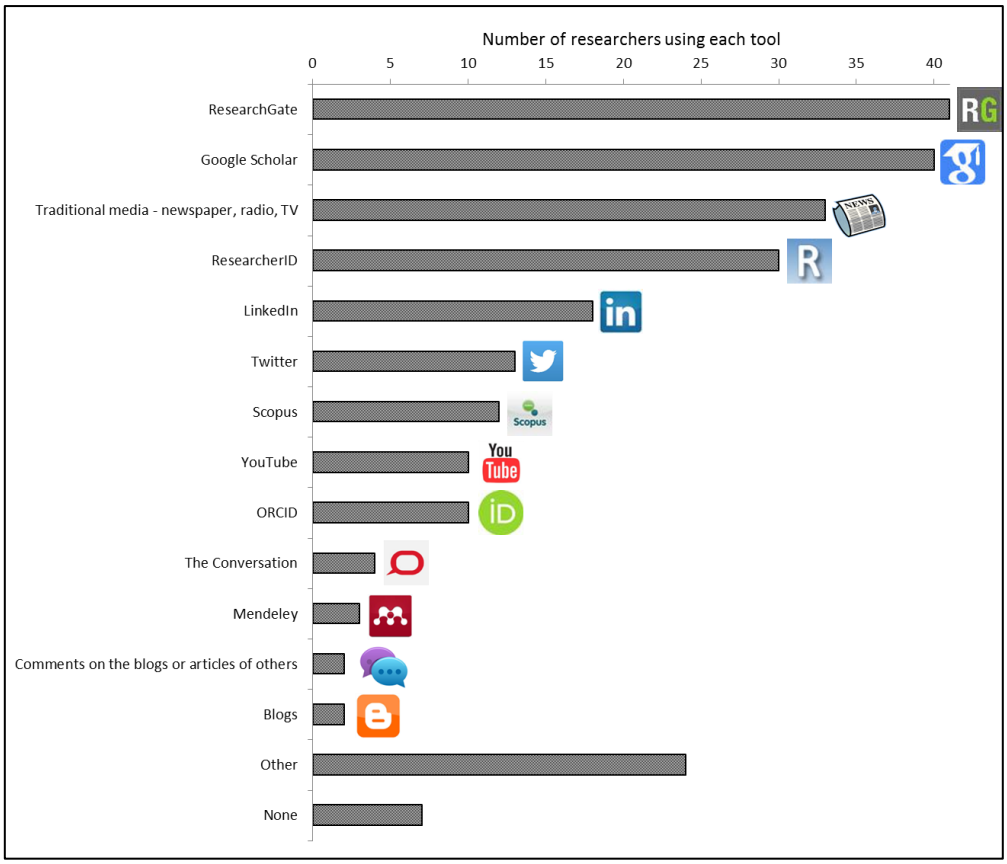

Figure 2: Display of results for the question "Have you used any of the following to promote or discuss your research?" (Responses from 78 submitted POMPs distributed to 89 researchers, compiled progressively and presented in sessions 1 – 8).

Can POMPs identify learning needs of researchers?

POMPs were effective and efficient in identifying current learning needs of researchers prior to a session and what the focus of the session content should be. POMP responses indicated

what researchers understood or were doing well and also gaps in their current knowledge or activities.

Responses from Life and Environmental Science researchers attending session 2 indicated that all researchers were using some online tools and almost half had used traditional media to communicate and promote their research (Figure 3). This suggested that they were generally aware of the importance of communicating and promoting their research. Despite this apparent awareness, the moderate to nil use of more than half the listed tools (Figure 3) also highlighted areas for further instruction.

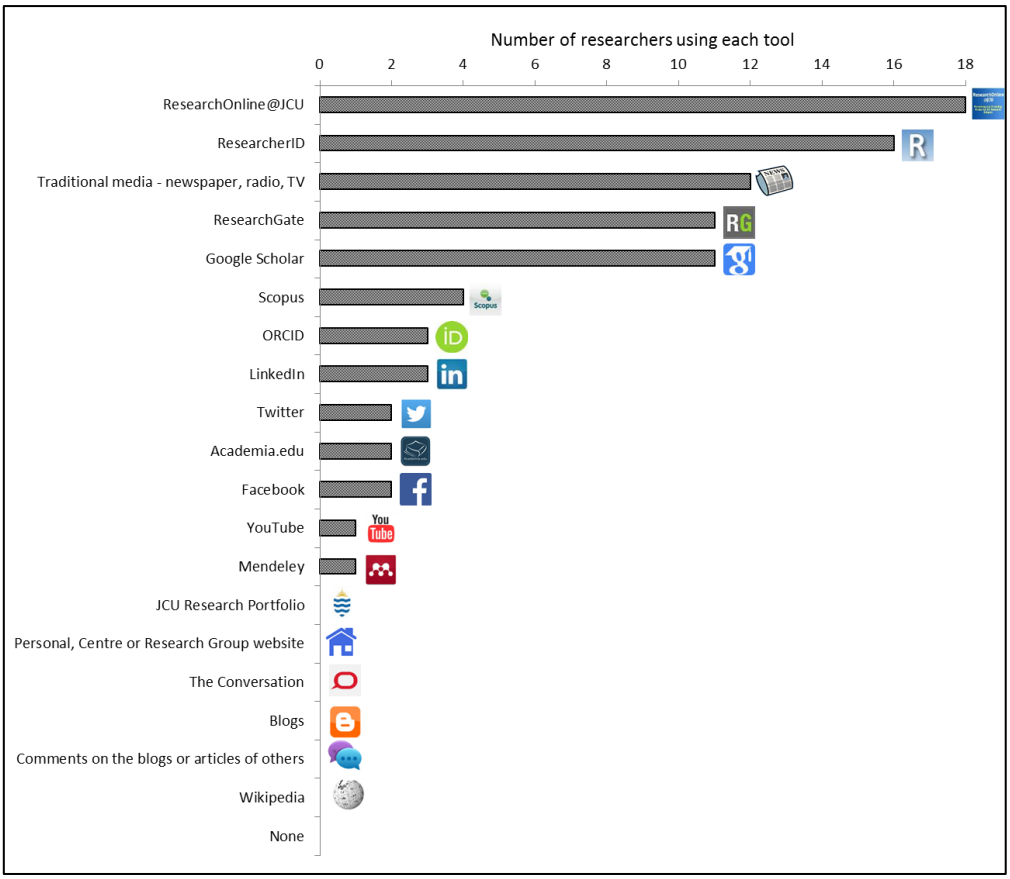

Figure 3: Display of results for the question "Have you used any of the following to promote or discuss your research?" (Responses from 28 submitted POMPs distributed to 28 researchers, presented in session 2.

Health Science and Life and Environmental Science researchers were mostly aware of whether an article processing charge (APC) had been paid for their article but were less clear about whether they had signed copyright ownership over to the publisher. Approximately one third of responding researchers from each discipline had authored a paper in which an APC had been paid and less than 10% were not sure (Figure 4). For authors who had paid an APC, a serious issue for discussion was highlighted i.e. eight of the Life and Environmental Science researchers (Figure 5) and the four Health Science researchers who indicated they had paid an APC were not sure if they had retained copyright ownership of their work. This finding highlighted the relevance of teaching these researchers about the importance of understanding the conditions of a publisher copyright agreement. This was pertinent given

that ResearchGate, a site which facilitates the sharing of research publications, was a frequently used social media tool (Figures 2 and 3).

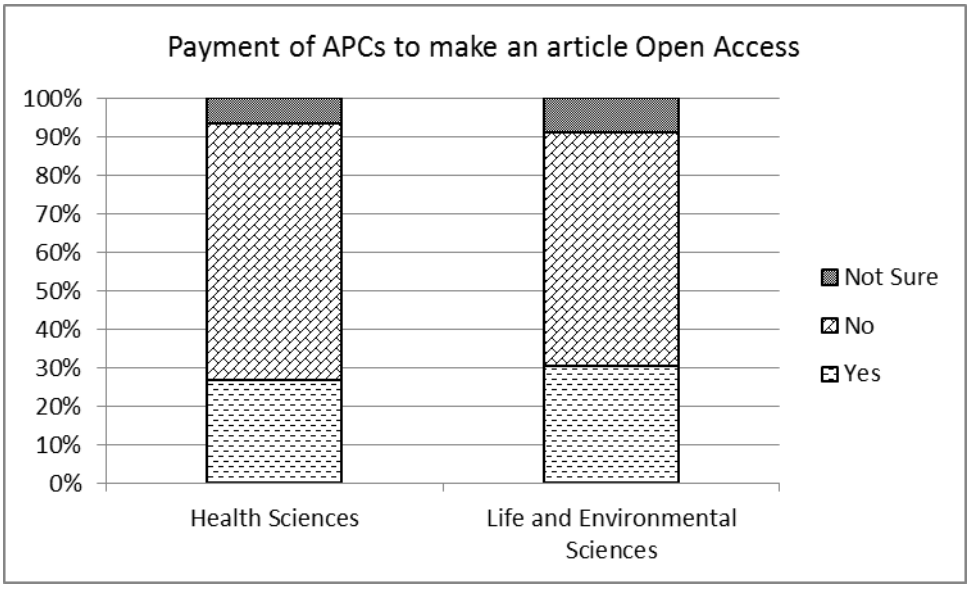

Figure 4: Relative proportions of researchers who have paid an Article Processing Charge (APC) to make an article Open Access; Health Science (15 responses, Session 10) and Life and Environmental Science (33 responses, Sessions 3-8)

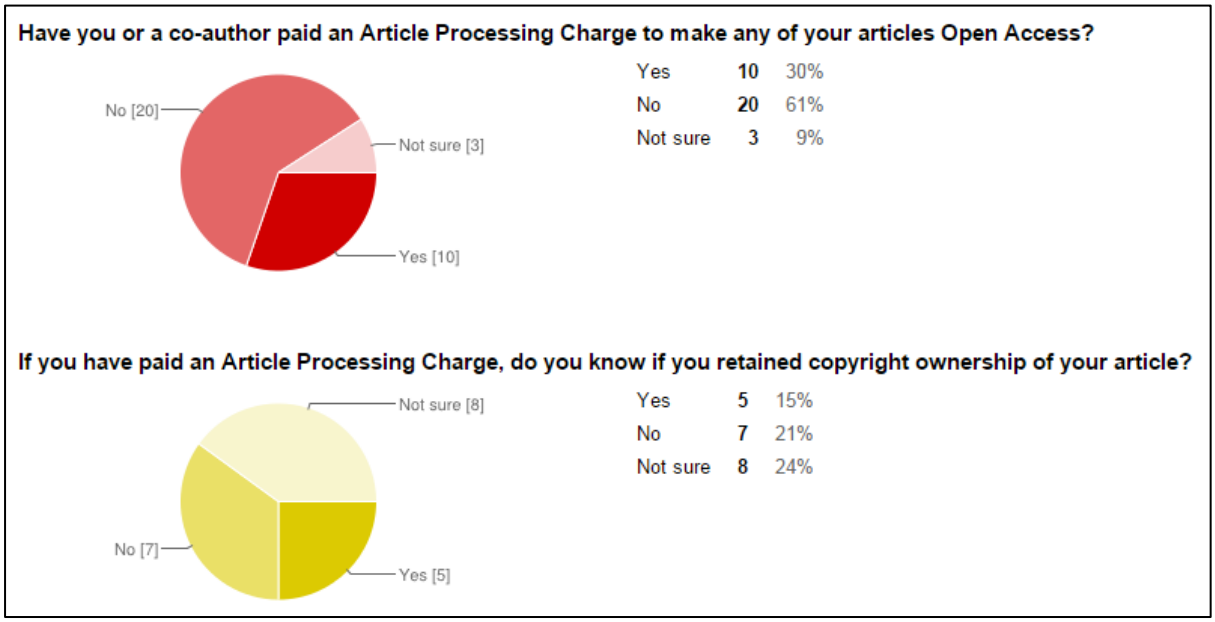

Figure 5: Display of results for the questions 5a: "Have you or a co-author paid an Article Processing Charge to make any of your articles open access?" and 5b "If you have paid an Article Processing Charge, do you know if you retained copyright ownership of your article?". (Responses from 38 submitted POMPs distributed to 38 researchers, compiled progressively and presented in sessions 3 – 8).

Despite the anonymity of POMP responses, examining answers to each question from individual responses was also useful for identifying learning needs. In relation to scholarly

publishing, researchers attending session 9 each had some publishing experience, mostly with journals and conferences (Table 2). However, only three researchers were familiar with the Australian Government Higher Education Research Data Collection: HERDC (Department of Education, 2014) and Excellence in Research for Australia: ERA (Australian Research Council, 2014). Although this group of researchers were aware of the importance of publishing, they may not be using the HERDC and ERA specifications, a form of summative assessment for researchers in Australian universities. Session content was therefore adapted to explain these specifications at a basic level. Similarly, of the 12 researchers in Figure 3 who had used traditional media to promote their research, only 6 identified ResearchOnline@JCU, the institutional repository, as a tool for communicating and promoting their research. This identified a point for discussion in the session, revealing that some researchers had only considered the institutional repository as an administrative reporting tool and not an avenue for communicating and promoting their research.

Table 2: Responses from Health Science researchers about their experience in publishing academic research (Responses from 6 POMPs distributed to 11 researchers)

Have you published any of the following types of journal articles?	**Have you published any of the following types of conference works?**	**Have you published any of the following types of books or book chapters?**	**Have you co-authored other types of works that are derived from your research?**	**Familiarity with HERDC or ERA**	**Use of journal ranking tools**
Peer reviewed article	Peer reviewed paper, Poster, Abstract or summary			ERA: Excellence in Research for Australia	
Peer reviewed article, Short note or commentary	Abstract or summary				Journal Citation Reports
Peer reviewed article, Non-refereed article, Case study	Peer reviewed paper, Non-refereed paper, Poster				
Peer reviewed article, Non-refereed article, Short note or commentary	Poster, Abstract or summary, Edited a conference proceedings	Teaching material		HERDC: Higher Education Research Data Collection, ERA: Excellence in Research for Australia	Journal Citation Reports
Peer reviewed article, Non-refereed article, Short note or commentary	Abstract or summary	Non-commercial		HERDC: Higher Education Research Data Collection	Journal Citation Reports
Non-refereed article					Journal Citation Reports, Scopus analytics

Are OMPs an effective tool for gaining feedback about researcher learning?

Polling One Minute Papers (POMPs)

POMPs created an opportunity to learn about the audience prior to an upcoming session, freeing up time in a session for discussion and teaching additional content. POMPs also created the opportunity to 'hear' from researchers who would normally not speak up in a session or who were only prepared to share information anonymously. Even when the number of responses was low, due to a small number of researchers attending a session, POMPs were still useful because all or most of the audience was assessed.

POMP responses were useful for refining how sessions were taught. Only a small proportion (14.7%) of researchers indicated that they had a good understanding of the term altmetrics, but all who selected this option provided an appropriate description of the term (Table 3). In contrast, of the 75 researchers who responded to this question, 42% indicated they had no understanding and 22% indicated they had some understanding of altmetrics. Given this range, discussion was encouraged in sessions to facilitate learning from peers who provided explanations that other session participants could easily relate to.

Table 3: Responses from researchers who indicated that they had some or a good understanding of altmetrics

Discipline	**Understanding of altmetrics**	**If you have heard of the term altmetrics, briefly describe what you understand it to mean?**
Health Sciences	Good	stats of research acknowledgement
Health Sciences	Good	It appears to be a count of twitter mentions (although it might include more than that)
Health Sciences	Some	heard it but not sure of it's meaning
Health Sciences	Some	No much I understand it
Health Sciences	Good	A measure of the social media impact of your paper
Health Sciences	Good	means of measuring research impact
Life and Environmental Sciences	Good	Non-traditional metrics, number of mentions on websites, social media, media etc
Life and Environmental Sciences	Good	proposed/potential alternative to Impact Factor, as a measure of influence
Life and Environmental Sciences	Good	Another way of measuring research 'impact'
Mixed Disciplines	Good	A number that represent the amount of attention an article receives from blogs, twitter, etc.
Mixed Disciplines	Good	measure of attention an article has received relative to 'lifespan'

POMPS created an unexpected insight from one group of remote researchers (session 14). Enquiry as to why only one researcher had responded to the POMP revealed that cultural differences as the underlying issue. The group's research manager explained that the researchers were embarrassed that they had no or few publications and so were reluctant to respond to the POMP. This information was useful in itself as it indicated that the session content needed to be directed at getting the researchers started with publishing. Further explanation about the POMP boosted the response rate to 6, although only 2 researchers attended the session. These insights will be considered in the planning of future sessions with this group of researchers.

Feedback from a colleague who trialed the use of a POMP (session 16) reported that it was very interesting and useful to see the range of disciplines and prior knowledge of the researchers who had registered for the session. In this POMP, respondents were asked to table any prior questions which gave the librarian time to prepare for complex questions.

Reflective One Minute Papers (ROMPs)

ROMP responses gave an insight into what researchers gained from their session. They were used by the librarian to determine whether intended learning outcomes were achieved and consider how the teaching or content of future sessions could be improved. ROMPs were particularly effective in facilitating reflective feedback at the end of remote sessions with small numbers of participants. In discussions at the end of sessions with 2-5 participants (Sessions 11-13), responses were received from all or most participants. In some cases, an immediate answer was given in the session while future sessions were offered as a response to more complex issues. Although response rates were lower for larger sessions, the ROMPs were still beneficial for encouraging reflection, feedback and continuing the conversation

with session participants. ROMPs were least effective for hands-on Life and Environmental Science sessions (Sessions 4 – 8). These sessions were all hands-on with substantial discussion and feedback throughout the sessions. When asked to complete the ROMP, the researchers repeated comments they had made during the session, but only 2 of 30 recorded their feedback in a ROMP. Feedback from these hands-on sessions was mostly positive. One researcher was however particularly frustrated with the work she needed to do to manage her online presence.

Within the 23 ROMP responses, 17 responded to all three questions, two participants responded to one question, and four participants responded to two questions. Responses are grouped into one of five categories (Table 4). The number of responses to each of the three questions is presented in Table 5. The categories "topic named" and "positive statement" suggest a relatively shallow level of learning and limited engagement with the session content. "Reflective statement" suggests some level of engagement while responses coded as "reflective statement with further insight" and "reflective question" each provide evidence of deeper learning. Most responses to the question about the most important things learnt were reflective statements. The majority of responses to the question about the most confusing thing covered were positive, indicating that respondents felt that they understood the session content. Responses to the question about the most interesting thing learnt indicated a range of levels of engagement from positive statements or a reflective statement with some demonstrating further insight.

Table 4: Categories used to group ROMP responses

Response category	**Explanation of category**	**Example responses from this study**
Topic named	Simple listing of an aspect covered in the session, with no insight to the researcher's learning	• open access • altmetrics
Positive statement	Indicates session was worthwhile, with no insight to the researcher's learning	• Nothing was confusing - excellently done • All of it. Informative and interesting presentation. Thank you. No negative feedback was recorded in any responses.
Reflective statement	Repeats content from the session, highlighting specific aspects	• labouring the points about "dodgy" journals. I liked the tips to improve your Altmetric score. • I also didn't know that Twitter can be so useful.
Reflective statement with further insight	What the researcher learnt and how it applies to their personal situation or how they will use what they have learnt	• The most interesting thing I learn was about the importance of open access. I am going to bring some of this information to my lab group and postgrads. Overall, thank you so much for taking the time and going over these things - you are so knowledgeable and kind, it was a wonderful workshop! • The importance of twitter to academics. I always thought it was meant for teenagers. I will definitely sign up for a twitter account after this session.
Reflective question	Indicates deeper thinking by new issues that the session content raised for the researcher	• Probably not covered entirely, but I am interested how publications in journal with lower impact, but receive higher citations, might influence the indices we looked at during the session • Nothing was confusing. However would have liked an example of how to tweet a publication. I have tweeted a publication but there are no doughnuts associated with the corresponding author publication list in Research Portfolio.

Table 5: Number of responses to each of the three ROMP questions

	ROMP Question and number of responses		
Response category	**What was the most important thing you learnt?**	**What was the most confusing thing I covered?**	**What was the most interesting thing you learnt?**
Topic named	2	1	1
Positive statement	1	10	6
Reflective statement	13	3	8
Reflective statement with	4	2	5

further insight			
Reflective question	0	4	1

Discussion

This study describes a new approach to providing library support for researchers. The defining feature of this approach is that it is simple yet informative. The approach adapts and combines two formative assessment strategies that have both been used in library information literacy classes. The first strategy is polling researchers using the One Minute Paper concept to (1) identify their learning needs and (2) increase levels of engagement (e.g. Hoppenfeld, 2012). The Polling One Minute Paper (POMP) is designed to be quick for researchers to complete, and easy for librarians to interpret and gain a snapshot of current learning needs of the target group of researchers. Completing the POMP prior to the session gave responding researchers an indication of the session content, raising their interest and allowing them to self-assess their understanding. During the session, a summary of the POMP responses was presented. Sharing the POMP responses was effective in that it provided context relevant information against which session participants could benchmark themselves. Observation of body language and engaged discussion provided informal evidence of the effectiveness of this strategy. At the end of the session, participants are asked to complete a Reflective One Minute Paper (ROMP), encouraging researchers to reflect on the session content and provide feedback which enables the librarian to review what the researchers gained from the session. This second strategy is adapted from the original One Minute Paper (Chizmar & Ostrosky, 1998), which was first used in library instruction by Choinski and Emmanuel (2006).

The POMP-ROMP approach can improve the value of library research support sessions for researchers. It offers a responsive approach to the current learning needs of researchers. Variation in undergraduate students' competencies represents a significant challenge in information literacy pedagogy (Dunaway & Orblych, 2011). Researcher learning needs may be more diverse than that of undergraduate students, varying with career stage, discipline and current research priorities or activities, and previous training. The increasingly complex and competitive environment that researchers now work in (Richardson, et al., 2012) also makes it difficult to identify and track researcher learning needs. Given this variability, the two complementary OMP tools described in this study are an effective means of rapidly obtaining a snapshot of the current learning status of a specific research group, immediately prior to and following a library support training session. Librarians can use this snapshot to determine the level of detail that they teach in a session, with the aim of meeting the learning needs of researchers and providing the right amount of challenge to spark engagement in the topic. Using a tailored approach is also creates proactive rather than passive library services, providing "just-in-time" and "just-for-me" assistance (Association of College and Research Libraries, 2010).

The POMP-ROMP approach is designed to slot into researchers' workflow. The simplicity of both the POMPs and ROMPs mean that they can be prepared at short notice and used for small, large, remote, face-to-face, lecture or hands-on sessions. The flexibility of these tools enables the library to contribute to improving research performance, or summative assessment, without adding additional burden to a researcher's workload (Parker, 2012). The

POMPs and ROMPs also extend the opportunity for discussion with researchers beyond the defined period of a library research support session, creating further opportunity to build and strengthen the researcher-librarian relationship (Auckland, 2012; Parker, 2012). In this study, ROMP feedback received in discussion at the end of sessions was responded to directly, with the offer of future sessions where relevant. Further consideration is needed for how to respond to written responses. One option would be to ask researchers to include their name on the ROMP if they would like further information. Another option would be to provide a single response, shared with all session participants, which responds to all issues raised in each ROMPs from the corresponding session.

Many academic libraries are now developing or offering support programs for their researchers (Auckland, 2012; Richardson, et al., 2012). It is likely that libraries will provide this support with no or little additional resources (Kennan, Cole, Willard, Wilson, & Marion, 2006; Kennan, et al., 2014). Therefore, as more librarians become involved in supporting researchers in their institution, a coordinated approach will be necessary to make efficient use of limited library resources. Maximizing the benefit for researchers of attending library research support sessions will also benefit libraries by efficiently using the time that librarians spend in supporting researchers. From the perspective of academic libraries, POMPs and ROMPs are useful for identifying new learning needs, sharing evolving perspectives in researcher feedback and optimizing content in library research support programs. As more librarians become involved, the opportunity for peer review will lead to new insights (Drew & Klopper, 2014) which may improve POMPs, ROMPs and other strategies for teaching library support to researchers.

One of the most important but often overlooked parts of the assessment cycle is for teachers or instructors to close the assessment loop by reflecting on assessment results and making appropriate changes, such as adjusting teaching methodologies or changing the structure of a program (Oakleaf, 2009; Swoger, 2011). Ultimately, the goal of all instruction and assessment efforts is to engage in reflective practice (Oakleaf, 2014). Teaching programs can nearly always be improved (Swoger, 2011) and should evolve to keep pace with new teaching strategies and content. POMPs and ROMPs are a viable means of gaining regular, systematic feedback from researchers to assist with developing and improving library research support programs.

Academic libraries and librarians must demonstrate their value. Libraries and librarians can no longer rely on an assumed belief by stakeholders that they are important (Association of College and Research Libraries, 2010). This is particularly true for the context of library research support. In this relatively new enterprise of research support, libraries are trialing various models of operation and entering spaces that were previously the domain of other sections of the university e.g. research offices. Assessing impact, to demonstrate value, is made more complicated because academic libraries operate in a changing environment in which people, services and needs are constantly evolving (Association of College and Research Libraries, 2010). It is also difficult to prove that actions taken by the library contributed to improvements in the performance of researchers (Association of College and Research Libraries, 2010). Implementing the POMP-ROMP approach as standard operating

practice for library research support will develop a data source which provides evidence of a library's value and how its contribution to the support of the institution's researchers has changed over time.

Limitations

Data obtained through POMPs or ROMPs should not be extrapolated to other contexts. The POMP-ROMP approach applies to a specific situation. Each dataset provides a snapshot of the status of the learning of a specific group of researchers. No control groups are used and sample sizes are often small and not randomly selected e.g. all responses are analysed and samples are comprised of researchers with similar interests or skill levels. Questions asked in POMPs are tailored to the topic of an upcoming session, so are not intended to provide a detailed or comprehensive insight to library research support issues.

The POMPs and ROMPs may not reflect the learning or experience of all researchers in a corresponding session. The needs of researchers who do not submit a POMP may not be considered in the preparation of session content. In the most extreme situation, non-response could be due to a lack of understanding of the question, although most non-responses are more likely due to the researcher having other priorities. Unexpectedly, the number of responses for sessions 3, 10, 12 and 14 were higher than session attendance, indicating that more researchers submitted a POMP than attended the corresponding session. This means that the needs of these researchers may be addressed but not actually apply to any of the researchers who attended the session. Non-response to ROMPs could be due to researchers not seeing a personal benefit in submitting their feedback or a reluctance to share their thoughts. In these cases, the librarian is reliant on discussion in a session which should form part of his/her reflection on the session. In the current study, non-response to ROMPs seemed mainly due to researchers not having anything to report that was not already expressed during the session. Unfortunately, this verbal feedback was positive, but not recorded for longer term analysis and comparison. In future sessions, the value of completing a ROMP will be emphasised, to encourage researchers to reflect on the session content and to record feedback to the librarian.

Conclusions

Polling One minute Papers (POMPs) and Reflective One Minute Papers (ROMPs) offer a new approach for librarians to guide the learning process of the researchers they support. This study demonstrates that POMPs and ROMPs have the potential to be remarkably informative, despite requiring little effort on the part of the researchers or librarians. POMPs and ROMPs are formative assessment tools which extend the opportunity for librarians to engage with researchers, both before and after a library research support session. POMPs allow researchers to self-assess the status of their learning and assist librarians to identify learning gaps. ROMPs encourage researchers to reflect on what they learnt in library research support sessions and assist librarians to determine whether intended learning outcomes were achieved. The simplicity of POMPs and ROMPs enable them to be slotted into researchers' workflow. As librarians take on research support duties, these tools can be used to share recorded evidence of the evolving learning needs of researchers. Responses to POMPs and

ROMPs also document evidence of the value that a library has contributed to institutional outcomes through improving the performance of its researchers.

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Appendix

Session #	Discipline / Client Group*	Questions	Response Options
1	Life and Environmental Sciences: Post-Docs	How would you rate your understanding of altmetrics?	None; Low; Good
1	Life and Environmental Sciences: Post-Docs	Which of the following do you use to do your research, or to talk about your research interests?	Academia.edu; Blogging; CiteULike; Comments on other sites; Facebook; Mendeley; Newspaper interviews; Radio interviews; ResearchGate; Slideshare; Twitter; Wikipedia; YouTube; Other
1	Life and Environmental Sciences: Post-Docs	Which of the following sites do you use to manage your research profile?	JCU Research Portfolio; ResearchOnline@JCU; ResearcherID; Scopus; ORCID; Google Scholar; Other
2	Life and Environmental Sciences	Is the information in your JCU Research Portfolio profile up-to-date?	Yes; No; Other
2	Life and Environmental Sciences	Which of the following do you use to do your research, or to talk about your research interests?	ResearchOnline@JCU; ResearcherID; Scopus; ORCID; Google Scholar; Other
2	Life and Environmental Sciences	Which of the following sites do you use to manage your research profile?	Academia.edu; Blogging; CiteULike; Comments on other sites; Facebook; Mendeley; Newspaper interviews; Radio interviews; ResearchGate; Slideshare; Twitter; Wikipedia; YouTube; Other
3, 4, 5, 6, 7, 8	Life and Environmental Sciences	Have you used any of the following to promote or discuss your research?	ResearcherID; Scopus; Google Scholar; ORCID; The Conversation; Traditional media - newspaper, radio, TV; Blogging; Comments on the blogs or articles by others; Twitter, ResearchGate; YouTube; LinkedIn; Mendeley; Other
3, 4, 5, 6, 7, 8	Life and Environmental Sciences	Have you heard of the term altmetrics?	Yes; No; Not sure
3, 4, 5, 6, 7, 8	Life and Environmental Sciences	If you have heard of the term altmetrics, briefly describe what you understand it to mean?	[Free text]
3, 4, 5, 6, 7, 8	Life and Environmental Sciences	If you have paid an Article Processing Charge, do you know if you retained copyright ownership of your article?	Yes; No; Not sure
3, 4, 5, 6, 7, 8	Life and Environmental Sciences	Have you or a co-author paid an Article Processing Charge to make any of your articles Open Access?	Yes; No; Not sure
9	Health Sciences	Have you published any of the following types of journal articles?	Peer reviewed article; Non-refereed article; Case study; Short note or commentary; Other
9	Health Sciences	Have you published any of the following types of conference works?	Peer reviewed paper; Non-refereed paper; Poster; Abstract or summary; Edited a conference proceedings; Other
9	Health Sciences	Have you published any of the following types of books or book chapters?	Research; Non-research; Teaching material; Non-commercial; Reference; Later edition; Report
9	Health Sciences	Tick the box if you are you familiar with the following government reporting or assessment exercises:	HERDC: Higher Education Research Data Collection; ERA: Excellence in Research for Australia; Other
9	Health Sciences	Tick the box if you have used any of the following for ranking the value of a journal:	Journal Citation Reports; Scopus analytics; Beall's list of predatory publishers; Other
10	Health Sciences	Have you used any of the following to promote or discuss your research?	ResearcherID; Scopus; Google Scholar; ORCID; The Conversation; Traditional media - newspaper, radio, TV; Blogging; Comments on the blogs or articles by others; Twitter, ResearchGate; YouTube; LinkedIn; Mendeley; Other
10	Health Sciences	Have you heard of the term altmetrics?	Yes; No; Not sure
10	Health Sciences	If you have heard of the term altmetrics, briefly describe what you understand it to mean?	[Free text]
10	Health Sciences	Have you or a co-author paid an Article Processing Charge to make any of your articles Open Access?	Yes; No; Not sure
10	Health Sciences	If you have paid an Article Processing Charge, do you know if you	Yes; No; Not sure

		retained copyright ownership of your article?	
11	Health Sciences	Have you published any of the following types of journal articles?	Peer reviewed article; Non-refereed article; Case study; Short note or commentary; Other
11	Health Sciences	Have you published any of the following types of conference works?	Peer reviewed paper; Non-refereed paper; Poster; Abstract or summary; Edited a conference proceedings; Other
11	Health Sciences	Have you published any of the following types of books or book chapters?	Research; Non-research; Teaching material; Non-commercial; Reference; Later edition; Report
11	Health Sciences	Would you consider that you have a fair understanding of:	HERDC: Higher Education Research Data Collection; ERA: Excellence in Research for Australia; Other
11	Health Sciences	Are any of your publications Open Access:	In ResearchOnline@JCU?; On the publisher's website?; Other
12	Social Sciences and Humanities	Are you the author of a peer reviewed journal article?	No; Yes
12	Social Sciences and Humanities	Are you the author of a peer reviewed conference paper?	No; Yes
12	Social Sciences and Humanities	Are you the author of a commercially published book or book chapter about a research topic?	No; Yes
12	Social Sciences and Humanities	Do you have publications available in ResearchOnline@JCU?	No; Yes
12	Social Sciences and Humanities	Do you have a Google Scholar profile that lists your research outputs?	No; Yes
12	Social Sciences and Humanities	If you have answered yes to Questions 1,2 or 3, have you searched for your publications in Web of Science?	No; Yes
12	Social Sciences and Humanities	If you have answered yes to Questions 1,2 or 3, have you searched for your publications in Scopus?	No; Yes
12	Social Sciences and Humanities	Is there any topic or question that you would like me to talk about in the session?	[Free text]
13	Social Sciences and Humanities	Have you used any of the following to promote or discuss your research?	ResearcherID; Scopus; Google Scholar; ORCID; The Conversation; Traditional media - newspaper, radio, TV; Blogging; Comments on the blogs or articles by others; Twitter, ResearchGate; YouTube; LinkedIn; Mendeley; Other
13	Social Sciences and Humanities	Have you heard of the term altmetrics?	Yes; No; Not sure
13	Social Sciences and Humanities	If you have heard of the term altmetrics, briefly describe what you understand it to mean?	[Free text]
13	Social Sciences and Humanities	Have you or a co-author paid an Article Processing Charge to make any of your articles Open Access?	Yes; No; Not sure
13	Social Sciences and Humanities	If you have paid an Article Processing Charge, do you know if you retained copyright ownership of your article?	Yes; No; Not sure
14	Social Sciences and Humanities	How many HERDC eligible publications do you have? This includes peer reviewed publications or commercially published books or book chapters.	[give number]
14	Social Sciences and Humanities	Have you heard of the term altmetrics, and how would you rate your understanding of altmetrics?	I have not heard of the term; I have some understanding; I have a good understanding
14	Social Sciences and Humanities	Which of the following do you use to manage your research profile?	JCU Research Portfolio; ResearchOnline@JCU; ResearcherID; Scopus; ORCID; Google Scholar; Other
14	Social Sciences and Humanities	Which of the following do you use to do your research, or to talk about your research?	Academia.edu; Blogs; Comments on any sites; Facebook; Mendeley; Newspaper interviews; Radio interviews; ResearchGate; Slideshare; Twitter; Wikipedia; YouTube; Other
15	Mixed disciplines: Academic teaching staff	Have you published any of the following outputs about your research?	Peer reviewed journal article; Non-peer reviewed journal article; Non-peer reviewed conference paper; Book or book chapter; Report; Other

15	Mixed disciplines: Academic teaching staff	Have you published any of the following outputs about your teaching?	Peer reviewed journal article; Non-peer reviewed journal article; Non-peer reviewed conference paper; Book or book chapter; Report; Other
15	Mixed disciplines: Academic teaching staff	Do you use any of the following social media tools to talk about or promote your teaching and learning?	Blogs; Comments on other people's posts; Twitter; Facebook; Academic.edu or ResearchGate; Slideshare; Wikipedia; YouTube; (Your) JCU Research Portfolio; (Your) Google Scholar profile; Other
16	Mixed disciplines: Higher Degree Research students	What is the discipline or subject area of your research?	
16	Mixed disciplines: Higher Degree Research students	Are you a:	Research Masters student; PhD student; Early Career Researcher i.e. are you within 5 years of starting your post-PhD research career?; Other
16	Mixed disciplines: Higher Degree Research students	Are you using (or planning to use) material in your thesis for which the copyright may have expired? Select Other if you would like to provide more information.	Yes; No; Not sure; Other
16	Mixed disciplines: Higher Degree Research students	Are you using (or planning to use) material in your thesis which is still under copyright? Select Other if you would like to provide more information.	Yes; No; Not sure; Other
16	Mixed disciplines: Higher Degree Research students	Have you ever requested copyright permission to use someone else's work in your research?	Yes; No; Not sure; Other
16	Mixed disciplines: Higher Degree Research students	Are you planning to publish your research in:	Journal article(s); Conference paper(s); book or book chapter(s); Other
16	Mixed disciplines: Higher Degree Research students	Have you heard of Creative Commons?	Yes; No; Not sure
16	Mixed disciplines: Higher Degree Research students	Do you have a copyright question that you would like answered in the workshop? Please provide more details here.	[Free text]