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# Self- and Cohort-directed Design in Research Training Tutorials for Undergraduate Researchers: Increasing Ownership and Relevance to Improve Learning Outcomes

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**This paper describes and analyses a method of self- and cohort-directed design of research training tutorials for final-year research-oriented undergraduate students at the University of Queensland, Australia.**

**The design methodology centered on a research skills self-assessment document used at the university, and utilized Personal Response System (PRS) technology to gather the cohort's design decisions. This paper examines the pedagogical framework for this instructional approach, analyses feedback on the students' experiences and performances, and outlines future further developments for this program.**

## INTRODUCTION

This article focuses on the use of a Personal Response System, or PRS, in combination with a personalized Research Skills Audit, for a research tutorial with a cohort of fourth-year research-oriented students in the School of Economics at the University of Queensland, Australia. It discusses the development of a cohort-directed resource discovery session, facilitated with PRS technology, built around the framework of a large body of both discipline-specific and generic information resources, skills and services and personalized by the cohort to suit the needs of their group. Background information is provided on the program and experiences of previous years' interactions, and on the PRS technology and Research Skill Audits. The methodology for the design and administration of the tutorial is outlined, and the pedagogical framework for each element is discussed. Feedback is analyzed on the students' knowledge of research resources, their engagement and participation in the tutorial and their performance in the creation and delivery of their thesis; and finally future developments in the use of this teaching method are explored.

## Background to the University of Queensland Economics Honors Program

The Bachelor of Economics degree at the University of Queensland is a 3-year undergraduate degree, offering an option of an Honors year in the fourth-year for high-achieving students. The Honors program consists of some advanced-level coursework, but focuses primarily on the production of a 20,000 word research thesis on the research topic of their choice. The Honors cohort is relatively small, usually 12 to 25 students each year, and students quickly develop strong cohort bonds and a sense of community and collegiality.<sup>1</sup> The 2009 honors cohort, who participated in this study, consisted of 20 students. All students were 19–22 years old. Six of the twenty (30%) were female, and the remainder were male. Twelve students (60%) had studied pure economics programs; the remaining eight had studied dual-degree programs combining economics with other subject areas (four in science, one in journalism, one in law and two in business/commerce).

As the initial part of the program, students complete a series of short courses which cover the formation of their thesis topic, research methodologies, writing techniques and thesis presentation. Each student was interviewed individually prior to commencing their studies and had outlined for them the School's expectations of their academic performance and professional conduct, and this is reinforced through the series. The series of courses was increased from three sessions to four in 2009, to better guide and support the students and to reinforce the ideas of the previous three sessions and the individual interviews.

The Liaison Librarian for the School conducts a 2-hour tutorial as part of this series, outlining the resources available to students for

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their research and giving generic research tips. Attendance at this tutorial is compulsory for every student; however in previous years the session has been dissatisfying for both the students and the Liaison librarian. Students found it difficult to engage with the vast amount of information being pressed upon them in a short time-frame, many of which may not have been applicable to their research topic. Many students had also developed sound research skills and knowledge of resources in their undergraduate careers, others less so. It was apparent that a “cover-all” approach was not a successful way to develop research skills in these students and to ensure they had sufficient knowledge of available resources to complete their theses.

## Background to the University of Queensland Library Research Skills Audits

The University of Queensland Library developed a series of Skills Audits for Research Higher Degree students in late 2008—these audits were a self-assessed checklist of the types of resources and techniques applicable to research in a given area of study at the University. It is usually completed by commencing Doctor or Master of Philosophy candidates in consultation with their supervisor and/or their School Liaison Librarian. The Skills Audit is a self-directed framework for developing knowledge of research resources in the student's discipline area, with a solid foundation of both library-based and external information resources but with the flexibility to personalize requirements depending on a student's research focus, prior experience with the University of Queensland library services, and existing Information Literacy skills.<sup>2</sup>

## Background to Personal Response System Technology

The PRS in use at the University of Queensland is TurningPoint; the system software ties in with Microsoft PowerPoint to create questions within slideshow presentations, and respondents record their answer on small hand-held keypads roughly the size of a playing card. Keypads relay their responses to a USB adaptor and can then be displayed on screen in the presenter's pre-selected format. Collected data can be exported for further analysis.<sup>3</sup>

The PRS and its devices, known locally as “Clickers,” are widely used at an undergraduate level at the University of Queensland, mostly within large lectures in the Faculties of Science, Health Sciences, and Engineering, Architecture and Information Technology. Librarians at the University of Queensland Library had explored the use of Clickers for engaging and testing information literacy of undergraduate students in these faculties previously, and reported good results, particularly with regards to student engagement.

## Pedagogical Framework

The library session with the Honors cohort was designed as a 2-hour interactive course in a lab setting. The aim of the session was to administer the Research Skills Audit *en masse* to the group, ensuring they were familiar with all resources and techniques applicable to research in the field of Economics. To maximize the efficient use of class time, the PRS was used as a “pre-poll” to ask students to consider their own knowledge of and experience with each type of resource. Each resource type was displayed on a slide, and students then used the [Personal Response System] response devices to vote either “Yes” to indicate they wanted to learn more on this topic, “No” to indicate they were confident they did not need to learn more, or “Not Applicable” if the resource type did not suit their research topic. Once all responses were in, a pie chart displayed the result of the class vote; the majority vote determined whether the resource would be covered or not. This process took about 25 minutes, to introduce the technology and the process and to administer three test questions and fourteen “real” votes. When all resources had been voted on, delivery of the lesson began; the lesson followed the basic structure of the

Research Skills Audit in terms of the order content was covered. All students had PCs, and while there were no formal exercises, students would be encouraged to try out the resources and techniques being covered. The lesson, including questions at the end, took approximately 1 hour and 50 minutes.

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This library session was designed on a foundation not only of past experiences of teaching this cohort, but on a pedagogical framework gathered from other studies and literature in the library and wider higher education sector. The component parts of this session plan—use of learning design promoting self-directed research professionalism, use of the cohort or community to direct learning, and use of PRS technology—increase both experiential and learning outcomes for participants, as outlined in the review of literature below.

## Use of Learner-Centered Research Skills Education

“Postgraduate research must be considered the training ground for researchers and academics of the future,”<sup>4</sup> and as such universities are striving to build acquisition of both discipline-specific and more generic research skills into the research higher degree experience. Research higher degree programs aim to make students into proficient and professional independent researchers, who not only possess excellent specialized disciplinary knowledge but also have strong interdisciplinary research skills which they can use flexibly in a range of employment destinations, both in the academic and professional spheres.<sup>5</sup> In the past, research skills education was never formalized within research higher degree programs, and relied on the supervisor playing role of mentor and trainer in the development of these skills, within the explicit context of the research discipline area. However, there has been a shift to an increasing realization that commencing research higher degree students, coming fresh from undergraduate or coursework Masters programs, cannot transform themselves into independent researchers simply by observing and imitating their supervisors, or with only minimal explicit input from educators.<sup>6</sup> Generic skills should place a particular emphasis on critical thinking, reading and writing skills, especially when internet sources are used; students often do not have an innate understanding of what critical analysis is and how to apply these skills to non-traditional works.<sup>7</sup> Formalized hands-on training is clearly required, both in generic and discipline-specific research resources and techniques.

As well as formalizing research training, the most effective methods of research skills education within the university's environment of adult learners are those that are learner-centered or self directed. A recent study by Manathunga and Goozée indicates that increasing autonomy and individualized focus in research training generally decreases the hands-on input required of supervisors by their research students, and increases the quality of manuscripts sent in for revision.<sup>8</sup> Research higher degree programs tend to have an unformulated and largely inherent curriculum where learning is tailored to individual student needs; every student in every cohort requires different resources and brings different prior learning with them, and training programs should be flexible enough to allow for this.<sup>9</sup> It is crucial that research training “retain the individuality of

each student's developmental journey"<sup>10</sup> and that training be tailored towards the needs and abilities of each student, embedded as much as possible within their research. Gurr argues that research skills education "should be done in a participatory fashion rather than on the basis of assumptions"<sup>11</sup>: for example, by gathering information about student knowledge before or during a session and feeding that data back into class design. It is important that training sessions encourage a proactive attitude in students as to what and when they learn, particularly in early-career research students. This participatory approach increases ownership and responsibility in students, and as Gurr's study shows, lead to better decision-making skills.<sup>12</sup> Learner-centered teaching, therefore, benefits students by taking account of their existing knowledge and better equipping them to be self-directed workers.

### **Use of Cohort/Community to Direct Learning**

The lower levels of research higher degree programs—Honors, Masters and early-career PhD programs—are often undertaken by individuals in a defined cohort; a group of students working in the same discipline area, beginning their research projects at the same time, with similar educational backgrounds and expectations of their research career. Teaching methods which make use of the cohesion and group behaviors of these cohorts have been proven particularly effective in many studies, both for educators and students. By learning together as a cohort, students are able to form "Communities of Practice" which not only support and nurture individuals in their work, but can also develop further into their future research and work with cohort peers. Cohorts can help research students overcome the isolation they can experience when working with such individual and specific projects and differing methodologies, much more so than if they were interacting purely with their individual supervisors.<sup>13</sup> Educating in groups also takes account of the important social capital the cohort has to offer: information, ideas, support, cooperation and influence.<sup>14</sup> As individuals progress through their research degree program, members within a cohort not only help to motivate each other and keep research momentum going, but also help individuals achieve best practice in terms of generic research skills.<sup>15</sup> Increasing students' ability to learn from one another also has the added benefit of decreasing strain on research supervisors who are already pressured to supervise multiple students.<sup>16</sup>

Aside from improving the research higher degree experience for students, directing learning within a cohort or community setting for research postgraduate is sound educational practice. Studies have shown that students learn some skills better in groups than alone, particularly transferrable skills, and that some elements of Research Higher Degree learning can in fact only be acquired through interaction with others in a community of scholars. It is important for research students to be aware of their peers and their knowledge, and to measure the strength of their community, an awareness easily fostered by teaching in groups. This awareness makes a cohesive and effective learning and exchange environment, and bonds a group together using the types of language, knowledge and inquiry their discipline values, making them stronger researchers in this area.<sup>17</sup> Indeed, when developing effectively, cohorts assist their members to achieve best practice in the skills required in their individual disciplinary fields, in addition to those generic research skills common to all.

### **Use of Personal Response System Technology**

The literature on educational, and particularly library, uses of PRS technology relays dozens of positive experiences, where both educators and students experience fun and fulfilling classes with this technology. The idea behind the technology is usually instantly recognizable from popular culture, and provides novelty in the

classroom without too steep a learning curve. Accounts from other classrooms found that before learning has even started, a PRS provides an excellent icebreaker for the session, as educators can begin informal dialogue with students before the session begins by handing out and answering questions about the response devices.<sup>18</sup> Library educators have always found challenging the task of fostering participation in a one-off session with no defined and summative assessment, and struggled with the image barrier of the library educational session as "dry" and "a chore."<sup>19</sup> However, a PRS can serve to increase engagement and decrease boredom because of its game-like nature, and testimonial feedback from other surveys reflects this well.<sup>20</sup> Other studies find PRS technology helpful in facilitating classroom management, particularly in a lab setting, both in distracting students from other technology-based diversions, in keeping an eye on class participation and timing of session, and in providing immediate notification through responses when a change of pace might be called for.<sup>21</sup> Finally, because PRS technology allows for anonymity in responses, there is a certain degree of safety for students in making mistakes and, even more, in giving opinions. This promised anonymity makes students more relaxed, decreases fear and increases their willingness to take part, maximizing participation.<sup>22</sup>

However, aside from these experiential benefits, when integrated correctly in an educational design which takes appropriate advantage of its capabilities, the [Personal Response System] becomes more than just an engagement tool, and in itself enables good pedagogy. Use of PRS technologies fits well with current constructivist, social models of learning; it fosters cohesion and community within the class group as students become engaged and invested in their class and classmates' participation and results. Successful use of technology is that which is, according to Kozma,<sup>23</sup> "designed into [the] complex social environments of learning" for the class, and the PRS is perfectly suited for this. PRS technologies within university classrooms also work well in the context of adult education theories, where information literacy, technological capabilities and confidence vary greatly both within and across groups. Educators can decrease both boredom on the one hand and confusion and anxiety on the other by gauging the abilities and knowledge of each new group afresh, which is easily accomplished using a PRS.

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### **Findings from the Session**

Feedback on this teaching exercise was sought in three ways: through the PRS exercise itself, verbally from participants after the session, and also, later in the semester, verbally from academic supervisors and coordinators within the Honors program. The first of these methods aimed to gauge students' pre-existing knowledge and information needs, to identify patterns in information use in Undergraduate economics students as they move into research. The second of these methods aimed to gauge students' views on the PRS technology exercise and the content and delivery of the session as a whole. The third aimed to gauge supervisors' and assessors' views of students' performance overall in the creation of their research thesis, and to determine if the session, combined with other factors of the program, assisted in improving performance at all.

**Fig. 1**  
**Student responses to components of Research Skills Audit (total participants = 20)**

Research Resource/Element	Percent of students who wished to include in session	Covered in session?
Books – Local UQ Collection	41%	No
Books – outside local collection	50%	Yes
Book Reviews	43%	No
Journal literature – Economics Databases	52%	Yes
Journal literature – Multidisciplinary Databases	57%	Yes
Journal literature – Citation Databases	95%	Yes
Data – Company/Industry	52%	Yes
Data – Statistical Datasets	80%	Yes
Other resources – Government/Legal Documentation	33%	No
Other resources – Newspapers	38%	No
Other resources – Multimedia	20%	No
Other resources – Theses/Dissertations	84%	Yes
Bibliographic Management (Endnote)	71%	Yes

### Feedback on Students' Knowledge and Performance

Results were gathered from the PRS responses to the Research Skills Audit conducted at the beginning of the session to formulate its structure. Results of student responses are displayed below in Fig. 1.

The results show that there were specific gaps in students' knowledge and skills in some resources, particularly those they would not have been directed to use previously in Economics undergraduate assignments. The assessment carried out in their 3-year undergraduate career would likely have made students comfortable with use of the library catalogue and portal to economics databases, thus it was unsurprising to note that students felt no need to learn more about these resources. It was also unsurprising that students saw no real need to learn more about multimedia or newspaper resources, as not only were these viewed as “too basic” upon inquiry, but are also made easily discoverable through library portals. Two surprise inclusions on the list of resources students decided to leave out of the session were book reviews and legal documentation; the second of these omissions is probably a true indication of the irrelevance of this resource type to their research topics, however the first is likely due to students' unawareness of the application of reviews as a resource for their research, and have not been able to use them to develop those key critical analysis skills identified by Catherine Manathunga and her co-authors as being of vital import to researchers.<sup>24</sup>

Students' lack of knowledge of cross-disciplinary databases is notable as most students have come to Honors from a 3-year Bachelor of Economics degree, where they have been focused on building knowledge of economics as a discipline and had explored cross-disciplinary topics, for example health economics, from an economic perspective rather than from that of another discipline. Their interest in learning how to use cross-disciplinary databases is a positive development, as this knowledge helps in building the important generic transferrable research skills identified in the literature.<sup>25</sup> Lack of knowledge of citation databases, and at such a high level, was also a notable concern, as without these resources students are at a disadvantage in identifying the most important or influential pieces of research in their field—again an indication of the need to build critical analysis skills. Company/industry information, statistical datasets and non-government report literature likely made the list as these are all

slightly more esoteric resources students were unlikely to have come across in previous research; the popular vote inclusion of information on Endnote bibliographic management software in the session is most likely due to both a forceful marketing campaign by the Library's Endnote trainers running at the time of the session, and also to recommendations for its use to students by their supervisors and friends in previous Honors or PhD cohorts.

### Feedback on Session Design from Students

Feedback was sought from students through a whole-group discussion immediately following the session, and in several voluntary one-on-one informal interviews in the days following the session. Verbal feedback from the students on the library session was very positive; students enjoyed the chance not only to choose the content of the session that was relevant to them, but also to engage with their peers in doing so. As was indicated in the literature, the PRS “clicker” devices were indeed an effective icebreaker, and only one student out of the 20 attendees had used the devices before; this student's prior experience with the technology was an important point for group learning at the early stages of the session with the cohort as she directed other students in their use of their devices. Despite some initial confusion over the format of the questions to be answered—students were unsure if they were responding “yes, we know this resource” or “yes, we need to learn more about this resource”—the question–response section of the session processed quickly and successfully and a list of what components was produced and approved by all students. The students then took further ownership of the learning experience by voting as a group, without any invitation from the librarian, to rank the learning items by percentage of popularity to design the class; this social style of decision-making and ownership was one of the most important educational outcomes of the presentation style selected, according to the literature.<sup>26</sup>

Once the class structure was decided, the content was presented, and after every section the students were invited to leave if the remaining sections were those they had indicated they were not interested in; no students left the session at any time, and students stayed beyond the allotted time for the course to ask more questions about resources. When considering the level of student engagement, it is important to



take external factors into account, most normally the behavior management exercises undertaken by the program coordinator with students at the commencement of their program; however, participation and engagement levels were noticeably far improved from previous years. The session also served to build a positive working relationship between the librarian and students for the year, which has continued with many students as they have entered further research.

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### Feedback on Students' Performance from Academic Staff

From all reports, the Honors students of the 2009 cohort had an excellent year academically, with several members winning prestigious awards and scholarships for their research work, and with the overall standard of performance in the group being very high. Although every cohort must be considered individually for their strengths and weaknesses, academic staff did observe that the quality level of students' research work was better than it had been in previous years. In particular, it was noted that the various progress reports and drafts were of a noticeably higher quality in the year 2009 than they had been in previous years. This improvement echoes Manathunga and Goezee's observations in the literature on one of the outcomes of the presentation style selected,<sup>27</sup> as well as an effect of the increased contact with the course coordinator and research short course trainers in foundation sessions. The number of scheduled checkups on performance was increased by the course coordinator in this year of the program, and established an informal list of 'milestones' students were required to adequately meet with their research thesis at various points throughout the year. It was reported that students kept well to all milestones and retained motivation well through the semester, so that no student failed to submit a thesis at the end of the year. It is possible the cohort-directed learning of the library session also played an important role in helping the students to motivate each other's learning and progress.<sup>28</sup> The motivation of the cohort-directed research training supported well the strong foundation work by the course coordinator and research short course trainers, and ongoing work by supervisors, to keep students on track to successful completion.

### FUTURE DEVELOPMENTS

As can be seen from the feedback and outcomes, the cohort-directed library session on research skills using PRS technology was an extremely successful venture. However, small changes would be made in subsequent offerings of the session to improve the experience for both participants and educators. Firstly, in order to speed up the session momentum, the initial audit performed using the PRS devices would be set to a timer, instead of waiting for each single participant to log their response. Not only would this small change, easily done in the TurningPoint software, serve to quicken the pace of the audit and decrease the risk of boredom, it would also increase students' engagement and sense of personal responsibility as they would be more pressured to have their response in quickly to make it count. Secondly, it is recommended that in subsequent offerings of the session a "team teaching" approach be taken, or that an assistant be present; this would allow PRS devices to be distributed as the librarian

presenting the session talked through the initial information, and therefore help the session to reach a good momentum in the initial stages, crucial for engagement. An assistant or second teacher would also allow feedback from the research audit to be taken down and ranked immediately on its receipt, again keeping session momentum working well. A team teaching approach would also allow two librarians to specialize in particular resource areas within the audit, and this deeper knowledge would allow for better teaching; this specialization approach would also decrease fatigue instead of having one librarian speak for over two hours without pause. Finally, it has been proposed that a longitudinal study be conducted, gauging student's feedback about their library session experience and performance across several years and cohorts, to determine what impact changes to the Honors program have had disregarding the particular natures of any individual cohorts.

### CONCLUSIONS

This session, the delivery of a learner-directed research skills audit to a cohort group using personal response system technology to direct the learning experience, was an extremely successful exercise, and resulted not only in a positive teaching and learning experience for the educator and students, but also translated to improved outcomes for the students in the creation and delivery of their theses. Sound data were gathered on the strengths and weaknesses of students' knowledge of information resources and skills, which will be extremely beneficial in the design of future information literacy training in the undergraduate Economics career. Although slight changes in delivery method may be implemented in future offerings of the session, it is certainly an exercise that will be repeated due to its strength as a teaching tool for the students of the Bachelor of Economics Honors program in upcoming years.

### APPENDIX A. SUPPLEMENTARY DATA

Supplementary data to this article can be found online at [doi:10.1016/j.acalib.2011.04.007](https://doi.org/10.1016/j.acalib.2011.04.007).

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