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# **A comparison between the conceptions of research of candidates enrolled for standard PhD and Integrated PhD programmes**

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## **Abstract**

Conceptions of research, which lead to approaches to research, provide useful insights into how candidates think about research. In terms of doctoral candidate development, understanding and appreciating these various conceptions can assist in supporting candidate learning. This study evaluated differences in conceptions of research between PhD candidates commencing at an Australian university in the standard PhD program, and those in a new structured program termed the Integrated PhD. An online survey was distributed to both cohorts and as the findings showed, respondents' conceptions of research were not significantly different for most categories, except Research as testing by data/experiment. Other key differences between the cohorts included their motivations for undertaking a PhD and the type of learning assistance required. The results highlight the need for structured support to help develop candidates' understandings of knowledge creation and to recognise the variations in candidates' conceptions of research and hence their research learning approaches.

## **Key words**

Conceptions of research, PhD entry, scaffolding research learning, research support, research programs

## **Background**

In countries such as the UK, Australia and New Zealand, it is becoming increasingly common to find doctoral candidates entering their PhD program with differing academic and professional work experiences compared with candidates from 20 or more years ago. For example, in Australia until recently the traditional-entry qualification for a PhD was Honours (First Class). Honours in the Australian system involves a fourth, undergraduate year which is research-focussed and involves disciplinary coursework, research skills development, and a thesis (Kiley, Boud, Cantwell, & Manathunga, 2009; Kiley, Boud, Cantwell & Manthunga, 2011).

Recently in Australia the number of students enrolling in Honours has decreased (Kiley et al., 2009) and subsequently the percentage of candidates entering a PhD with Honours has also declined. In conjunction with this decline there has been an increase in the number of candidates entering a PhD with a Masters by Coursework qualification (Kiley, 2015). Unsurprisingly, a noticeable percentage of these candidates are International and another growing percentage are those entering with professional experience as one of their main "qualifications" (McGagh et al, 2016). It is this second group of candidates entering a PhD with professional experience that provides the main focus for this paper.

Research in Australia suggests that PhD supervisors find mature age candidates who have come to their PhD with varying qualifications to be highly motivated, well organised and focused. However, one area of need that was reported was lack of well-developed research skills (Kiley, 2013).

In response to the two issues raised above, that is the drop in numbers of candidates entering with First Class Honours and an increase in the number of candidates entering with professional practice as a substantial qualification, a number of universities have been developing specific programs to address this change in entry qualifications. Referred to by various names, these programs specifically provide a first year of structured support where the candidate's learning as a researcher is scaffolded prior to having a more specific focus on undertaking the actual research (Collins, Brown, & Holum, 1991; Green, 2005).

Collins et al. (1991) use the term *cognitive apprentice* to describe a scaffolded approach to learning. They suggest that in traditional apprenticeships the Master demonstrates the task and then the apprentice helps with small tasks that eventually build to a complete job. They suggest that this process involves modelling, scaffolding, fading out the support and then coaching. The modelling is aimed at making the process visible, with scaffolding offering support. As the learner becomes more skilled the scaffolding fades to be replaced by coaching, which is where an overview of the learning is provided.

While it might be argued that these structured PhDs are no different from those that require standard coursework for all PhD candidates, there are some differences that are worth highlighting. One specific aspect is that the candidate commences candidature with their supervisor and begins to focus immediately on the research project. Then, in an integrated fashion, the candidate participates in specific courses and learning support that is related to their project. For example, if the workshop topic is writing a literature review the candidate would approach their supervisor for three or four papers related to the research project and these would form the basis of the activity for that student. A second example is that for many of the learning activities the supervisor is involved in assessing the quality of the work.

This paper examines the introduction of an Integrated PhD program at Edith Cowan University (ECU), specifically in the context of how candidates from different entry pathways may vary in their conceptions of research.

### **Theory/theoretical framework from literature**

To provide a theoretical framework for our research we worked with the Conceptions of Research literature (Meyer & Halliday, 2007; Meyer, Shanahan, & Laugksch, 2005, 2007). In the original work (Meyer, 2001), candidates enrolled in doctoral and research masters programs were invited to provide answers to open-ended questions about their conceptions of research. From these responses the authors identified five main conceptions of research: research as seeking the truth, as problem-solving; as re-search; as an insightful process; and a number of misconceptions of research. Based on the original work an inventory was developed, the Students' Conceptions of Research inventory (SCORi). Over the past 15 years reported use of the inventory has come from a number of countries including Australia (Bills, 2004), the UK (Aiston & Meyer, 2006) and Scandinavia (Salmento, Kiley & Murtonen, 2017). The critical nature of conceptions of research relates to the further work by Meyer (2007) where he identified

a connection between a candidate's conception of research and their approach to research.

For the research reported here, candidates who entered the Integrated PhD program and the standard PhD program were invited to identify the conceptions of research that they held at the commencement of their program.

## **Methods**

The Integrated PhD program was implemented at ECU in Semester 2, 2015 (10 candidates enrolled). This program provided an alternative pathway for candidates entering the PhD, with a structured first year to prepare for the PhD research project. The subjects covered in the first year support for the development of the research project and included generic research training and discipline-specific units. Students were assigned a supervisor from the start of the coursework units.

This study commenced for the second cohort of candidates in Semester 1, 2016, as well as the following cohort in Semester 2, 2016. An online survey was distributed to all candidates commencing a standard PhD (~80) and the Integrated PhD (~35). The survey consisted of the following:

1. Demographic questions, including entry qualifications and professional experience
2. Open-ended questions for further exploring differences between candidates' conceptions of research and support services needed by candidates including candidates' 1) motivations; 2) understanding of knowledge creation process and the meaning of research method; and 3) requirements for learning assistance
3. Conceptions of Research Inventory as developed by Meyer (2007), including measurements of the five dimensions: 1) research as finding the truth; 2) research as testing by data/experiment; 3) research as solving problems; 4) research as enhancing knowledge; and 5) research as extending knowledge.

The survey data were analysed in two stages. In the first stage, standard and integrated PhD candidates' responses to the Conceptions of Research Inventory were statistically compared, using an independent sample t test. One-way analysis of covariance (ANCOVA) was then used to test if candidates' demographic characteristics e.g. entry qualifications and research area have any impact on their conceptions. The second analysis stage focused on the open-ended questions with responses analysed by a content analysis using NVivo 21, with an aim to further explore differences between Integrated and standard PhD candidates. Although the sample was small for the proposed statistical analyses, the quantitative findings were used to supplement the understandings of qualitative responses, and together the quantitative and qualitative results will provide valuable insights for future investigations in conceptions of research.

## **Quantitative findings**

The online survey collected 58 completed responses. After data cleaning, 47 responses were retained (20 Integrated PhD and 27 standard PhD). As shown in Table 1 key demographics about these respondents, the majority were females, enrolled as domestic candidates and used English as their first language. There were nearly even numbers of

respondents in sciences and humanities. Respondents enrolled in the standard PhD had already obtained research-related qualifications, such as Honours or Masters by Research; whereas most respondents enrolled in the Integrated PhD had completed Coursework Masters degrees which generally involves a small percentage of research, although a couple had publications.

**Insert table 1 about here**

Candidates' responses to the 20 variables measuring five dimensions of Conceptions of Research were summated into five scales (see [Supplemental material Table A](#)), with descriptive results included in Table 2. Noticeably, Scale 2 Research as testing by data/experiment and its subscales were negatively worded, thus respondents' disagreement (coded as 4-Disagree and 5-Strongly disagree) indicated their sophisticated conception. In this study candidates generally disagreed or were inclined to disagree with Scale 2 (mean=4.25 for standard PhD; mean=3.61 for Integrated PhD). In other words, candidates on average had a well-developed understanding that Research is not just about testing by data or experiment. Regarding Scale 5: *Research as extending knowledge*, candidates expressed a fairly consistent consent. Such findings indicate that respondents were relatively critical about how accurately research can identify the exact truth, but they agreed that the process of research can certainly extend their knowledge in a particular field.

**Insert table 2 about here**

Subsequently, the main analysis was conducted to compare candidates' conceptions of research from the five aspects. Given that data for all five summated scales were approximately normally distributed (skewness and kurtosis were within the accepted range of  $\pm 1.96$ ) (Allen, Bennett, & Heritage, 2014; Hair et al., 2018), an independent samples t test was employed. Results ([Supplemental material Table B](#)) showed that there was only a significant difference ( $p < 0.05$ ) between standard and Integrated PhD candidates for Scale 2: *Research as Testing by Data/Experiment*. The Integrated PhD candidates ( $M = 3.61$ ,  $SD = 0.916$ ) were more likely to agree with *Research as testing by data/experiment* than the Traditional-entry PhD candidates ( $M = 4.25$ ,  $SD = 0.866$ ),  $t(45) = 2.435$ .

Of note, respondents' conceptions of research regarding the other four scales were not significantly different, regardless of their entry pathways.

ANCOVA was conducted to further examine if there were different conceptions of research, particularly about Scale 2 *Research as testing by data/experiment*, between candidates who had English as their first language and those with English as second or additional language. Results (see [Supplemental material Table C](#)) demonstrate that candidates' English background is significantly related to candidates' conception of Scale 2,  $F(1,44) = 9.44$ ,  $p = 0.004$ . However, after accounting for the effect of English proficiency, candidates' conception of Scale 2 is still significantly different due to their different entry pathways (Integrated or standard PhD),  $F(1, 44) = 8.53$ ,  $p = 0.006$ .

ANCOVA was also conducted using "Domestic/International", "Arts/Sciences", and "Have a research background or not (what degree did you use to

apply for a PhD)” as covariates. None of these factors was found to be significantly related to their conception of Scale 2.

The above results indicate that Integrated PhD candidates are more likely to have a less sophisticated conception of research specifically regarding Scale 2. They are more likely to perceive data/experiment as the core of research and overlooked the more theoretical aspects of knowledge creation. Further evidence for this is provided below in the qualitative findings.

### **Qualitative findings**

The questionnaire in this study included five open-ended questions for exploring PhD candidates’ characteristics, such as their motivations to undertake a PhD degree, their understanding of research methods and knowledge creation, as well as what learning assistance they required for completing a PhD degree.

From the 58 completed surveys, open-ended comments from 54 participants (25 Integrated PhD and 29 standard PhD) were analysed. By using a content analysis, key themes were identified in relation to candidates’ motivations and understandings of relevant research areas (e.g. knowledge creation, research method and research assistance) (See Table 3). Through a comparison of the candidate cohorts, two key differences were highlighted and are discussed below.

#### **Insert table 3 about here**

The first difference relates to candidates’ motivations to undertake a PhD degree. For both groups, the top two motivations were: 1) career development and 2) contributing to the knowledge, community and industry (mentioned 48 and 37 times respectively). Out of all career options, standard PhD candidates, however, mainly focussed on developing an academic career and focusing on general professional development (mentioned 20 times). Typically, standard PhD candidates were motivated “To further develop my career as an academic” and mentioned “Since I want to be an academic it is necessary to do PhD and research”. In contrast, Integrated PhD candidates mainly hoped to contribute to industry and solve a specific industry problem (mentioned 21 times). Typical comments are “so we can improve current treatment techniques and potentially investigate/develop new treatments” and “help contribute to chemo patients’ care”. It is suggested that these different responses highlight the influence of industry experience of Integrated PhD candidates compared with their standard entry colleagues.

The second difference was revealed by candidates’ requirements of learning assistance. About 75% of comments in relation to learning assistance required by standard entry candidates were associated to specific research skill development e.g. statistics and publishing. However, Integrated PhD candidates’ reports were mostly associated with specific staff, especially supervisors (mentioned 12 times) and librarians (6 times). This indicates compared with Integrated PhD candidates, standard PhD candidates are more likely to have a clear idea of their research direction and skills needed for completing the research. Additionally, this could be because Integrated PhD candidates may not yet have a clear picture of their research, or perhaps because of human factors. These factors could include age or work experience in professional

practice where they are used to working in teams and seeking help from those with expertise in the field.

In terms of responses to “how is knowledge created in your field?”, approximately half of respondents demonstrated a well-developed understanding of knowledge creation. Although their answers were varied due to the disciplinary uniqueness, key elements of reasonable inquiry, research, practice, evaluation, and confirmation could be found from their responses. The other half, however, provided very simple responses, which did not demonstrate their understanding of knowledge creation clearly. For example, a common response was that knowledge is created through “trial and error”. Interestingly no evident difference was found between Integrated and standard PhD students in relation to the quality of their responses to knowledge creation. This important finding highlights the need for support for both entry pathways regarding developing a strong foundation in conceptions of research early in the PhD.

Aligned to the candidates’ common misunderstanding that “knowledge is created through trial and error” was the finding that this was paralleled with a misconception of *Research as testing by data/experiment (Scale 2)*. This may reveal a potential relationship between PhD candidates’ misconception of research and their under-developed understanding of knowledge creation. As Van Rossum and Scheneck (1984) found in their classic study of student learning analogy, students’ conceptions of learning influences their approaches of learning (as cited in Meyer et al., 2005). As such, PhD candidates’ conceptions of research may also be related to their approaches of research (that is, knowledge creation).

As presented in the quantitative analysis results, several PhD candidates had misconception of research in believing research is about testing data or experiments but statistically, Integrated PhD candidates were more likely to have this misconception of research. Consequently, a further investigation was conducted below to explore whether a:

1. PhD candidate’s conception of scale 2 is linked to their understanding of knowledge creation.
2. Student’s enrolment style and conception of scale 2 is linked to their understanding of knowledge creation.

### **Further investigation comparing the qualitative and quantitative data for Scale 2**

The emerging two assumptions above were examined using a cross-tabulation analysis with the 45 candidates who responded to both Scale 2 of the conceptions of research and the qualitative question about knowledge creation. These candidates were comprised of nearly equal sized Integrated and standard entry PhD candidate cohorts (23 and 22 respectively).

The cross-tabulation results firstly supported the link between candidates’ conception of scale 2 and their understanding of knowledge creation. As shown in Table 4, among 10 candidates with misconceptions of Scale 2 (<3), 8 of them (80%) provided overly simple responses to knowledge creation. Among 34 candidates with well-developed conceptions of Scale 2, 23 of them (68%) provided sophisticated understandings of knowledge creation. Thus, the results firstly support that most candidates with under-developed conceptions of Scale 2 also had overly simple

understanding of knowledge creation, and candidates with well-developed conception of Scale 2 often had a stronger understanding of knowledge creation, regardless of their entry pathways.

Certainly, Table 4 also shows that overly simple responses were not necessarily coming from candidates with under-developed conceptions about Scale 2. Among 20 candidates who had a simple understanding of knowledge creation, 55% (n=11) were those with a well-developed conception of scale 2. As such, simple answers may also come from candidates who were not motivated to respond in-depth to indicate their understandings. However, it can be seen that sophisticated responses to knowledge creation were mainly from candidates with a well-developed conception of scale 2 (92%, n=23). These results together indicate that a well-developed conception about scale 2 is a basis for candidates to provide sophisticated responses to knowledge creation, thereby, candidates' conception of Scale 2 is positively related to their understanding of knowledge creation.

**Insert table 4 about here**

## **Conclusion**

A number of possible insights have been provided by this study. Firstly, both the quantitative and qualitative findings suggest that candidates entering a PhD without the traditional research qualifications may benefit from a structured program of learning, at least in the first year of their program with regard to research methodology and methods. Secondly, these candidates may benefit from quite explicit discussions of conceptions of research and what they mean for candidates who have not had a strong research education background.

A third, and perhaps the most significant insight relates to curriculum development for programs adopting an integrated approach, and that is the use of conceptions of research as a framework. By identifying, and then specifically addressing the relevant conceptions of research in the scaffolding of candidate learning it is suggested that candidates might quickly be introduced to “thinking like a researcher”.

One of the particular issues, facing the introduction of the Integrated PhD program was that it might have been seen as the “soft option”, however, the results suggest that this is not the case. Furthermore, the introduction of courses and workshops has been demonstrated as providing candidates with a firm grounding for their doctoral research program whether this program is a standard PhD or in other cases, the Professional Doctorate.

A limitation of this study is the integrated PhD program has only been introduced in recent years with the number of enrolments in this study being relatively small, so the quantitative analysis results demand further investigation. An inclusion of more candidates from different backgrounds will better inform the impact of attributes, such as research discipline and English proficiency, on candidates' conceptions of research. Along with the trend of universities developing more alternative entry pathways to a PhD program, further research into the diverse backgrounds and needs of candidates entering PhD via alternative pathways is crucial.



## Disclosure statement

No potential conflict was reported by the authors.

## Notes on contributors

Hairong Shan is a lecturer from Edith Cowan University, Australia. Her research interests include hospitality marketing and consumer behaviour, as well as higher education and research program design

Natasha Ayers specialises in research and innovation projects and is currently Managing Director for a private consulting business. Previously she was the Course Coordinator for the Integrated PhD program and is currently an adjunct at Edith Cowan University.

Margaret Kiley: For many years Margaret's research and teaching interests have been related to the education of future researchers. She now holds an adjunct position at the Australian National University

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