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The development of an assessment matrix to promote student learning in postgraduate multidisciplinary research projects

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Abstract

An assessment matrix based on a research skill development framework has been developed to promote learning outcomes and improve evaluation and feedback to students undertaking research projects as part of their multidisciplinary postgraduate coursework program. Although general University grade descriptors are available, they are often open to interpretation, which can cause inconsistency especially where students and supervisors are from different disciplines. The paper describes the development of the assessment matrix to guide and evaluate research projects.

Introduction

This paper captures our early thoughts and considerations in the development of an assessment matrix to enhance student feedback when integrated into a feedback loop in research projects. The project forms the research component of several postgraduate coursework programs at the University of Adelaide. The programs comprise courses from across all five faculties within the University and integrate a broad range of subject matter spanning population health, sustainability, climate change and resource management. Students participating in these programs come from a wide range of disciplines and cultural and professional backgrounds. Similarly their supervisors are appointed from many disciplines in academia and from private and public sector organisations.

Matrices can help students to understand course requirements and the criteria that are assigned to particular levels of performance (Reddy and Andrade 2009). The matrix is included in the research course handbook so that the requirements and expectations of various aspects of the project are explicit to both students and those involved in their supervision. In view of the diversity of the professional and cultural backgrounds of participants, and that some projects are taken off campus as industry placements, the development of clear criteria for project planning and evaluation is intended to avoid misunderstandings between students and supervisors and provide greater consistency in the format and style of feedback and the allocation of final grades.

Andrade (2001) has stated the need to distinguish between evaluation and grading by having ongoing evaluation that provides precise and detailed information about what is required in an assignment combined with advice on how students can improve the development of their skills to improve learning outcomes. The integration of this process within feedback loops has been reported to align learning and assessment to deliver course objectives (Hounsell et al. 2008).

Methodology

A two-page matrix has been developed to guide student learning in postgraduate research projects. The University of Adelaide grade descriptors (University of Adelaide 2011) and the Research Skill Development (RSD) framework (Willison & O'Regan 2007) were used as a starting point. Integrating grade descriptors within a research skill development framework aligns assessment with learning outcomes to enhance the learning process. The matrix aims to provide greater clarity about the course requirements for students as they progress through the various stages of their research project. Allen and Tanner (2006) note that matrices provide explicit instruction and serve to expose any implicit or hidden requirements which may only exist in the mind of the supervisor.

While the University policies and codes of practice (University of Adelaide 2006, 2011) provide a general guide as to the standard of work that is expected at each grade level the postgraduate coursework code of practice states that these 'generic descriptors are to be used as the basis for graded courses, but they should be interpreted within the context of the level of study, the relevant discipline and award requirements and within the scope of the assessment task'. In effect, these descriptors of performance used in the allocation of grades are more an explanation, or justification, for the grade given. They provide limited insights to aid the learning process, and students still ask 'What do I need to do to get a distinction?'

Further the grade descriptors are open to interpretation depending on the level of enquiry. For the research project the criteria need to reflect the level of autonomy expected of students undertaking early postgraduate research. Following a meeting with other Education Research Group of Adelaide (ERGA) members with an interest in assessment tools it was decided to explore the use of the RSD framework (Willison 2009; Willison & O'Regan 2007) as the basis for an assessment matrix. The value of this framework is that it promotes learning in a structured and systematic manner. The categories range from 'closed enquiry directed towards a pre-determined outcome' (Level 1) through to 'open enquiry involving high levels of autonomy and self-determination' in terms of what is studied and how that study is carried out (Level 5). For the purposes of developing an assessment matrix for masters-level research the assessment criteria were aligned with *Level 4* of the RSD (Figure 1). At this level students are expected to carry out 'research at the level of an open inquiry within structured guidelines.' While informative, the RSD is not concrete enough for students and leaves too much room for interpretation for supervisors. Since students and supervisors came from different faculties, it was important to make expectations explicit.

Figure 1 – RSD framework Level 4 (Willison & O'Regan 2007)

Research Skill Development framework categories	RSD Level 4 - Characteristics of categories for open level of inquiry
A. Students embark on inquiry and so determine a need for knowledge/ understanding	Generate questions/aims/hypotheses framed within structured guidelines
B. Students find/generate needed information/data using appropriate methodology	Collect and record self-determined information/data from self-selected sources, choosing an appropriate methodology based on structured guidelines
C. Students critically evaluate information/data and the process to find/generate this information/data	Evaluate information/data and the inquiry process comprehensively using self-determined criteria developed within structured guidelines
D. Students organise information/data collected/generated	Organise information/data using structures and processes suggested by provided guidelines
E. Students synthesise and analyse and apply new knowledge	Synthesise, analyse and apply information/data to fill recognised knowledge gaps
F. Students communicate knowledge and processes used to generate it, with an awareness of ethical, social and cultural issues	Use the language of the discipline and appropriate genre to address knowledge and understanding gaps from several perspectives for a self-selected audience

The matrix consists of research skill criteria, a clear description of attributes for each performance criterion and a grading scheme. The criteria reflect the processes considered important in research and the attributes explain the level of performance expected of a student to demonstrate achievement to a particular grade. Willison and O'Regan (2007) list six aspects of the research process as a basis to categorise research development and these form the rows in the matrix. The grades (fail, pass, credit, distinction and higher distinction) included in the University assessment policy were rewritten within the construct of Level 4 to describe levels of attainment across the columns. At this level students develop their own research topic in consultation with their supervisor(s) and are expected to undertake their research with a high level of autonomy only under broad guidance. The draft matrix has been prepared with input from peers and students. The end result is more student centred and more explicit than either the RSD or the university grade descriptors.

The matrix aims to encapsulate the learning behaviours associated with Level 4 research skills, as illustrated in Figure 2, so that students are better able to monitor their own performance and reflect on their skills development. As such the matrix provides a focus on skill development for research. The inclusion of grades at the top of each column adds little in terms of the development of these research behaviours. It has been argued that the inclusion of grades in matrices can be counterproductive (Edstrom 2008) as the focus becomes one of audit and assessment rather than guidance to improve learning outcomes. However descriptors have to be included for grade allocations in keeping with the University assessment policy. Further for many students the challenge of attaining a high grade can be an important motivating factor (Elton & Laurillard 1979). Figure 2 illustrates the translation of the University descriptors into concrete performance criteria.

Figure 2 – Matrix for evaluation and feedback

	Fail	Pass	Credit	Distinction	Higher Distinction
General description	Does not satisfy the minimum requirements	Satisfies the minimum requirements	Demonstrates a high level of understanding	A very high standard of work which demonstrates originality and insight	Outstanding or exceptional work in terms of understanding, interpretation and presentation
A	Does not identify most key concepts related to research project	Identifies most key concepts related to research project	Identifies all key concepts related to research project	Identifies a broad range of concepts related to research project	Demonstrates insight and understanding in identifying a broad range of concepts related to research project
	Does not clearly explain key concepts	Clearly explains concepts identified	Clearly explains all key concepts	Clearly explains broad range of concepts demonstrating an understanding of more subtle aspects	Clearly explains broad range of concepts demonstrating a deep and nuanced understanding
B	Scope of research lacks focus	Scope of research from published sources includes adequate number of references relevant to project	Scope of research includes most key references commonly cited in primary and secondary sources relevant to project	Scope of research includes key primary and secondary sources with additional references relevant to project	Scope of research elaborates key primary and secondary sources with additional references that demonstrate new insights and connections relevant to project
	Methodology for data collection is inadequate	Methodology for data collection omits some key aspects	Methodology for data collection demonstrates awareness of conventional approaches	Methodology for data collection refines conventional approaches	Methodology for data collection refines conventional approaches using innovative search strategies
	Data collection is inadequate to support research project	Data collection provides adequate foundation for research project	Data collection provides a solid foundation for project	Comprehensive data collection provides a strong foundation for project	Comprehensive data collection using innovative search strategies provides an original foundation for project

C	Students critically evaluate information/data and the process to find/generate this information/data	Critical analysis or evaluation of data quality is limited	Critical analysis or evaluation of data quality is present, but inconsistent	Critical analysis or evaluation of data quality is systematically provided with respect to main issues	Critical analysis or evaluation of data quality is systematically provided with respect to a broad array of issues	Critical analysis or evaluation of data quality is systematically provided and generates new insights and connections.
D	Students organise information/data collected/generated	Limited evaluation of data collection processes	Inconsistent evidence of critical evaluation of data collection processes	Consistent evidence of critical evaluation of strengths and weaknesses of data collection processes for main sources	Systematic evidence of critical evaluation of strengths and weaknesses of data collection processes across sources	Systematic evidence of critical evaluation of data collection processes produces deep analysis of procedures
E	Students synthesise and analyse and apply new knowledge	Limited application of new knowledge	Application of knowledge to solve only aspects of the problem	Application of knowledge in ways that demonstrates ability to solve routine problems	Application of knowledge in ways that demonstrates ability to make new connections to solve non-routine problems	Highly developed analysis and evaluation demonstrating capacity to solve challenging problems
F	Students communicate knowledge and processes used to generate it, with an awareness of ethical, social and cultural issues	Flow of ideas unclear	Flow of ideas sometimes difficult to follow	Flow of ideas is clear	Flow of ideas and the connections between them is clear	Flow of ideas integrates new connections and generates new insights
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Discussion

The research project within the Masters programs requires completion of a number of assessment tasks and these include project proposal, literature review, conference or workshop presentation and final dissertation. These assessment tasks are evaluated against the attributes for each research skill development criterion. The matrix guides feedback around each assessment task and is integrated into a feedback loop at each phase of the project.

The work of Hounsell et al. (2008) on guidance and feedback was instructive in enhancing the application of this assessment tool. For each assignment they identify six steps in the assessment process that form a feedback loop:

1. Students' previous experiences initially shape their expectations and approach towards the assignments that are part of their research project (e.g. research proposal, literature review, report preparation)
2. Details of each assignment, its relative weighting and schedule for submission are given in a handbook that is provided to students
3. The inclusion of the assessment matrix provides guidelines for levels of performance in research skill development and students can seek further clarification from their supervisors.
4. Feedback on drafts can be discussed with supervisors at regular meetings
5. Students are given the opportunity to redraft their work under guidance
6. Feeding forward, rather than feeding back, to step 1 to the next stage in the development of their research project again with timely and adequate feedback to close the feedback loop.

When students embark on their research project and undertake preliminary research to scope their research topic they are required to prepare a research proposal before starting. Where a student redrafts their research proposal following discussions with their supervisor they enter into a second feedback loop for this assignment. On satisfactory completion of their proposal they move on (feed forward) to completion of their literature review. Once they have collected, evaluated and organised their research data the analysis and presentation of their findings can involve several drafts of their research report and again this can result in multiple feedback loops before the thesis is ready for submission.

The contribution of the matrix to the assessment process is in keeping with a more formative and iterative approach best suited to postgraduate research work. It helps build dialogue around the research approach and builds understanding and rapport between the student and supervisor. It serves to hand more control to the student for the learning process and is in keeping with the constructivist view which places the teacher as the facilitator in the learning process promoting a cooperative learning environment which fosters greater collaboration (Morris et al. 2004).

Feedback from peers and students during development of the matrix has been positive. Its ideal place seems to be as a tool for use during discussions with students to visualise progress with their research. The explicit descriptors are useful in a multidisciplinary setting with students and supervisors from different backgrounds, cultures and countries as they provide clear criteria for project planning and evaluation and shape the format and style of feedback and the allocation of final grades. Future stages of this work will explore the value of this tool for improving evaluation and feedback in the programs. However measuring the effectiveness of rubric-based interventions is problematic (Reddy & Andrade 2009) and even

where experimental designs are used the designs have limitations, particularly the use of controls.

Conclusion

Some might ask 'Why spend so much time preparing an assessment matrix to do something that many supervisors would consider to be intuitive?' It can be argued that it adds a discipline to course delivery that has the capacity to improve the quality of both teaching and learning. A matrix identifies what is important and through its use in an iterative feedback process reinforces the development of research skills.

Assessment matrices have largely been used for evaluation, the ways in which they can be used to teach has been less well explored. It is acknowledged that simply handing out a matrix will not necessarily impact on the quality of work. It ultimately depends on the way it is integrated into formative and summative assessments and how this is used to develop an understanding of the required skills development.

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