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Developing the Parameters of Scholarship in Postgraduate Coursework Studies

Introduction

This paper discusses the development and application of 'scholarship' parameters in relation to postgraduate coursework studies, particularly those involving a mix of coursework components, case study analyses, project work and minor thesis activities. The Master of Engineering Management program at RMIT University is used as an example, in which students are required to undertake a three semester minor thesis sequence intended to extend on and reflect the core tenets of the program which strongly focus on the management of engineering and technology-based organisations. Many engineering and natural sciences students are deeply instilled with positivist leanings and classically inductive thinking approaches to problem solving (Blaikie, 1993). For example: What is it? How does it work? How can I fix it or make it work better? If I can do 'whatever' with it, then the solution should apply wherever and whenever the problem occurs! Rarely, it seems, are the Who and Why parameters applied. Yet, it may well be that it is in these grey areas of developing understandings about who, what, when, where and why, but not necessarily how, that the real value of the minor thesis may prove to be most valuable, at least in this specific context of managing technology-based organizations .

It is proposed to further develop the experiential role of the minor thesis as a means of establishing effective preliminary investigation into significant issues, where such issues are identified as requiring or being appropriate for more in-depth formal research activity, for example, in the context of a subsequent doctoral research program or an external industry-based research and development activity. Typically, current implementation methodologies in such coursework programs use supervision of industry-based case-studies, and minor thesis development, as a formal teaching strategy focussed on developing both demonstrated discipline focussed scholarship and practical experience in research activity. This paper reviews this approach against the expectations of the Boyer classifications of scholarship (Boyer, 1990) and argues that whilst the approach is a viable example of combined pedagogical and research oriented scholarship, further extension and integration of Boyer's scholarship parameters may further enhance and add value to overall student experience.

Perceptions of Scholarship in Postgraduate Studies

Professor Ernest L. Boyer, in his seminal work on scholarship (Boyer, 1990) encapsulates the purpose of incorporating opportunity for students and academic staff to collaboratively engage in the process of thesis development as being: "The work of higher learning, at the core, is and must remain disciplined inquiry and critical thought" (Boyer, 1990, p69). In this integrative context, both academic supervisor and student, together, both scholars in the sense that each within their established role, supervisor or researcher, carry a responsibility for ensuring 'disciplined inquiry and critical thought' is demonstrably at the root of their research processes, findings, writings, and arguments.

Boyer's tetradic classification system, or four part theoretical model for thinking of scholarship, incorporates three core components that are most commonly related to the activities of research, investigation and subsequent thesis preparation: the Scholarship of Discovery, the Scholarship of Integration and the Scholarship of Application. However, his fourth area of scholarship, the Scholarship of Teaching, is also considered by Boyer to be the most critical component in his model.

Relative to the Scholarship of Discovery, Boyer's own words give a sense of the power of bringing students and the academe into active engagement in research based activity as a scholarship enhancing teaching and learning strategy:

The scholarship of discovery, at its best, contributes not only to the stock of human knowledge but also to the intellectual climate of a college or university. Not just the outcomes, but the process, and especially the passion, give meaning to the effort. The advancement of knowledge can generate an almost palpable excitement in the life of an educational institution (Boyer, 1990, p17).

Typically, the exercise of engaging in postgraduate study involves a range of learning experiences, very often including undertaking a research project and the subsequent preparation of a minor thesis. For many engineering students in particular, this can be a daunting task, for others it can provide an exciting insight into the world of research and become the first step towards engagement in a higher degree by research program, or a future career path in research and development. Clark (2002) in his position paper on Evaluating the Minor Thesis, provides a most telling yet succinct outline of this process as shaping the expectations of students relative to their experiences of research activity, he further argues that the minor thesis development process can be a significant factor in determining subsequent postgraduate research experience.

Within Boyer's theoretical construct of scholarship, it is readily possible to see how effective engagement in research and investigative activity and subsequent thesis preparation can help meet the demands and rigour expected of scholarship in contemporary academic thought. Active engagement in the processes of designing, and initiating the transition from a body of disparate elements of collected data, the extraction of coherent information from such, and the application of critical thinking and synthesis in its eventual interpretation, interpolation and application to meaning and associated extraction of intelligence, is both challenging and rewarding, as well as a significant influence on intellectual growth. It involves directed observation, data collection and analysis and a capacity to think through both the obvious and the hidden, and the application of a disciplined yet creative imagination in a search for a sustainable argument and coherent explanation. In turn it places extensive demands on intellectual engagement in the exploration and application of knowledge and experience to resolving the unknown.

Boyer's construct of a Scholarship of Integration addresses the need to integrate new and evolving knowledge into, throughout and across our disciplinary worlds and their established bodies of knowledge and practice. "The results of a scholar's integrative efforts might help shape public debate and broaden understanding of the issues at hand" (Glassick et al, 1997, p30). All too often, the spectre of resistance to change appears in the form of barriers to entry of new ideas and approaches that challenge our understandings, knowledge and experience. A fixation on existing and proven curricula, embedded systemic teaching strategies and techniques, and an established history of assessment practice and performance expectations, are typical areas where such barriers appear. However, such environments are also rich grounds for the introduction of new approaches, adaptation and opportunity for growth in the scholarship and practice of integration of new knowledge, skills, and the evolution of cross-disciplinary expertise. For the student, this represents opportunity for potentially significant added value to their learning experience through a broadening of perception and introduction to new relationships beyond their previous expectations.

Boyer's Scholarship of Application extends these issues in integration to the building of new expertise and practice and its application to addressing complex problems in a scholarly manner.

Such constructs of application of knowledge and skills to problem solving, in an academic environment, can be further extended to the meeting and resolving of related needs in the real world. Reflecting this shift from a bounded academia environment to the broader real world, Boyer subsequently extended his 'Scholarship of Application' construct to what he then called a 'Scholarship of Engagement' (Boyer, 1996, p11). In large measure, this shift in conceptual positioning reflects the necessary transition from focussed intellectual engagement in academic pursuit (as is typically the case in higher education teaching and learning environments) to a re-focussing on the harsh realities of using that same focussed intellectual engagement with new knowledge and skills, to resolving real problems in the real world in real time (Braxton & Luckey, 2010). Whilst 'application' and 'engagement' are typically seen within academia as the mechanisms through which faculty members demonstrate their scholarship abilities through publication, applied research and industry and civic relationship building (O'Meara, 2010) for the student it has often taken the form of 'work integrated learning' and internship placements. However, there is a much stronger and challenging aspect that potentially goes well beyond observing and experiencing that theory and practice can be integrated in the real world. The challenge that is laid down by the scholarship constructs of application and engagement is for both faculty and graduates alike to use that theory and practice to 'change' the world (Fitzgerald et al, 2010).

The fourth component of Boyer's model, the Scholarship of Teaching, focuses not only on the classroom and the many pedagogical imputations that arise, but is also strongly relevant to the role of the project/thesis supervisor and is clearly considered by Boyer to be a critical and potentially integrative component in his classification system: "It is the scholarship of teaching that keeps the flame of scholarship alive" (Boyer, 1995, cited in Glassick et al, 1997, p2). The progressive shift from a focus on the structure and practice of 'teaching' to a focus on the form and function of 'learning' has been a growing characteristic of the education field over the past 20 years. In turn, this has required a rethinking of the role and purpose of teaching, to seeing it as a means to the far more complex and powerful construct of learning. Yet, teaching itself remains not simply a means to an end, but is in itself a growing and complex set of evolving knowledge and practice. As a form of scholarship, it requires of itself active research and enquiry, continuing integration of new knowledge and practice, and a level of dedicated engagement and participation in the processes of learning and its application to the real world.

Subsequent research and critique of Boyer's classification scheme has seen both support for its central thematic, and argument to extend and broaden the interpretation and application of his scholarship constructs. In particular there have been calls for mechanisms for evaluation of what is meant or implied or interpreted or the results of actions resulting from or as according to the use of 'scholarship' as expressed in Boyer's framework (Glassick et al, 1997) and a need to extend the experience and meanings of scholarship in its various forms to and across the diversity of the educational community at large (Huber & Hutchings, 2005; Hutchings et al, 2011).

Boyer's views and concerns can also be seen reflected in the works of other writers and theorists, although at times difficult to extract and certainly at times focussed on different aspects of the overall theme of teaching and learning in higher education. Indeed, many writers (including Boyer) have largely focussed their attention on developing and enhancing pedagogy oriented teaching and learning in undergraduate programs, however many aspects (though not all) of adult education are generic across program boundaries, whether undergraduate, postgraduate, coursework based or research based, and across disciplines.

As a particular example, Ramsden's study of teaching and learning in higher education provides particularly relevant insights into the array of differing teaching and learning strategies available and their location within particular theoretical frameworks and the constructs of 'surface' or 'deep' approaches to learning. His "Theory 3: Teaching as making learning possible" (Ramsden, 2003, p110) confronts lecturer and thesis supervisor alike with the challenge of developing student-teacher-supervisor engagement that actively encourage students to engage with the subject matter. This in turn reflects Ramsden's core determinate of developing pertinent curricula, implementing relevant teaching strategies, designing appropriate student-teacher-supervisor interaction, and encouraging learning processes that collectively create a learning environment conducive to 'deep' approaches to learning:

Deep approaches generate high quality, well-structured, complex outcomes; they produce a sense of enjoyment in learning and commitment to the subject. Surface approaches lead at best to the ability to retain unrelated details, often for a short period of time. As they are artificial, so are their outcomes ephemeral (Ramsden, 2003, p80).

In this regard, Marshall (2009) specifically addresses the potential for developing higher levels of cognition and intellectual engagement through incorporating thesis or dissertation requirements into the curricula:

Projects and dissertations have always been seen as an effective means of research training and of encouraging a discovery approach to learning... Such an approach is aimed at the development of higher level cognitive skills such as analysis, synthesis and evaluation (Marshall, 2009, p151).

It is an inherent postulate of this paper that it is possible to build a theoretical viewpoint on Boyer's scholarship classifications and in particular his 'scholarship of research' that can bring together a viable teaching and learning strategy for the role of minor thesis engagement and specifically its inclusion within curricula at postgraduate coursework level. The approach of incorporating research skills as a core component in university business and management related curricula is exemplified by the works of the late Professor Bill Zikmund (vare 2010), Professor Uma Sekaran, and many others alike, who between them have consistently asserted that business research is an important managerial tool that can significantly influence the quality of management decision making (Zikmund, 2003; Zikmund et al. 2010; Sekaran & Bougie, 2011; Cavana et al. 2001). As such there is significant argument made for the development of business related research skills that use systematic and objective processes for collecting, collating and analysing business and management related data. Zikmund et al (2010) also clearly place research activity within the purview of epistemology and the search for knowledge, wherein they ascribe to the practice of research the following meaning: "The term (research) connotes patient study and scientific investigation wherein the researcher takes another, more careful look at data to discover all that can be known about the subject" (Zikmund et al. 2010, p5).

However, this imputation that a student may, through careful and patient study, 'discover all that can be known' also reflects a number of anomalies and misconceptions about the very nature of research as perceived by the academe and students alike. Specifically, it challenges our understandings of the acquisition of knowledge, development of theory, and associated bodies of practice across areas of uncertainty. In essence, research is the means by which we explore, observe, apply the tools and instruments of analysis, and formulate conjecture. The likelihood of this ever achieving 'all that can be known about' a given topic or subject of investigation is exceedingly unlikely (Magee, 1973; Papineau, 2004; Popper, 1972). As such, it is important that students entering into research related activity, whether in the context of coursework programs or

fully research based programs, are aware that they face a challenging world of uncertainty with potentially forever moving boundary conditions.

Whilst it is possible to identify the characteristics or generic focus of thesis preparation as identified in course guides and assessment outlines for particular programs as published by various universities, these vary widely in both detail and complexity. However, for all the variations demonstrated in a review of such extracts, it is clear that the learning experience of 'thesis', whether minor or major, is premised on a supervised academic activity undertaken within locally defined guidelines and subject to rigorous assessment, with clear implications for and expectations of demonstrated 'scholarship' capabilities. For the student, the implications are for the need to demonstrate clarity of purpose and the application of critical thinking within the parameters of discipline defined theory and practice. For the academic supervisor, there is the need to ensure that there is clearly demonstrated compliance with the expectations of the academe for scholarly engagement with the subject matter, and that relevant issues identified in the research have been raised and discussed adequately, albeit within the constraints/requirements of the program area and capabilities of the student.

The relevance of the above viewpoints on scholarship, teaching, and learning to thesis work is surely clear. The role of supervisor/teacher is critical to encouraging the student to engage with the subject matter and in providing an enabling scholarship oriented environment that actively engenders a pleasure and enjoyment in learning and in engaging with the challenge of the unpredictable. The 'palpable excitement' of Boyer's 'life in an educational institution' (Boyer, 1990, p17) and the 'enjoyment' of learning as Ramsden so pertinently puts it (Ramsden, 2003, p95, p98). Yet there are also other, more pragmatic or prosaic ways of thinking about the various theoretical constructs and associated processes involved in research. These include, but are not be limited to: relevant research design, clarity and definition of stated purpose and intent, perceived need and potential benefits, definite and achievable research objectives, relevant and answerable research questions, definable research methodology, reliable data collection strategies, appropriate measurement regimes and rigorous approaches to analysis and argument development.

However, even these traditional foci for research practice are being challenged in the light of more contemporary approaches to business and management related curricula and the educational use of research as a viable teaching and learning strategy (Cassell & Lee, 2011). The central issue that now derives from these concerns about the traditionally focussed and process oriented strategies is that of expanding the space of learning. This invokes shifting students out of the established text-book/lecture orthodoxy of directed and an essentially positivist tradition of thinking (Cassell & Lee, 2011, p2) and as illustrated in the process list above, to the far greater challenge of encouraging students to determine for themselves their own approach to a problem or issue and selecting, applying and maybe even developing, their own choice of appropriate research strategies.

What value then does the formal inclusion of research activity provide or add to a curriculum? How does it contribute to, or enable or enhance student experience and quality of learning? Cassell & Lee explore these issues and questions as well, addressing them as components in key areas for debate and challenge in the growing business of business and management oriented research and its place in the education arena. In effect, these new areas of argument and challenge produce a shift in the underlying purpose for presence of research in the academic curricula. Away from the traditional construct of academic ownership of research as a particular action learning teaching strategy that is expected to set in concrete previously taught concepts and rationale, to that of pro-actively setting and meeting the challenge of producing a new category of

research-skilled graduates, capable of both critical reflection and rigorous analysis and willing to challenge the historical bastions of business and management education and practice. Given the demonstrable failure of so many historically informed and structured management decisions in recent years and the resultant impact of global economic crises, this has the potential to significantly shift the ground on which a wide range of academic curricula in management related programs have been constructed.

Case Study: Master of Engineering Management

The Master of Engineering Management is a typical coursework based postgraduate program. It specifically aims to challenge students to demonstrate that they can meet the increasing demands by industry and government for knowledgeable, creative and responsible leadership in the deployment of advanced technology and the management of technology-based organisations and systems. Since its inception in 1996 the program has graduated some 300+ students with approximately 10% continuing on to further studies at doctoral level both in Australia and internationally. An average of 50+ students are active in the program at any one time 90% of whom come with academic backgrounds in the engineering disciplines. Whilst the program is primarily targeted at engineering professionals it also attracts participants from various technology related backgrounds. The essential focus of the program is to develop student's skills and capabilities in thinking strategically; challenging established practices and norms of industrial behaviour; developing innovative approaches to managing an ever changing technology base; developing a systems approach to problem solving; and addressing opportunities as potential means for developing competitive advantage. Students are exposed to and encouraged to address and engage with real-world issues and to assume responsibility for their own learning and for setting their own key directions for their investigative/research activities. Currently, the program is structured as one third 'core' coursework, plus one third 'elective' coursework, plus a further one third consisting of mandatory investigative case-study and research activity.

The pedagogical design aspects of the program have progressively evolved from an original fixed focus on classroom based coursework teaching with limited opportunity for divergence from a fixed set of coursework curricula and assessment requirements, to a more flexible curriculum structure that allows students opportunity for choice and control over a large proportion of 66% of their program, as well as choice in delivery mode. Pedagogical adaptation has seen a significant shift from the role of lecturer as a central and controlling authority figure, to that of a more collegiate form of engagement. The design and introduction of independent learning guide materials and the subsequent development of more flexible online delivery, has seen the individual student exposed to a wider range of teaching and learning modes.

The inclusion of the investigative and research component, in an otherwise coursework based program, was undertaken as a response to widespread discussion of the 'Review of Engineering Education' undertaken by a joint Task Force of the Institution of Engineers Australia; The Academy of Technological Sciences and Engineering; and the Australian Council of Engineering Deans. This review identified the need for a culture change in engineering education focussed on producing graduates capable of leading the engineering profession in active engagement with the then expected, now a continuing reality, of social, economic, environmental, and cultural challenges and technological transitions, the latter occurring with increasing frequency (Institution of Engineers Australia, 1996). Clearly the introduction of such broad changes across the face of engineering education has taken time and continues to this day and beyond. It has required not just a single strategic adjustment, but rather a continuing reassessment and active engagement with

the technological, sociological and governmental sectors of society, with both regular and ad hoc re-appraisal of curriculum structures and content.

Given this background to the purpose and strategic intent, the engineering management minor thesis sequence was initiated in 2000 with a one semester research methods related course, during which students develop an initial research proposal focussed on identifying a problem or opportunity, developing a research methodology and approach and identifying appropriate investigative strategies. Subsequently, the research activity is actioned throughout the following semester through a formal literature review and associated data collection, collation, and analysis. The following (third) semester involves the formal writing up and submission of the final minor thesis expected to be in the order of 15,000 - 20,000 words. This full sequence is in turn individually supervised by an academic supervisor. Students are encouraged to determine their own choice of topic, albeit in consultation with the Program Director and potential research supervisor. This individual selection of research topic results in a very wide array of research topics being addressed. It should be noted that local students working in industry invariably negotiate topics of direct relevance to their workplace and with the support and encouragement of their employer. This very practice provides a unique opportunity for the program and its academic staff to actively 'engage' with industry through student participation in addressing real world industry-based issues. Typically, 20-25 students are taking the minor thesis sequence in each semester with the program's academic staff supervising 3-4 students each, with topics in an area of specific interest and related to the expertise of the staff member.

The following is a short list of recent successfully completed research topics that typify the range and complexity of issues addressed: Application of New Technologies and Systems in Bushfire Management; Quality Management Issues in a Global Supply Chain; Predicting the Impact of Planned Outages on a Electricity Power Grid; Measuring Employee Performance in an Automotive Company; Improving Clinical Engineering Services in the Healthcare Industry; Developing an Integrated Management System: Environmental, Safety and Quality; Impact of Government Legislation on Project Management Methods; Identifying Constraints in Technology Leadership; Effectiveness of Knowledge Transfer and Knowledge Management Systems in a Large Organisation.

The curriculum structure and supporting materials for this investigative research component are largely drawn from the body of published works on applied research, business research, technological innovation and change management approaches, plus a liberal sprinkling of elements from 'Social Research', given that beyond the more obvious technology issues, engineering firms are made up of people, with all the attendant concerns and issues that social structures and inter-relationships bring. The relevance, point and purpose of this overall approach reflects the view that research is essentially a complex process, reflecting as it inevitably does the interests, values and expectations of its proponents (Cavana et al. 2001, p8).

The teaching and learning relationship between student and supervisor is primarily focused on assisting the student to develop a rigorous and independent approach to the required analysis. In particular, through encouraging the student to apply the principles of strategic and innovative thinking and critical reflection on identified key issues, specifically in the context of integrating key discipline-based theory and practice in both the research process and its findings. The student's specific responsibilities lay in demonstrating a capability for actioning rigorous and independent investigation and analysis of project findings and the exploration and understanding of key issues and identifying potentials for future application and broader engagement.

	Minor Thesis	Major Thesis	Convergence or Differentiation
Problem or Opportunity Definition	Invariably pragmatic in orientation and primarily focused on developing understandings about what is in fact known about a potentially esoteric issue.	May be more esoteric in nature, although invariably focused on investigating in-depth some specific real-world problem or issue with a future orientation.	Clarity and purpose and intent critical to success in both.
Context Development and Scope	Often a broad context but with limited scope, being essential for realisation within limited time and resource availability.	May be more detailed in development of context and with more intensely defined and focused scope.	Potential for minor thesis approach to explore initial area of understandings prior to longer-term/ more focused/ deeper/ resource-intensive activity in a major thesis.
Currency and Future Orientation	Primarily focused on 'currency', what has been evidenced and is known to be, 'now'.	Primarily focused on growth of knowledge with a strong future orientation.	Potential to view minor thesis as documenting known facts, on which a major thesis may build new findings.
Methodology and theoretical Positioning	Limited but rigorous with demonstrated competence in research methodology and practice.	Extensive and rigorous with demonstrated advanced competence in the field of interest.	Potential to use minor thesis as a tool to establish appropriate methodological approach for major thesis activity.
Strategy Development and Orientation	Often focused on meeting short-term requirements.	Primarily focused on meeting stringent longer-term demands.	Potential for minor thesis to provide initial testing of ideas from which larger scale research may be developed.
Knowledge Base	Largely focused on developing understanding of what is known and practiced in current contexts.	Largely focused on expanding barriers of knowledge through adding new knowledge and potentially leading to new practice.	Need to understand what is known before attempting to address what is not known.
Commercial Opportunity	Limited but possible, typically speculative in nature.	A critical expectation of significant contribution to potential commercialization.	From short-term opportunistic advances to longer-term strategic alliances.
Publication Potential	Clarity of discussion and critical exposition with excerpts suitable as conference papers.	Compelling / defensible argument suitable for major publication.	Both provide opportunity for formal publication.

Table 1. Comparison of Minor and Major Theses

Table 1 illustrates an analysis of the curriculum documents for this coursework program and other more research based programs and provides an outline/comparison of a minor thesis versus a major thesis against a limited set of typical thesis characteristics with comments on the potential for convergence or differentiation, particularly with regard to a future role for the minor thesis as precursor to more formal research activity. Note that these reflect key characteristics referenced earlier in the discussion on perceptions of scholarship in thesis development.

Pedagogy and Related Teaching & Learning Issues

In general, the processes of supervision that apply in minor thesis work do not differ greatly from that of supervising formal 'research' theses, in that outcomes are expected to focus on demonstrating a clear understanding of a stated problem or opportunity and the development, implementation and testing of solutions in defined contexts. Where differentiation does exist, it appears to be largely in relation to the extent or scope of the research being undertaken and expected depth of detail and extended rigour of analyses being applied. The pedagogical attributes of the minor thesis are strongly oriented towards the development of understandings and competencies in research methodology (as discussed above) both in theory and practice, the application of program tenets to develop understandings and potentially resolution of an identified issue, and a value-added experience of effective and enlightening supervision.

The following current 'graduate attributes' and associated course and assessment requirements listed for a minor thesis (see Table 2) also identifies the characteristics that it is expected will be demonstrated and thus provides insights into the potential needs and direction for minor thesis pedagogy and the related focus of successful and value-adding supervision. Whilst reflecting a commonly used approach to identifying how a particular program or course will contribute to student growth in skills, knowledge and expertise, it also identifies the generic core areas on which supervision must necessarily focus and in which all of Boyer's scholarship ideals may be applied.

Graduate Attributes	How Course Addresses Attributes	How Assessment addresses attributes
Knowledgeable	Develops knowledge and understanding of key concepts.	Requires demonstrated understanding of key issues.
Creative	Encourages creative approaches to resolving real world problems.	Provides opportunity for creative problem solving.
Critical	Provides opportunity for critical reflection on key issues and development of critical thinking.	Requires in-depth critical argument.
Responsible	Develops theme of industry taking responsibility for its actions	Requires development of strategies reflecting responsible thinking and actions.
Employable	Develops strategic management skills.	Requires demonstrated capacity for strategic thinking.
Life-long Learners	Encourages students to continue to explore and develop themes and issues of specific interest.	Provides framework for opportunity to extend learning activities beyond direct scope of current course/program.
Potential Leaders	Strongly emphasises leadership potential and identifies key areas requiring current and future leadership.	Requires student to take an active leadership role either in group activities or in development of assessment materials.

Table 2. Graduate Attributes for Master of Engineering Management Thesis
(Derived from Mclay, 2012a)

Clearly though, it does not provide the specifics, nor indeed the metrics, required for an interpretation of exactly how individual theses may meet the required attributes. For example, in relation to the graduate attribute of ‘knowledgeable’: How is this to be interpreted in the context of the minor thesis and in relation to the role of the supervisor? Is it to be directed only at developing understandings in the key discipline based areas of knowledge? Or could it be interpreted as applying more widely to incorporate the methodological approaches, strategies, rationale, intent and purpose used in a particular area of research activity? For the supervisor, this may in turn provide challenging variations in demand for an interest and/or skills in strategic thinking about issues, purpose and intent, versus a detailed and technically specialised background in a particular area of a specific technology application!

It is not uncommon for minor thesis students to say ‘I am interested in ... (whatever it may be) ... but I have no real working knowledge about it’. For the supervisor this raises immediate concerns about the perceived necessary conditions or level of entry knowledge and skills required to undertake meaningful research activity in a given or defined area. On the other hand, it also indicates an opportunity for real growth in understandings by the proposing student! It is also typical of the election to research/investigate an emerging area of research interests where little or no background data or information is readily available. Developing skills to assist students address these challenging new areas is clearly relevant to both major and minor thesis supervisors. Yet, how could or should it be done, particularly in the light of the above graduate attributes. It would seem the supervisor is faced with raising and ensuring the opportunity is there for the student to be able to identify and engage in creative problem solving strategies, reflect on key issues and engage in critical thinking as a ‘deep learning’ strategy (Ramsden, 2003; Biggs & Tang, 2007) that extends and applies cognitive processes to resolving challenges and enhancing intellectual engagement in the development of in-depth argument and discourse. All this in the context of also ensuring opportunity for developing leadership skills and a disciplined and imaginative creativity that builds and extends intellectual endeavour.

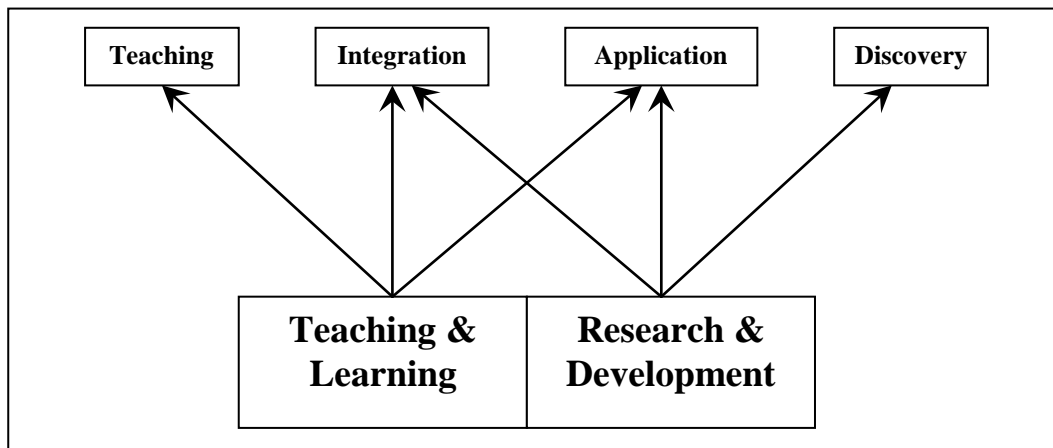


Figure 1 Boyer Scholarship Model. (As referenced in RMIT (2000) RMIT Teaching and Learning Strategy 2000-2002)

It would seem then that some thought is needed on what constitutes core purpose and intent for the introduction of a minor thesis and its actual role in the implementation of the Boyer model of scholarship in postgraduate programs. What is it meant to do? What purpose does it serve in the

overall scheme of developing demonstrable knowledge, skills and expertise through identified processes subjected to the demands of academic rigour, requirements for expression of independent thought and action and compliance with specific assessment criteria? Further, how is this core purpose and intent to be translated into and be seen to encompass Boyer's classifications of scholarship and subsequent engagement. That is, how can the minor thesis realistically apply itself across the full spectrum of Boyer expectations of scholarship as outlined in Figure 1?

In the particular minor thesis example outlined above, the thesis activity is structured as a three semester sequence. In the first semester the student is largely engaged in class-work/coursework based learning activity in which the processes associated with the scholarship of 'teaching' are directly and intensely involved. Students are introduced to the theoretical underpinning of research methodologies. What are they? Who developed them? When were they developed? Where do they come from? Why do we have them? How do we use them? What does it all mean in the broader sense of their own and related discipline areas? What are the connections between theory and practice and how are they formulated in relation to the student's own selected research topic? (McLay, 2012b)

Whilst mainly within a lecturer directed environment, opportunity for open discourse with peers and staff develops the self-directed and disciplined learning process so essential for the successful researcher. Thus, the minor thesis clearly commences within the ambit of the scholarship of Teaching, the quality of which will largely impact on and influence the direction, structure and success prospects of the subsequent research activity. The supervisor's role here is clearly pivotal as the student prepares to identify and go through the processes of formal problem or opportunity definition and the matching of these against the options for developing a formal research methodology and approach.

It further progresses through the scholarship of Integration as students grapple with how to design and construct meaningful and effective research strategy. At this stage, students and supervisors typically find themselves having to operate across discipline boundaries. Engineering students for example suddenly find themselves faced with having to explore social science, or health, or business related issues that suddenly appear on their research horizon and become significant agenda items to be addressed. This broadening of perceptions and valuing of other discipline bases can play a significant role in the development and maturing of a successful researcher and in effect, a quality graduate.

As the student then proceeds to implement the selected research strategies and faces the all too often confusing task of dealing with 'what can go wrong will go wrong' and in turn resolving the many pragmatic as well as conceptual issues that face and challenge researchers wherever and whoever they may be, the supervisor must again take on a challenging and pivotal role if the Boyer scholarship of Application and its subsequent descendant the scholarship of Engagement, is to genuinely bring theory and practice together in scholarly service to address real world concerns and issues.

More difficult to perceive is the application of the minor thesis to the scholarship of Discovery. Although, experience has shown that occasionally minor thesis students do make that unique breakthrough that produces something new, or at least a new insight into an old problem or issue. It is perhaps here that a new role for the astute supervisor can be argued for. To be able to identify when a piece of minor thesis work begins to approach boundary conditions and to raise conceptual or practical challenges that demand further empirical attention in a more formal or major research environment. In terms of the Boyer scholarship model, there would appear to be a *prima facie*

case that the minor thesis has a serious role to play, at least in connecting and potentially operating across the scope of the four scholarship areas, certainly when interfaced through to a subsequent major research program whether within the academic environment or externally in industry-based research and development projects.

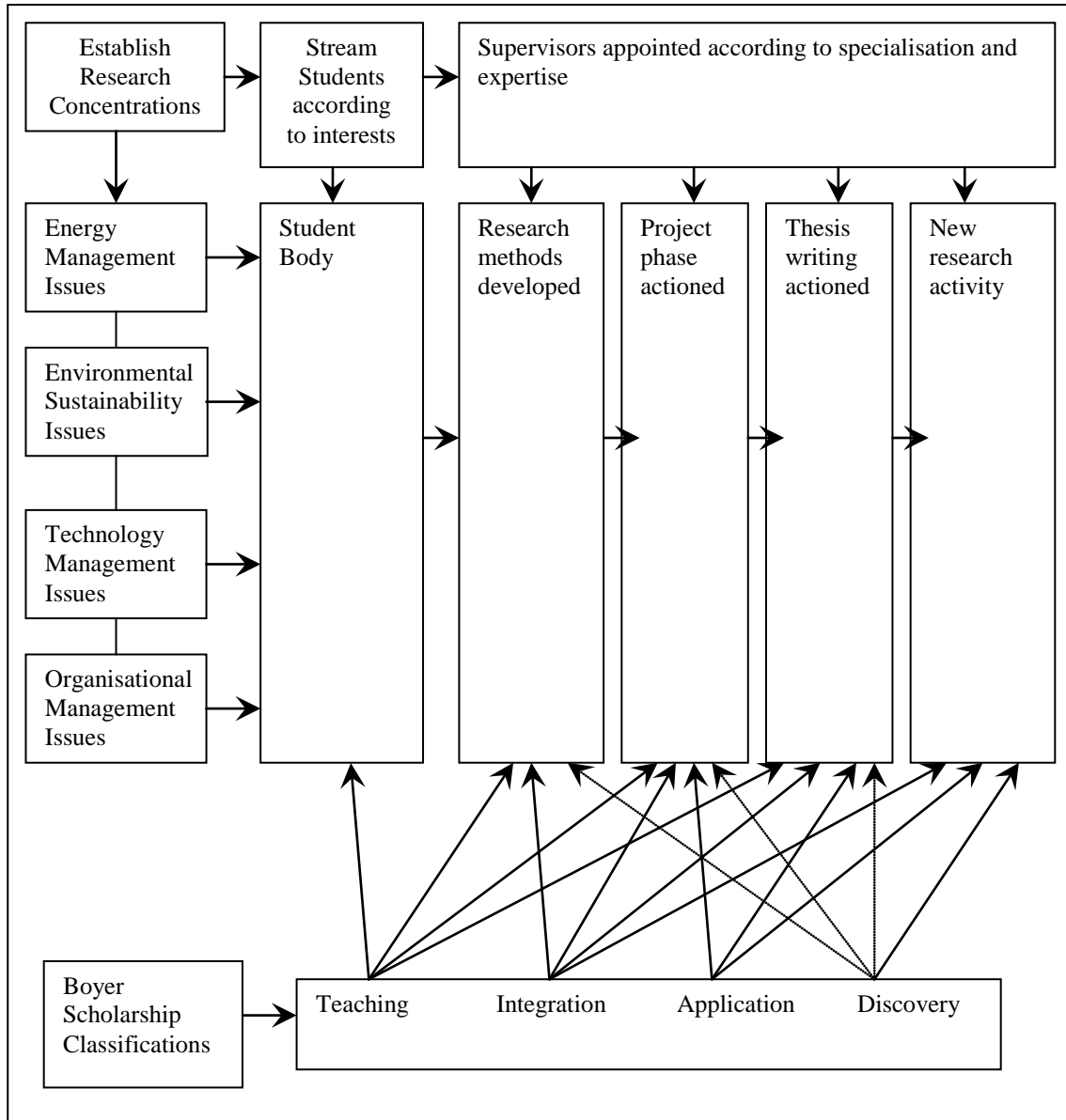


Figure 2. Relationships between minor thesis students, supervisors, activities and the Boyer Scholarship Classifications.

Proposed Future Models for Minor Theses and Relationship to Major Thesis Work

The generic theme discussed throughout this paper of utilising the minor thesis activity as an introduction, or as providing background development for subsequent formal research, has developed from the reality of having many past coursework students return to discuss taking their original postgraduate minor thesis/project work further into formal PhD research or industry-based project activities. This has included projects focused on opportunities to enhance technology management and related governance issues, and both government and industry supported research and development projects (one particularly successful example can be seen at: <http://amcrc.com.au/rmit-student-prize-winner>). Thus the above discussion has highlighted areas in which the supervision of minor thesis work may be used to develop broader understandings of the context and environment in which real-world, albeit discipline oriented, problems or opportunities are addressed with the view of subsequently developing formal research activity.

This approach then provides a possible basic framework for thinking about the future role of the postgraduate minor thesis as an effective research medium and the developing role of the postgraduate minor thesis research supervisor. In the case of the Master of Engineering Management program, there would seem to be a strong case evolving for defining specific areas of research concentration within the minor thesis program itself, supplementary to and supporting the already defined research and development concentrations established within the existing department and school structure.

Figure 2 provides a possible framework for thinking about the relationships between minor thesis students, supervisors, activities and the Boyer scholarship model (exemplar research concentrations listed are derived from the Engineering Management discipline area).

Perspectives on Minor Thesis Supervision

In effect, this reflects a significant paradigm shift in teaching and learning approach within an otherwise coursework based program. The requirement is for a move from the coursework world of clearly defined and stated learning objectives with required outcomes stated in tightly defined and very often discipline specific language, to a differently defined and yet rigorous world of exploration, explanation and potential discovery, albeit still within the common bounds of the home discipline. This reflects the Boyer Scholarship idiom of moving from teaching, through integration and application, to the potential for discovery and active engagement in bringing theory and practice to bear in resolving real world problems and issues. For the coursework academic turned would-be supervisor, this may well prove to be quite daunting, at least initially.

Yet, the initial processes of preparing for supervision would appear to call for a no-less structured approach than effectively preparing for a successful class-work based lecture series. For example, the following short list of supervision tasks, clearly require preparatory thought and a goodly proportion of 'duty of care':

- Ensuring that both student and supervisor are alert, aware and committed from the outset to the application of rigorous and systematic methods throughout the research activity (whatever the methodological regime may be).
- Clearly announcing the processes of problem or opportunity definition that may apply to the specific field of enquiry and ensuring there is agreement on the actual purpose and intent of the activity, the research questions to be addressed and the locus of the research focus.

- Guiding the novice researcher through the sometime maze of research ‘methodology’ selection to ensure coherence between stated purpose, a formalised research approach and subsequent research activity.
- Advising on effective research design, given the specific field of enquiry.
- Facilitating access to appropriate ‘tools’ for data collection, collation and analysis, whether software, hardware, or conceptual frameworks.
- Ensuring currency with relevant contemporary theory and practice.
- Determining an appropriate level of complexity and completeness for the work as a whole.
- Ensuring that the rights and obligations of researcher and researched are met in an ethical manner in keeping with societal and legal obligations.
- Being alert to the possibilities of uniqueness, innovation and change, whether embedded in approach or formalised findings.

Conclusions

Clearly, the role of the minor thesis supervisor reflects many of the characteristics of major research supervision. The outcomes of major or minor research may differ in terms of their extent and focus on adding to a given discipline’s body of knowledge and practice. However, their core purpose and intent as effective mechanisms for initiating and promulgating research training skills and related discipline specific scholarship and research expertise, lay along similar if not effectively parallel paths, whilst the array of supervision skills and expertise required to achieve satisfactory scholarship performance appears to differ very little.

Research supervisors, whether involved with major postgraduate research programs or postgraduate coursework based minor theses, can be seen to have considerable intellectual challenges to address in the processes of supervision to ensure the development and execution of rigorous scholarship. The above discussion highlights areas in which the role of supervising postgraduate minor theses as significant research focused components of otherwise coursework based programs, can be directly linked to both developing new major research activities and meeting the expectations of the Boyer Scholarship Model.

In particular, this may involve extending the role and purpose of the coursework program based minor thesis to more directly engage in and address all of the Boyer scholarship classifications with a particular emphasis on the scholarship of ‘Discovery’ and Boyer’s later perception of a scholarship of Engagement. Directing this potential entry into the world of research at real and present needs, at least through acting as a developmental or preparation stage for subsequent formal research activity, clearly requires that expectations for rigour in research method and approach are genuinely reflected in the scope and quality of scholarship in minor thesis and associated project work and its effective supervision.

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