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An Educational Process for Developing Student Post-Graduate Mastery in Research, Theory and Its Application

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In higher education, students are required to develop complex cognitive capabilities that they may not have needed in their undergraduate work. While a plethora of resources is available to students of research, it seems that many students struggle to understand how to read, understand, integrate, and apply research and theory to a research question or hypothesis. To help my own masters and doctoral students develop these vital skills, as part of our initial doctoral foundation course I have developed a semester-long project grounded in theory and research from cognitive instruction that explicitly teaches and supports the objectives of (a) mastery of a research-supported knowledge base, and (b) development of conceptual tools to foster understanding, integration, and effective application of research. The process of this semester-long student project follows two basic threads: (a) to build a research knowledge base in the content area and (b) to develop student skill in reading. I have used this developmental process for six years to help graduate students build both abstract and applied competencies in reading, understanding, and applying research. It has been extremely successful, based on the students' ability to use their newly developed competencies in more advanced endeavors, and their stated confidence to do so.

In higher education, especially at the post-graduate level, students are required to develop complex cognitive capabilities that they may not have needed in their undergraduate work. Specifically, masters and doctoral students early in their academic programs must demonstrate mastery of challenging concepts and skills required to read theory and research, exhibit understanding of the content of what they read, and then effectively apply and integrate that literature into writings and projects of their own. These research competences are vital tools for students to develop and are necessary to successfully pursue their graduate programs. Sadly, instructors often find that research skills seem to be elusive and difficult for graduate students to acquire.

A plethora of resources is available to students of research. Typically, colleges and universities offer a variety of courses in research relating to research and design, statistical analysis, and the research process. Writing style manuals such as the *Publication Manual of the American Psychological Association* (2001) and the *Chicago Manual of Style* (2003) offer guidance in research writing, and many texts and handbooks (e.g. Amato, 2002; Ballenger, 2001; Garson, 2002) offer step-by-step instruction and examples to the student in how to conduct scholarly research. Moreover, throughout the last decade, more and more resources have become accessible through the Internet, ranging from stories of personal experience, through hints and tips, to "dissertation survival guides." Though these sources vary in quality and utility, all seem to be designed to help the advanced student develop skills in research reading and writing. Even with all these supports, it seems that many students struggle to understand how to read, understand, integrate, and apply research and theory to a research question or hypothesis. Consequently, it seems not surprising that beginning students of research – my own and those of colleagues from other institutions – anecdotally report feeling anxious and concerned about their ability to learn about and eventually conduct research.

Developing Mastery of Research Skills

To help my own masters and doctoral students develop these vital skills, as part of our initial doctoral foundation course I have developed a semester-long process that explicitly teaches and supports the objectives of (a) mastery of a research-supported knowledge base and (b) development of conceptual tools to foster understanding, integration and effective application of research. The specific content of this course investigates adult developmental theory and research, but the process for building concepts and competences in the reading and understanding of research literature and its application would seem to be adaptable to a wide range of foundation graduate programs.

The project used to support the teaching, development, and mastery of research skills in graduate students is grounded in theory and research from cognitive instruction (Bruning, Schraw, Norby, & Ronning, 2004). Over the last three decades, much research has been conducted to understand how people think and understand concepts and how they relate ideas and build new concepts from more basic ones. Pedagogical processes that are developed and supported by this body of research are typically called cognitive instruction. Cognitive instructional processes that inform the project described here include cooperative

learning (Slavin, 1996) in which student cognition is supported socially through focused peer discussion and scaffolding. Scaffolding refers to the practice of providing hints, comments, and connections to students at the point of confusion, rather than just "giving the answer" (O'Flahavan & Stein, 1992; Vygotsky, 1986). Instructors can scaffold complex learning in their students, and more capable students can scaffold less capable peers. Consequently, students simultaneously teach and learn through the support and feedback of more capable others – a process that is helpful in building concepts and useful knowledge (King, Staffieri & Adelgeis, 1998; Vygotsky, 1986). Additionally, cognitive strategies for teaching and learning (Gaskins, 1998; Palinscar & Brown, 1984) help students remember concepts and make conceptual connections between concepts more consistently and effectively. Cognitive strategies also help students to understand their own learning processes (often termed metacognition). Finally, recent work by Case (1996), Fischer, Hand, and Russell (1984) and Knight and Sutton (2004) has demonstrated that people continue to develop new and increasingly abstract cognitive capabilities through early adulthood, rather than reaching completion during adolescence. Consequently, for many young graduate students competence in understanding abstract and complex concepts is still emerging and fragile. A bit of extra cognitive support from the instructor and/or capable peers at difficult junctures in content or process can often help students bridge the gap from memorizing to truly understanding the concepts at hand (Knight & Sutton, 2004). In short, when instructors employ this new knowledge through the use of cognitive instruction, enhanced student learning and comprehension typically results.

Strategy for Reading Research

One way to support graduate students' reading and comprehension is actively to teach and discuss in class the structure of research articles, the purpose of each section of an article, and to explicitly familiarize students with research language and process. This approach, consistently employed, supports reading research novices by helping them to manage the cognitive demands of this new endeavor, and consequently supports student understanding of both research process and article content (Bruning, et. al., 2004; Kuhn, Schauble, & Garcia-Mila, 1992). Even so, when initially reading literature, typically students grapple with unfamiliar and often difficult concepts. Often several readings of an article are necessary for students to begin to understand highly abstract ideas and concepts.

During class meetings, students working in small groups are required to discuss the assigned theory and research and to identify and explain application of the concepts at hand (Slavin, 1996). Since students are likely to be thinking and understanding at similar, but somewhat varying, levels of cognitive complexity, they inevitably support and scaffold one another's thinking in the course of their back-and-forth discussions. Those students who may be more advanced in their understanding scaffold those less advanced (e.g., "Yes, argon *is* an inert gas"), while simultaneously modeling more complex thinking. Further, since students bring differing experiences and perspectives on readings, group interaction results in a richer, broader understanding to each participant. Finally, the instructor circulates among the small discussion groups to monitor and clarify student understanding – and possible misconceptions – further modeling high-level thinking and supporting student comprehension. Recent work in adult cognition (Knight & Sutton, 2004) indicates that such collaborative concept building is not only helpful but also vital for graduate students to grasp and understand challenging and highly abstract concepts such as those required in reading, understanding, conducting, and writing research.

Throughout the duration of the course, students use this described process to read, discuss, apply, and integrate instructor-selected research and theory with the objective of developing a knowledge base of pertinent literature that encompasses the discipline at hand, whether that be cognitive development or highway bridge engineering. In addition, and equally important, early in the course *each student* is assigned a semester-long project that helps the student progressively to apply theory and concepts as they are learned and understood. Hence, while each student has the support and integrating discussion of the group and the scaffolding and critique of the instructor, each student must develop his or her individual research knowledge and skills with the ultimate objective of reading, writing and conducting research independently. This last objective is beyond the scope of the initial course and process described here; nevertheless the process and project are designed to lay the groundwork for each student's eventual independent research efforts.

Semester-Long Research Application Project

The process of this semester-long student project follows two basic threads: (a) to build a research knowledge base in the content area (for example, in my course, adult developmental theory and research) and (b) to develop student skill in reading, understanding, applying and writing in the content area. The two threads intertwine as the student uses his or her growing

knowledge base to inform the interview questions that will provide data for the increasingly demanding case studies and research-integrated-application reports the student will prepare.

This example describes the process in the context of a human development course and the reports here are to be written in the style of that field. When the process is applied to a different field, the form of the reports will vary depending on the course material and the customs of that field.

The project is composed of three phases. In Phase 1 (see Table 1), students read, integrate, and apply fundamental content theory and concepts to their own experience, gathering data via a self-interview using a standard structured interview form. This application is within reach of most students since their own experience is familiar and easily accessible near-term (Fischer, 1980). The findings of this initial phase are written and submitted in the form of a case study supported by research-based results and conclusions based on the research read so far. Each student's submission is critiqued by the instructor, who writes specific and supportive comments (Alderman, 2004) on the paper, relating to both application of research concepts and writing clarity and style; the paper is returned to the student. Then, each student must resubmit a revised paper, often through two or three critique-and-edit cycles to reach a criterion of accuracy of understanding and application and writing clarity. The student then continues to the next phase, though his or her reading for that phase typically begins before the Phase 1 criterion is reached.

TABLE 1
Adult Development, Motivation, and Learning Class Project: Project Phases and Phase Descriptions

Your class project will be comprised of three phases as described below. Your task will be to interpret your findings with the aid of concepts, theory and research and integrate them inter-personally, intra-personally and longitudinally. You will be asked to present a brief summary of your final report to the class.

Phase 1: *Interviewing yourself.*

1. Identify and describe one or more significant turning points, milestones or events in your life that have impelled you toward, prepared you for, or drawn you into Psychology, Counseling, Administration, or other profession and explain why. Relate your experience to the theories and models you are studying in class.
2. Identify and describe those of your characteristics or styles that you feel make you particularly suited for your chosen profession or make this profession your career preference or choice, and explain why. Relate and integrate these characteristics or styles to the concepts, theories and models you are studying in class.

Phase 2: *Interviewing a "mid career" similar professional in your chosen profession.*

1. Find a working professional with at least 10 years of experience in your chosen profession who is roughly halfway along his or her career.
2. Ask this person to identify and describe one or more significant turning points, milestones or events in her or his life that had impelled her or him toward, prepared her or him for, or drawn her or him into his or her profession and explain why. Relate your observations of her or his experience to the theories and models you are studying in class.
3. Ask this person to identify and describe those of his or her characteristics or styles that he or she feels make him or her particularly suited for this profession or make the profession his or her career preference or choice, and explain why. Relate and integrate these characteristics or styles to the concepts, theories and models you are studying in class.
4. Relate the events and characteristics described by this person with your own events and characteristics that you described in Phase 1. Reflect on the data and use your understanding of the concepts, theories and models studied in class to integrate your findings.

Phase 3: *Interviewing an "end career" professional.*

1. Find a professional, near, at, or past the end of her or his career (a retired Psychologist, Counselor or College Professor, for example).
2. Ask this person to identify and describe one or more significant turning points, milestones or events in her or his life that had impelled her or him toward, prepared her or him for, or drawn her or him into the chosen profession, and explain why. Relate your observations of her or his experience to the theories and models you are studying in class.
3. Ask this person to identify and describe those of his or her characteristics or style that he or she feels make him or her particularly suited for his or her career preference or choice, and explain why. Relate these characteristics or styles to the concepts, theories and models you are studying in class.
4. Then, ask this person to contemplate their experience and think of *a specific entry-level professional they have known* while answering the above two questions (2 & 3) in regard to the entry level professional of whom they are thinking. That is, you want the *senior professional's* observations of an *entry-level professional.*
5. Relate the events and characteristics described by this person with regards both *to himself and to the entry-level professional he described* to your corresponding findings from Phase 1 and your corresponding findings from Phase 2. Reflect on the data and use your understanding of the concepts, theories and models studied in class to integrate your findings.
6. Prepare a comprehensive review of your data, interpreting your findings with the aid of concepts, theory and research and integrate them inter-personally, intra-personally and longitudinally. Be prepared to justify your conclusions after presenting them to the class.

In Phase 2 (see Table 1), students tackle additional readings that build on their growing foundation of research skills and apply all of their nascent but growing theory and knowledge to a selected complex case study. This task is more challenging in two ways: (a) the students must learn, understand and integrate approximately twice the volume of research than was required for the first phase, and (b) they must apply their growing knowledge to a constrained context that is not familiar to them and consequently not as accessible – in this case, a mid-career person they seek out and interview using a structured interview format. As in Phase 1, the student writes and submits the findings of the second phase as a case study with research-based results and conclusions, based on all the readings encountered thus far. As before, each student's submission is critiqued by the instructor, who provides specific and supportive comments written directly on the student's paper (regarding both application of research concepts and writing clarity and style) and returns it to the student. Each student revises and resubmits her or his paper, often progressing through two or three editing cycles to reach a criterion of integrated understanding and application and writing clarity and form. The student then continues to the third phase, though his or her reading for that phase typically begins before the second phase's criterion is reached.

Finally, as the course nears its end, students grapple with Phase 3 (see Table 1). To complete this phase, each student must have read, understood and integrated the entire scope of assigned readings and must apply the entire scope of theory and concepts therein to an in-depth, multifaceted case or experimental context and explain the findings and dynamics or processes of the case effectively and comprehensively. Again, the student submits a paper that presents a thorough understanding of the entire body of research studied and demonstrates accurate application via a structured interview with an end-career person with an explanation of appropriate findings, concepts, dynamics and processes. The student is given specific written feedback and suggestions to improve both application of the research base and to improve writing style. The student edits and resubmits this comprehensive effort, often through one or two more cycles, until a near-professional or professional level is reached – in both effective use of research literature and quality of written expression and communication. Last, the student is required to return to his or her Phase 1 and Phase 2 efforts and recast each paper in terms of the full range of readings studied in the course. At this point, the students' rewritten efforts are typically of very high quality in terms of breadth and application of both research and written presentation. Rarely is a third rewrite necessary.

Students who complete this demanding process develop a content knowledge base upon which they can refer and build further concepts. Further, through repeated and effective written feedback from their instructor, the students have learned how to understand, select, apply and write about theory and concepts that define and relate their content area. Consequently, the students have seen their research skills progressively grow and expand in terms of what they know, how they know it, and how to write about their chosen discipline.

Application

The adult development course I teach is a foundation course for advanced masters and beginning doctoral students. The course emphasizes cognitive development, learning, decision-making, and motivation from late adolescence through late adulthood. Course materials include an adult developmental text with two dozen carefully chosen text-augmenting articles. All theories and concepts in these materials become part of each student's project's literature base. Semi-structured interview data recorded verbatim is the source data for the students' application of the research materials provided.

In this project, each student interviews three persons: for Phase 1, herself or himself; for Phase 2, a mid-career person in the student's chosen career; and for Phase 3, a late career person. Permission and confidentiality procedures are carefully followed. With semi-structured questions (see Table 1) similar for all three interviewees, the student explores the interviewees' career selection and advancement decision processes. The three interviews are done early (Phase 1), at the midpoint (Phase 2), and late in the semester (Phase 3), to support progressive mastery, integration and application of literature.

After the Phase 1 interview, the student must clearly report in written form her or his findings, incorporating concepts and theories from the literature studied up to the time of that interview. The initial, self-interview requires mastery and application of only six or seven references, meticulously selected and supported.

For the second, Phase 2 interview, a dozen or more references are required, representing the literature studied to that point. Now, the student must not only apply literature effectively to another person rather than to himself or herself, in depth, but also compare the findings – and appropriate literature – from the self-interview to the mid-career person's interview. The third, Phase 3 interview, is correspondingly more demanding; the results of the first two interviews and all the literature and concepts from the entire course are to be considered, and comparisons, concepts and trends identified across all three interviewees.

TABLE 2
Criteria for Phases 1, 2 and 3 Integrated Reports

1. Identify and analyze overall trends, themes, influences, or motivating factors, supported by data from the interview. You will use appropriate application of theory from a number of perspectives to explain/explore as determined by the phase of analysis.
2. Clarity of argument, thinking and scholarly support is required.
3. Clarity and precision of writing is required.
4. Appropriately reference in text and on reference sheet the research/theory applied, using APA Style, 5th Edition.
5. Concisely summarize your analyses at the close of each interview—clarity in thinking and writing is required.

Further, the late career interviewee is also asked to reflect upon the early career process in order to capture an experienced person's changes in perspective over time.

Interview reports are criterion-assessed, using the criteria in Table 2. Typically, students rewrite – and improve with extensive instructor feedback and coaching – each report several times before meeting that part's criteria. With each interview, students master more literature, applying concepts with greater precision and clarity, in successively more complex writings. When the student has written and annotated all three interviews, related concepts, identified and embodied trends and theory from the entire course, revising the entire project for scholarly competence, they have met the criteria of the project rubric (see Table 3). Having met the criteria, they have achieved the objectives of the course: demonstrating mastery of a developmental psychology knowledge base, and have honed conceptual tools that will foster understanding, integration and effective application of research literature in both reading and writing.

TABLE 3
Rubric for Final Integrated Reports

Category	A-Range	B-Range	C-Range	D-Range
Interview Data	Interview data are appropriate in scope, content and rigor, and are described in terms of background and purpose.	Interview data are appropriate in both scope and content, but not fully described and/or lacking in rigor.	Interview data are appropriate in both scope and content, but lack clear description and rigor.	Interview data are not appropriate for this class.
Writing and Organization	The paper has a logical organization and is written clearly, coherently and with precision.	Writing is basically clear, logical and well-structured with minor grammatical/usage/ organization difficulties.	Writing is somewhat choppy, organization difficult to follow. Grammatical and/or usage errors present.	Writing is unacceptable for post-graduate-level work
Literature and Organization	Literature is selected from appropriate professional sources with sound decision making; organized by topics and integrated or connected; and clearly establishes support and rationale for your integrated report.	Literature is from professional sources, appropriate for the interviews and project, but may be more "knowledge telling" rather than selecting and explaining, may be too limited or lack integration.	Literature is topically appropriate, but insufficient for explaining interview findings; not logically organized, and/or inconsistently supportive of integrated findings and conclusions.	Literature is not from approved professional sources, clearly misused or not organized by topics.
Interpretation and Conclusion	The interpretation/ conclusion refers to literature for support and follows directly from the concepts identified in the interviews.	The interpretation and conclusions drawn from the interview data are not clearly and explicitly related to the literature.	The interpretation is vague, or poorly related to project goals.	Interpretation/ conclusion absent or unconnected to literature/ interviews or inappropriate.
APA Citations and References	APA style is appropriately used for text citations and reference list.	APA style is appropriately used for citations and reference list with only occasional minor errors.	APA is used for citations and references, but often incorrectly.	APA style for references and citations not used or consistently incorrect.

With a little imagination this process can be applied to a wide range of subject domains. For example, in civil engineering students could develop an integrated understanding of the development of bridge technology, from simple Roman arch through nineteenth century truss to modern cable-stayed structures. In this supportive process, readings in bridge construction could be coordinated with the student's selection of an example of each type of bridge, writing reports similar in form (if not content) to the reports described above. Rather than integrating research into human development with each level of a person's development, the student would be integrating bridge design and research with an existing modern bridge of his or her choice. The process would be the same, including the final fully developed project.

Conclusion

For the last six years, I have used this iterative, developmental process to help graduate students build both abstract and applied competencies in reading, understanding, and applying research. To date it has been extremely successful, based on the students' ability to use their newly developed competencies in more advanced endeavors and their stated confidence to do so. While it is difficult to estimate long-term effects of any course, it is not unusual for dissertation-level scholars to report to me that this course started them down the road toward effectively reading, understanding and conducting their own research. To me, these testimonials are the best legacy an instructor could ever desire.

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