

RESEARCH MANUSCRIPTS REVIEW AND SUMMARY

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(See Portfolio Sections A.3 Research, A.5 Faculty Development Program, and B.11-12)

Each of the seven professors performed classroom research on the Scholarship of Teaching. For details about their research design and results, see B.11, a-g.

The Scholarship of Teaching, or experimental classroom research, was a variable in the research and evaluation design to determine the success of the CEET Faculty Development Program (A.5). It is important to remember that our primary goal was to prepare the professors for experimental classroom research on teaching and learning. That type of research is quite different from research typically performed by engineers and technologists. The research was based upon what they learned in the Faculty Development Program about teaching and student learning, including the program component on educational research. Based upon their interests, stemming from program participation, the professors worked with the program leaders to determine research questions and the experimental study designs. They then executed the research in their respective classrooms.

Only one study achieved statistical significance in student learning; the others did not achieve statistical significance. However, our primary goals were to engage them in a program during which they built a knowledge foundation about teaching, student learning and assessment and to prepare them to engage in classroom research on the Scholarship of Teaching. To some, the lack of statistical significance in the classroom research would be disappointing. To us, the formal execution of the research was the primary and most important aspect of the research. As mentioned above, the design and execution of formal experimental research in the classrooms with students as the Scholarship of Teaching was the goal, serving as a variable in the research and evaluation design. Also research studies inform us, regardless of the statistical results. It is important that the professors learn how to explain not only what happens when statistical significance is achieved but also to consider and understand why statistical significance was not achieved. This is what leads to new questions or hypotheses. Either way, the research and its results will inform the teaching and learning communities and contribute to those bodies of knowledge and the literature.

We were pleased with the professors' efforts; their dedication to full execution of formal, experimental classroom research; and their follow through with preparing the draft research manuscripts that will be submitted to professional journals across engineering and technology. All seven professors who participated in the program described in Portfolio Section A.5 and research described in Section A. 3 submitted draft manuscripts. A critique of the manuscripts follows the Faculty Learning Community's research questions below. Please note that two different professors researched the same questions presented in 2 and 4 below. Also another two different professors researched the same questions, presented in 5 and 7 below. The research questions across all Learning Community members were

1. Does individual performance-based learning or cooperative performance-based learning result in better student learning as reflected in an end-of-unit exam.

2.
 - a. Does a performance assessment administered in conjunction with a traditional test result in increased learning beyond the traditional test alone as indicated by scores on the traditional test?
 - b. Does the order of the administration of a performance assessment and a traditional test result in differential learning as indicated by the combination of the performance assessment and traditional test scores?
 - c. Does the order of administration of a performance assessment and a traditional test affect knowledge retention as indicated by a final exam?
3.
 - a. In problem-based learning projects, are hands-on manipulative procedures more effective on learning than graphical procedures as reflected in a midterm exam?
 - b. In problem-based learning projects, are hands-on manipulative procedures more effective on retention of learning than graphical procedures as reflected in a final exam?
4.
 - a. Does a performance assessment administered in conjunction with a traditional test result in increased learning beyond the traditional test alone as indicated by scores on the traditional test?
 - b. Does the order of the administration of a performance assessment and a traditional test result in differential learning as indicated by the combination of the performance assessment and traditional test scores?
 - c. Does the order of administration of a performance assessment and a traditional test affect knowledge retention as indicated by a final exam?
5.
 - a. Does individual learning vs. cooperative learning result in differential knowledge gains as indicated by a traditional test?
 - b. Does individual learning vs. cooperative learning result in differential knowledge retention as indicated by a final exam.
6.
 - a. Does the administration of a performance assessment that covers a subset of content also covered in a traditional midterm result in increased learning beyond the administration of the traditional midterm alone as indicated by the scores on the traditional midterm?
 - b. Does the administration of a performance assessment that covers a subset of content also covered in a traditional midterm result in increased knowledge retention beyond the administration of the traditional midterm alone as indicated by a separate final exam?
7.
 - a. Does individual learning vs. cooperative learning result in differential knowledge gains as indicated by a traditional test?
 - b. Does individual learning vs. cooperative learning result in differential knowledge retention as indicated by a final exam?

Discussion of Research Manuscripts

Variable to determine success of the CEET Faculty Development Program

As the final evaluation factor to determine or confirm what professors had learned in the CEET Faculty Development Program, the manuscripts revealed that they had learned what was expected. Although *some* of the drafts did not reveal the literature basis or learning theory basis for the research, it was clear in the execution of the studies that they understood what they were trying to achieve. Also some of the professors did not use the educational terminology at all; some used it quite well; some still interchanged terms such as “objectives” with “outcomes.” However, once again, it was apparent that they understood what they were discussing. The educational “jargon” or terminology is usually confusing to those who have not followed its transitions and often subtle definition changes with those transitions. Overall, the manuscripts, along with the other eight variables, were evidence of program success.

Quality

The quality of the manuscripts varied from

- excellent, ready to submit for publication
- excellent, appropriate draft; almost ready to submit
- appropriate for draft; consider critique comments, modify, and then submit

Challenges

The greatest challenges to manuscript preparation for these professors seem to be

- use of educational terminology (for all)
- writing style (for some)
- establishing the context of the study within the framework of the learning theory; other research, and relevant literature (for all)
- discussing and interpreting the results in the context of learning theory, other research, and relevant literature (for all)
- establishing where the research leads them next (for all)
- explaining and sourcing the context of their study within the Faculty Development Program (for all, however, some did mention it)
- **Closing the Loop:** none of the professors described changes or future

Some of the professors prepared their manuscripts using a writing style more appropriate for technical or lab reports – no context. Although a few did somewhat, most did not use appropriate educational terminology; however, it is important to remember that most the educational terminology was very new to almost all of the professors. Some professors did not provide the theoretical basis for their research using other research and literature to create the research context and framework; others introduced their research using relevant sources, research or literature, although somewhat minimally, but did not follow through with using it in the results, discussion, analysis, or conclusions sections of their manuscripts. Most importantly, none of the professors described where the research would lead them; they did not **close the loop** and describe what changes they would make in their courses or what research questions would be considered for the future.

Comments are very general and not meant to serve as similar to the Peer Review or Refereed process by journal boards. Our priority was on establishing the overall quality of research, or should the professors choose, also implementation of new teaching and learning strategies. Six articles focused on the research; one, however, focused on teaching and learning – implementation. Therefore, it was not possible to review the research process used by that professor, only the student learning data as reported in Section B.11. See the comments below for each manuscript:

! = excellent ✓ = appropriate first draft
 NC = needs more consideration

Table B.12.1: Research Manuscript Review

Professor		Manuscript Title	Research Questions	Quality Design	Methods	Procedures	Literature	Discussion & Interpretation	Conclusions and Recommendations
Coller, Brianno Mechanical Engineering	! ✓	<i>An experiment in hands-on learning in engineering mechanics: statics</i>	Yes	Yes	Yes	Yes	Yes	Yes	1. Consider writing a manuscript this well describing the program. 2. Use more education and learning terminology 3. Close the Loop: Also where are you going from here? What changes will this lead you to make in the course next time? Does this lead you to reconsider the design and research again, or on to other research questions? New hypotheses?
Gupta, Abhijit Mechanical Engineering	! ✓	<i>Effect of order of administration of Performance Assessment and Traditional Assessment</i>	Yes	Yes	Yes	Yes	Introduction good; could choose to expand, revealing more literature context for your study	Needs more discussion and interpretation in context with current or related research; if none, then establish that there seems to be no other studies similar to this one	1. Introduce more learning theory; theoretical basis for study 2. Introduce program 3. Use more education and learning terminology 4. Could reference literature in consideration of discussion about results; whether that means adding a “discussion and interpretation” section before results and conclusions?? 5. That would enhance the overall effect of what you are presenting. And there is really a lot more to discuss. 6. Close the Loop: Also where are you going from here? What changes will this lead you to make in the course next time? Does this lead you to reconsider the design and research again, or on to other research questions? New hypotheses? 7. edit for infinitives 8. use listing and numbers (e.g., research questions, indent and number) 9. check organization and structure

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Table B. 12. 2: Research Manuscript Review

Professor		Manuscript Title	Research Questions	Quality Design	Methods	Procedures	Literature	Discussion & Interpretation	Conclusions and Recommendations
Regina D. Rahn and Reinaldo J. Moraga Industrial Engineering	! ✓	<i>The Study of Knowledge Retention and Increased Learning Through the Use of Performance Based Tasks</i>	Yes	Yes	Yes	Yes	Introduction good; could choose to expand, but also not necessary	Needs more discussion and interpretation in context with current or related research; if none, then establish that there seems to be no other studies similar to this one	<ol style="list-style-type: none"> 1. Introduce more learning theory; theoretical basis for study 2. Use more education and learning terminology 3. Explain program 4. Could reference literature in consideration of discussion about results; whether that means adding a “discussion and interpretation” section before results and conclusions??? 5. That would enhance the overall effect of what you are presenting. And there is really a lot more to discuss; 6. Close the Loop: Also where are you going from here? What changes will this lead you to make in the course next time? Does this lead you to reconsider the design and research again or on to other research questions? New hypotheses?
Reinaldo Moraga and Regina Rahn Industrial Engineering	! ✓	<i>Studying Knowledge Retention through Cooperative Learning in an Operations Research Course</i>						<p>Must source literature (e.g., into paragraph-coop learning is well known in literature); have to source these type of statements and mention exactly “what” about coop learning;</p> <p>You did that later, so just source up front;</p>	<ol style="list-style-type: none"> 1. Introduce more learning theory; theoretical basis for study 2. Use more education and learning terminology 3. Explain program 4. Could reference literature in consideration of discussion about results; whether that means adding a “discussion and interpretation” section before results and conclusions??? 5. That would enhance the overall effect of what you are presenting. And there is really a lot more to discuss. 6. Close the Loop: Also where are you going from here? What changes will this lead you to make in the course next time? Does this lead you to reconsider the design and research again or on to other research questions? New hypotheses?

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Table B.12.3: Research Manuscript Review

Professor		Manuscript Title	Research Questions	Quality Design	Methods	Procedures	Literature	Discussion & Interpretation	Conclusions and Recommendations
R. A. Tatara, PhD Technology	✓ NC	<i>Applying Detailed Student Learning Objectives, Group Learning, and Assessments in an Introductory Polymers Course</i>	Not mentioned in manuscript	Yes	Not clear in manuscript; number or separate linearly; Introduce study; set it up with other research and literature context; Identify what you are going to do clearly; Present methodology and procedures;	Not clear in manuscript; number, separate	Some used; but some critical sources not there; need more, especially theoretical basis;	So much more possible in context with literature; Good stage setting for course change from professor centered to student centered; remember knowledge and assessment centered complete the balance; show clear connections to national standards IMPORTANT The “reversed” and “intentional” process is: a. outcomes b. assessments c. teaching models, etc.;; see page 3 bottom	<ol style="list-style-type: none"> 1. Background introduces the college and program context; add Introduction to the study 2. use more education and learning terminology 3. need literature to set study context 4.**Introduce more learning theory; theoretical basis for study; add literature to interpret study results 5. break away somewhat from lab report type writing to research manuscript style 6. add abstract and key descriptors; .consider overall organization and structure 7. be clear about: “student learning outcomes,” NAIT national standards (whereas ABET has labeled theirs “outcomes,” we began with term objectives because that was traditional language and the way some had it in their course, as course learning objectives, etc.) 8. be more specific about change process; that will impress readers and help them to understand magnitude of change 9. must source (e.g., individual vs. group learning accountability, Johnson, etc.) 10. source program, etc. 11. In intro, add intro to CEET program, etc.; that is the context of the study 12. results are good, but what does this mean for the course and other courses? Is replication needed? Close the loop; identify changes for next time teaching course 13. change fonts and size in graphics or boxes-reader impact 14. Conclusions must be addressed related to theory and other studies or research; connect and discuss, then interpret, then conclude 15. Close the Loop: Also where are you going from here? What changes will this lead you to make in the course next time? Does this lead you to reconsider the design and research again or on to other research questions? New hypotheses?

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Table B.12.4: Research Manuscript Review

Professor		Manuscript Title		Quality					
			Research Questions	Design	Methods	Procedures	Literature	Discussion & Interpretation	Conclusions and Recommendations
Azad, Abul Engineering Technology	! ✓ NC	Suggest new titles to better reflect manuscript content Re-design of an Introductory Digital Electronics within an Electrical Engineering Technology Undergraduate Program Reflective Practice – Part I: Course Re-design in Engineering and Technology Using Educational Theory, Research, Best Practices: Part I The Scholarship of Teaching Through Reflective Practice – Part II: Experimental Classroom Research in Engineering and Technology	NA Implementation and Program manuscript Appropriate approach: Program description and outcomes was focus, not classroom research; Resesarch article will be prepared as second manuscript	Ok for type of article Appendixes – good approach for presenting products	NA for research, but for presenting program process, ok	NA for research, but for presenting program process, ok	You have some good sourcing, but can use more literature throughout	Expand this section and use literature to discuss as similar, dissimilar, or how we have gone in a new direction	<ol style="list-style-type: none"> 1. The priority of the manuscripts was to prepare a manuscript about the classroom research as that is the primary focus of the initiative. 2. Consider using more sources in the Intentional Instructional Design section. Use Wiggins for Reversed Design, Dick and Carey for Systematic Design, Jule Scarborough for “Intentional” or all three when used together. 3. Edit for prepositions and infinitives 4. Note that Reflective Practice is what you engaged in to prepare for The Scholarship of Teaching; then, continue, as you do, and discuss “Critical Reflection” for students; Portfolio Assessment is a good example for Self-Assessment. Use some sources and check understanding and meanings. 5. Must source appropriately throughout; e.g. Assessment System, need to note Kuhs et al for basic model, then program and Jule for extended model, then you..... 6. Discuss results; itemize changes, then express how each change you implemented worked or did not work. Discuss what you think occurred, OR why it seemed to work or why not, then.... 6. Close the loop....identify changes for the next time based upon what was learned during this implementation. How did the students respond to the new course strategies? And, more. 7. Later, when you write the research manuscript, also: . Close the Loop: Also where are you going from here? What changes will this lead you to make in the course next time? Does this lead you to reconsider the design and research again or on to other research questions? New hypotheses?

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Table B.12.5: Research Manuscript Review

Abdel-Motaleb Ibrahim	✓ NC	<i>Instructional Research Project: Learning at the Expert Level "Investigation" of the Impact of Cooperative Based Learning on Engineering Student Learning"</i>	Yes	Yes	Yes	Yes	<p>None; really need to build study context with literature</p> <p>Also need to interpret and discuss using literature</p> <p>How does your study fit into the picture; relate it to other studies; or note it as new or different</p>	<p>In context of results, but not in context of related research or theoretical literature</p>	<ol style="list-style-type: none"> 1. Need introduction to study and program; use education and learning terminology 2. Use more education and learning terminology 3. needs literature to set study context **Introduce more learning theory; theoretical basis for study 4. needs literature to interpret study results 5. needs to introduce study with questions, design, methods, procedures 6. needs to break away somewhat from lab report type writing to research manuscript style 7. research focus needs to be evident in title, abstract, or body 8. be clear about: "student learning outcomes," NAIT national standards (whereas ABET has labeled theirs "outcomes," we began with term objectives because that was traditional language and the way some had it in their course, as course learning objectives, etc. 9. be more specific about change process; that will impress readers and help them to understand magnitude of change 10. must source (e.g., individual vs. group learning accountability, Johnson, etc.) 11. need to source program, etc. 12. In intro, add intro to CEET program, etc.; that is the context of the study 13. what "uncontrolled variables" in concluding remarks; this would be great to discuss 14. Use boxes or graphics to present rubric, test items, etc. to separate them from other language 15. design graphics-lines off 16. consider overall organization and structure 17. . Close the Loop: Also where are you going from here? What changes will this lead you to make in the course next time? Does this lead you to reconsider the design and research again or on to other research questions? New hypotheses?
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