The Journal of Effective Teaching
an online journal devoted to teaching excellence

Volume 13/Issue 2/September 2013
Online at http://www.uncw.edu/cte/et/
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The Journal of Effective Teaching is published online at http://www.uncw.edu/cte/et/. All submissions should be directed electronically to Dr. Russell Herman, Editor-in-Chief, at jet@uncw.edu. The address for other correspondence is

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(ISSN 1935-7869 for limited print issues and ISSN 1935-7850 for the online issues)

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The Journal of Effective Teaching is accepting submissions for review for the Spring 2014 issue. Manuscripts will be due October 31, 2013. The expected publication date will be February 28th. Articles will be accepted in any of the Content Areas supported by the journal.
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Manuscripts for publication should:

- Follow APA guidelines (5th Edition).
- Include an abstract and 3-5 keywords.
- Typeset in English using MS Word format and 12 pt Times New Roman
- Articles/essays on effective teaching should be 2000-5000.
- Research articles should be 3000-8000 words.
- Tables and figures should be placed appropriately in the text.

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Letter from the Editor-in-Chief:
Are Grades a Necessary Evil?

Russell L. Herman
University of North Carolina Wilmington, Wilmington, NC

No matter how much we employ innovative teaching methods, investigate how students think and learn, or spend late hours networking with our classes, eventually most of us will have to grade exams and papers, post grades for courses, and fret over recording less than optimal grades for some students. Grades can disappoint both students and faculty. They have also been the subject of debate within and outside academic circles.

Are grades necessary? There is an expectation that end-of-course grades are useful in providing information about student achievement. Some instructors say that students should come to class with a desire to learn and not have to stress over grades. After all, the university is a community of scholars and introducing grades into the mix is contrary to our goals. Other instructors would attribute some aspect of importance to grades. Grades are used for assessment; as feedback for both students and instructors; for evaluation of student performance; as motivation to learn; to increase competition amongst students; or, to rank and sort a cohort of students. The grades are then be used by parents, employers, or post-graduate institutions to open doors for further education. Setting high standards leads to a trust in the professional we count on such as doctors, nuclear engineers, chemists working with drugs, bridge engineers, and teachers.

Current grading practices are relatively new. The first public exams, such as apothecary or civil service, started in the 1800's. By the 1900s, school systems had grown and the report card became a common instrument for reporting student progress (Moll, 1998). Grades were often reported as percentages. During the 20th century school systems experimented with different grading systems. Now we mostly see letter grades with the possible additions of plus/minus, pass or fail, and possible addition or deletion of some subset of these. Interesting discussions of this history can be found in Drum (1993) and Schneider and Hutt (2013).

Grading is personal and the reasons for assigning and weighting grades are up to the instructor. The composition, or what goes into a grade, could be based entirely, or in part, on examinations, effort, practice, and improvement. The University of Illinois at Urbana-Champaign Center for Teaching Excellence (2009) is one of many centers which provides advice for all aspects of grading. Having decided on the approach to take towards grading which is appropriate for the discipline and level of the course, the instructor

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1 Author’s email: hermanr@uncw.edu
2 The difference between letter grades and percentages is referred to as norm-referenced or criterion-referenced, respectively (UNC Center for Faculty Excellence, 2012).
should elaborate on the grading rubric in the syllabus. Covington (1989) discusses the meaning of grades. However, we need to understand that grades shouldn’t be “confused with self-worth or innate intelligence.”

Determination of which slot to assign to students is an art. Those who believe that the grades should be distributed such that a few students are deemed excellent and others should fail might use a bell curve. However, there can be problems stemming from the misuse of the bell curve. [See Fendler and Muzaffar (2008) for an interesting discussion of the history of the bell curve.] Allain (2009) and Richeson (2008) describe in their physics and mathematics blogs, respectively, issues and techniques surrounding curving exam grades. Other instructors might allow all students to receive high grades or all to get low grades depending if they have accomplished the learning outcomes spelled out for the course. Administrators sometimes discourage such practices like in the case that a biology professor was removed and her grades were adjusted higher (Jaschik, 2010).

No matter how one has decided to determine end-of-course grades, a final grade distribution will be recorded. It is these final distributions that have been used by others, rightly or wrongly, to glean something about the history of grading practices over time to compare groups of courses, instructors, or universities to each another. As one example, former Duke University professor Stuart Rojstaczer (2002) analyzed data from studies of grade inflation that had been compiled on many schools and had reported these results at his web site, http://www.gradeinflation.com/, in interviews, and later in articles (Rojstaczer & Healy 2010, 2012). As noted by gradeinflation.com,

“In the 1930s, the average GPA at American colleges and universities was about 2.35, a number that corresponds with data compiled by W. Perry in 1943. By the 1950s, the average GPA was about 2.52. GPAs took off in the 1960s with grades at private schools rising faster than public schools, lulled in the 1970s, and began to rise again in the 1980s at a rate of about 0.10 to 0.15 increase in GPA per decade. The grade inflation that began in the 1980s has yet to end.”

Rojstaczer and Healy (2010) had noted that there was a 0.12 increase in GPA in public institutions and 0.15 in private institutions over a fifteen year period ending around 2005-6. These results have become referenced in the media since that time. However, one needs to be careful as to what these results mean. Hu (2006) notes that grade inflation consists of a number of pieces: grade increase, grade inflation, grade compression, and grade disparity. While grade increase is simply an increase in grades, grade inflation refers to an upward shift in GPA without a similar rise in achievement,. One must also take into account grade compression, which occurs when grades increase but differences in student performance are hard to distinguish at the high end of the grading scale. Grade disparity results when different professors award drastically different grades the same level of student achievement. Therefore, the sole reporting of grade increases is not enough to indicate that there is grade inflation. [See (Johnson, 2006) for a review of Hu’s report.]

3 Similar discussions are reported in the U.K. as noted in the Daily Mail, http://www.dailymail.co.uk/news/article-2238151/University-exams-enter-history-books-coursework-blamed-grade-inflation.html

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As an example, in 2007 we had looked at grade distributions on our campus. In Table 1 we see that there is no noticeable trend in the GPA’s. We then looked at grade distributions for lower and upper level courses and played with the data. As one example, we considered distributions of all grades, A, A-, B+, B, B-, etc. and then regrouped the data into bins of A’s, B’s, C’s, D’s, and F’s & WF’s by combining the B-, B, and B+ grades, etc. In Figure 1 we show these trends for the data we had at the time. We found that the C’s dropped an average of 0.43% per year, while the combined A and B grades rose about 0.42% per year. The combined A+B+C grades are about level, which agrees with the apparent constant percent of both D’s and F’s in the figure. Thus, the change grade distributions are not reflected in the average GPA.

### Table 1. Academic Year GPA’s from 2001-2007

<table>
<thead>
<tr>
<th>Academic Year</th>
<th>GPA</th>
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<th>GPA</th>
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<tbody>
<tr>
<td>2001-02</td>
<td>2.778</td>
<td>2004-05</td>
<td>2.855</td>
</tr>
<tr>
<td>2002-03</td>
<td>2.826</td>
<td>2005-06</td>
<td>2.847</td>
</tr>
<tr>
<td>2003-04</td>
<td>2.866</td>
<td>2006-07</td>
<td>2.839</td>
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Figure 1. Trends in Grade Groups A, B, C, D

However, noting a rise in SAT scores, the slight upward trend of grades, and the short time span, there was no data confirming that the rise in A’s and drop in C’s, or the lack of a constant upward trend in GPA, were strictly due to either grade inflation or the changing characteristics of the student population. Nonetheless, in recent years some universi-
ties have are fighting grade inflation by contextualizing grades on student transcripts; i.e., included the class average for courses (Eubanks 2011).

Grading is one part of what we do. While grades are not acknowledged to be part of program assessment, the way in which one evaluates student achievement can be used effectively to provide a better learning environment. Grades can be used to evaluate the quality of student work, communicate that quality with students and others, motivate students, and guide instructors in the design and organization of courses. While there is not one way to handle grading, an instructor can put as much effort into the grading process as the topics and assignments to be covered. An instructor can set learning goals, assignments, and tests to measure what is valued in each topic and expectation of what the students should be learning. Instructors can then assess their grading practices. [See (Walvoord & Anderson, 1998) for ideas on effective grading.]

Do not leave the motivation up to the pure motivation of students needing to attain a certain grade, but seek to motivate learning and tie achievement to that. Look at assignments and exams and evaluate them as to whether or not they are effectively assessing the achievement of your goals or providing sufficient motivation for the students. Some of the ways to do this can be found in the writing of many of the authors in JET. As noted by a colleague, grades are not a measure of catching students at their worst, but should be used to motivate students and instructors to do their best work.

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Teaching Beginning College Students with Adapted Published Research Reports

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Abstract

This study used peer-reviewed published research reports to teach a seminar on learning and memory to first-semester college students. Complete reports (not summaries, reviews, or news reports) were re-written by this author to be more “student friendly” to college freshmen. These adapted published research reports (APRRs) retained original structure and key data but omitted references and tangential data while providing explanatory notes.

Rather than lecturing the students about the papers, the approach was to engage students directly in scientific thinking by requiring them to work first individually and then as analysis teams to conduct a simulated peer review of the APRRs. To prod higher-level analysis, students were required to develop insightful answers to 21 scaffolding questions. All questions required critical thinking, and seven specifically called for creative responses. The questions prompted the students to think deeply about alternative approaches for testing, organizing and presenting results, meaning of the results, and the broader implications of the research.

An end-of-course survey revealed that students regarded the experience positively. Most believed they learned more than they would have from lectures, had more interest in the subject matter, were less intimidated by research reports, grew in ability to comprehend research, and felt pride in realizing they could think at this level.

This application of APRR seems to be a useful and engaging way to teach in a freshman seminar. Lessons learned include the need to provide more advance explanation about the nature of research in the field and more professor feedback on the students’ simulated peer reviews. But, the results do lend support to the claim of others that APRRs can teach the nature of scholarship better than textbooks.

Keywords: Adapted research reports, seminars, teaching scholarship, peer review.
lem solving. The use of APRRs is a relatively new idea in science education and apparently has not been used as done here in a seminar context nor has anyone seemed to have required students to work as analysis teams to conduct simulated peer reviews. Specific hypotheses about the APRR teaching approach tested here include:

1. **Content mastery**: this kind of supplementary teaching should promote greater student engagement with the content and more active learning than with lecturing. Students should learn about the research process.

2. **Self assurance**: students should improve their ability to evaluate research, feel more confident in analyzing research reports, and be positively reinforced by the realization that they could generate insights that were not presented by professional authors.

The purpose of this report is to show how this approach to teaching can be relevant for any one-hour seminar course, while providing some insight on how students might react if APRR experience were incorporated into a traditional beginning science or engineering course. By testing with freshmen, findings might be applied to gateway courses in science in the hope of improving their learning in later courses, reducing attrition, and attracting new science majors.

To promote intellectual engagement with the content of APRRs, students were required first individually and then as analysis teams to conduct simulated peer reviews and present their analyses to the class.

**Rationale**

Introductory science courses are often the target of the common criticism of undergraduate science and technology education as too broad and shallow (National Research Council, 2011). Many critics of traditional science and technology education charge that traditional lectures tend to bore students and lack proper emphasis on scientific thinking and process (Aldridge, 2012). The NSF report, “Shaping the Future: New Expectations for Undergraduate Education” (NSF, 1996) stresses the need to develop critical thinking skills, address the current applications and implications of didactic instruction, and encourage students to develop skill in communicating scientific ideas and thinking.

Science educators increasingly realize that traditional education in introductory courses does not give students enough experience with the essence of science and technology: scientific reasoning and argumentation (Llewellyn & Rajesh, 2011). Students frequently fail to see how knowledge is constructed and they misinterpret presentation of science in popular media and everyday conversation (Cavagnetto, 2011). Students likewise do not appreciate the central and crucial role played by reading and writing in the advancement of science. Their focus too often is on memorizing enough material to pass multiple-choice examinations.

Undergraduate students should learn to think like scientists in order to realize the excitement and joy of discovery. Using scientific journal articles to teach scientific inquiry and
reasoning skills lets students obtain a deeper and more authentic understanding of the scientific method and processes than is provided in other teaching resources. Scientists learn their craft largely from reading journal articles. Undergraduate students could learn in the same way if the journal articles were adapted for easier comprehensibility.

Science, as practiced by professionals, requires peer review by outside experts who critique the experimental design, methods, data, and the scientific reasoning the authors used to construct their hypotheses, explanations, and argumentation. Why can’t students learn about science the way it is practiced in the real world?

What might APRR learning experiences provide that is not already readily available in many traditional lectures and textbooks? APRR learning activities can address many of the key findings about how science is learned. APRRs provide the specific advantage of focus on core ideas and minimize jargon and emphasis on terms. Scientific communication seems increasingly “overloaded with unnecessary information, technical detail, and so cluttered with abbreviations, jargon, and acronyms as to be nearly incomprehensible to anyone but the specialist” (Schatz, 2012).

Osborne (2009) suggests that science has become too advanced for lay persons, specifically beginning college students, even if research papers are adapted to be more understandable. Osborne claims that the “entry cost” for the novice reader becomes higher and higher with each ensuing generation. If true, science will become too complicated for students, and science could enter a dark age where there are only a few scientists left. Osborne did, however, stress that teachers often misrepresent science as a “hands-on” activity (of pushing buttons on a machine, doing manipulations in a fume hood, or whatever), instead of being more of a “minds-on” activity—which is the main point of APRR teaching. Thus a key objective of the present study was to test the notion that research reports are beyond the understanding of the novice, in this case freshmen college students.

**Prior APRR Studies**

The idea of teaching with APRR fits well with the current educational emphasis of stressing “inquiry learning.” APRRs emphasize the inquiry nature and the value of evaluating research papers as a way to learn science (Yarden, 2009). In an isolated use of an adapted paper on a mathematical model for West Nile virus epidemiology, Norris, Macnab, Wonham, & de Vries (2009) report that the APRR experience helped high-school students correct some common misconceptions about mathematical models.

Two valuable features of APRRs, authenticity and support for teachers, were noted by Yarden et al. (2009). They claimed that APRRs can promote the learning of science content as well as science process and that APRRs expose students to an unfamiliar genre of scientific writing.

The approaches of which this author is aware differ from the application in this present study in several key ways. The present study used complete research reports, not just the abstract and introduction of a research report as used by Falk and Yarden (2011). Ira
Clark and colleagues (Clark et al. 2009) used a form of APRR in a seminar environment in which the professors provided lecture explanation. This approach eliminates the need (and benefits) for students to read (which today’s students often avoid when possible).

None of the studies of which I am aware required students either to 1) conduct a critical analysis in the form of simulated peer review, or 2) create an academic deliverable such as a written report or class presentation on the analysis.

**Methods**

**Students**

APRR activities were used in a Freshman Year Seminar class on learning and memory given in the Fall of 2012 for incoming students. The course met for one hour once a week, with pass/fail grading and a one-semester credit hour credit. Attendance was mandatory. Enrollment consisted of twenty four students in 13 academic majors.

**Adapting Published Research Reports**

Eight published research reports on learning and memory were re-written by the author as a third-party description of what was said in the original, only with simplification, footnotes of added explanation, condensation of some data, and elimination of references and the more arcane or tangential parts of the original. Each adapted paper maintained the structure and overall style of the original report but was adjusted to the conceptual understanding, reading level, vocabulary, and mathematical skill of undergraduate college students. Ideas in the original text were not enhanced, nor were professor opinions interjected. The reading level was word-processor scored as 12th grade or less. After adaptation, the page length was usually reduced to 3 to 5 pages.

Four APRRs were assigned in the first half of the semester and four in the second half. Although a given student group only analyzed one of each set of four APRRs in depth, they were required to have a minimal knowledge of the other three papers so that they could participate more meaningfully in debate and discussion over the conclusions reached when the in-depth analysis of those papers was presented by other students.

**Simulated Peer Review**

Each student individually answered 21 questions intended to serve as scaffolding for the analysis (see Appendix). Questions stressed the need for critical thinking and insight. Each student had to show the professor a bullet-list response to each of the scaffolding questions on the paper they were assigned for in-depth analysis. This assured that each student had thought about the issues and was prepared to contribute to the group analysis. Then, I formed four heterogeneous analysis teams of six members each, which were to use some of the formalisms of effective collaborative learning (Gabbert, Johnson, & Johnson, 1986; Johnson, Skon, & Johnson, 1980; Johnson & Johnson, 1981; Johnson & Johnson, 1989; Kadel & Keehner, 1994). In general, the educational literature shows that
collaborating students are more active learners than they would be from passively listening to lectures. They improve their understanding and insight about content from group interaction. They should also learn communication and small-group “struggle and subtlety” social skills that are relevant to a laboratory or office after graduation.

Each analysis team selected its own team captain, and the other members negotiated role assignments. Teams had four weeks to debate the issues, reach consensus, and develop their simulated peer review presentation to the class.

Students were cautioned to avoid trivial comments and reminded that no one study is supposed to be exhaustive. Students were to think of a research report as a package of ideas. The issue for them to emphasize was not so much the size of the package but the quality of its contents. Instructions urged students to focus on matters of theoretical concepts, design, methodology, and interpretation that the investigators could have improved on had they thought hard enough about it. Students were encouraged to be innovative and challenge weaknesses in the paper. Students were reminded of the obligation of every student in the group to participate in the consensus building on answers to the scaffolding questions. The analysis was to emphasize insight on ideas and conclusions that were apparently not recognized by the authors.

**Classroom Implementation**

The basic approach was tested in a First Year Seminar class, a recently established program of the university aimed at helping students adjust to the intimidating environment of this huge (50,000+ on-campus enrollment) research university. The idea is to enroll incoming first-year students in a seminar of their choice in a small-class, low-stakes environment (maximum of 20 students). The enrollment limit for the learning and memory seminar described here was raised to 25 because of the course popularity (one student dropped the course after the first class meeting).

These seminars are supported by many senior faculty, and it provides a way for incoming students to become acquainted with the university’s top-ranking professors. Teaching such seminars seems to appeal to senior professors because it is an easy task for them and the environment is more informal and cordial for both students and professors than in typical high-stakes courses. At the professors’ discretion, the seminars are graded or listed as pass/fail.

Class periods are 50-min long, and in this Learning and Memory seminar usually involved student work on the APRRs, followed by 15-20 minute lectures. In the first two class periods students worked alone a single APRR assigned for their simulated peer review without knowing who else in the class was working on the same APRR.

All students had to pass a quiz on the three APRRs that were not designated for in-depth analysis. A short lecture explained that research papers have in principal just four parts: WHY (rationale and hypotheses for performing the study, which is presented in the paper’s Introduction); HOW (experimental design and methods, found in the Methods sec-
tion), WHAT (the basic findings, found in the Results section), and SO WHAT (the implications and “take-home” message of the paper, found in the Discussion section). For each category, students were told it would suffice to memorize one or a few bullet points that captured the essence of each part of the paper.

To make memorization of the bullet points easier, students were taught the well-known memory-peg technique in which each the ideas was represented in an image that integrated the bullet-point ideas in an imagined scenario or story. Students were taught on the first day of class a new composite flash-card study system (Klemm, 2012a). In this system, clip-art images are pasted in table format in an animated PowerPoint, one row of four icons for each unassigned report (memory of information is facilitated by where it is located and images are easier to remember than words). Self-testing during study was to consist of anticipating what the first icon represented (WHY) and how that image served as a mnemonic peg for the associated bullet points. Then, a mouse click advanced to the next icon, and so on. Readers can download a sample composite flash card from a link at http://thankyoubrain.com/consultant.htm.

Then, in the third class period, heterogeneous teams were formed and students began team building and group consensus throughout periods 4-6 and took a quiz on the three unassigned reports. In the 7th and 8th class periods, student groups gave their simulated peer review presentations to the class and conducted class discussion. Two teams gave presentations in each class period.

In the second half of the semester teams remained intact and four new APRRs were used. We repeated processes of the first half, with a couple of exceptions: 1) All team members switched roles, so that each student gained experience with at least two team roles; 2) For the three papers that were not assigned for simulated peer review, each student individually and independently prepared a composite flash card mnemonic for the Why, How, What, and So What aspects of the reports. This was to be in PowerPoint (not Word, as many students had used in the first half of the semester—see Results) so they could self-test in flash-card mode and discover how much easier things are to memorize that way.

Tests of Hypotheses

Content mastery and confidence were assessed by an end-of-course survey that measured student self-assessment of content mastery and confidence in analyzing research reports. Students completed the post-course survey (10 questions on a 5-point Likert scale) on the last day of class. To prevent mindless box checking, some of the questions were worded negatively, and students were advised of the need to read questions carefully. Six of the questions dealt specifically with the simulated peer review experience, and only those results are reported here.
Results

Quiz performance on Unassigned Papers

On the quizzing for the first half of the semester, only two of the 24 students got all the answers correct for all three of their unassigned papers. It was clear that the vast majority of students had recall difficulties, even though they had three weeks to prepare and memorize simple bullet-point answers for the “Why, How, What, and So What” of three papers. Because it seemed clear that most students did not use the mnemonic strategies that had been covered in the lectures and in their text (Klemm, 2012b), students had to show evidence for the next set of APRRs that they had developed a memorization strategy by using the composite flash card system (Klemm, 2012a). However, when students submitted their “flash card,” many students prepared them in a MS Word document, not PowerPoint. That is, the icons and associated bullet lists were pasted into one document without any animation. In that form, students fell back into the old study habit of “looking over” material to be memorized, not using the power of mental images and explicit self-testing. There was no way to know if they used the images as mnemonic pegs, but the poor test results suggested they did not.

Group Simulated Peer Review Presentations

Students were told to go beyond simple bullet-point slide show format that listed their answers to the scaffolding questions. Even in the first set of presentations, the students presented their analyses in an engaging and informative way. All groups effectively used either two or three team members to deliver the presentation. The slideshows were well crafted. One group even used Prezi instead of PowerPoint. However, the depth of analysis and insight were not at the hoped-for level. Most students were not rigorous or creative analysts.

Student Self-assessment

Content Mastery. More than 2/3 of the class (score of 4 or 5) believed they learned more about the subject of the two papers they analyzed than they would have if that material had been presented as lecture (Fig. 1).

Only about 1/3rd of the class believed they learned much about the research process, while nearly 45% reported no effect (Fig.2). About half the class thought the simulated peer review was more interesting than listening to lectures, but the others concluded there was either no difference or else preferred lectures (Fig. 3).

Confidence. Nearly half the class reported feeling less intimidated by research reports after the APRR experience. The other half (approximately) felt the same as before. (See Fig. 4.)
Over 2/3 of the class believed they were better able to analyze research papers than before this experience (Fig. 5). No one felt less able in this respect. Over 2/3 of the class were pleased to realize that they generated ideas that did not seem to occur to the professionals (Fig. 6).

Discussion

Student Learning Strategies. Resistance to change in memorization strategy seemed marked. For the first quiz on the three non-assigned reports, most students clearly were
using the rote-memorization strategy they had used during their previous 12 years of schooling. This was evident from the poor test scores and from the fact that many students did not use the PowerPoint format that would have allowed flash-card style self-testing. Informal surveys of these students and others outside of this course indicate that many students have no learning strategy, relying on repeated “looking over” the material until they think they have learned enough to pass tests. The idea of using mental imaging mnemonics is apparently alien. Breaking well-ingrained habits of learning is apparently difficult to achieve in a short time.

The level of critical and creative thinking seemed disappointing to this professor, suggesting that these skills were not well developed in secondary school. To the extent that this conclusion is correct and generalizable, it suggests that a price is being paid for school emphasis on learning expected answers to state-standard questions. This, of course, adds justification to making this kind of experience available early in a college career.

In fact, why not provide some APRR experience in secondary school? Such teaching seems ideal for helping teachers meet the expectations of the National Research Council’s new Framework for K-12 Science Education (NRC, 2011). Simulated peer review of adapted reports specifically addresses the Framework’s requirements for students to learn how to 1) ask questions and define problems, 2) analyze and interpret data, 3) construct explanations and design solutions, 4) engage in argument from evidence, and 5) obtain, evaluate, and communicate information.

### Student Self-assessment

A strikingly large number of students thought they could learn more from research report analysis than if they were presented the same didactic content via lecture (Fig.1). However, this conclusion is tentative, in that no formal examinations were used to compare how much material is retained under the present condition versus lecture instruction on
the same material. Despite this limitation, much memory research clearly establishes that
thinking about academic content is profound memory rehearsal and one of the best ways
to memorize—clearly superior to rote memorization (Klemm, 2012c).

Since most students did not think they learned much about research process (Fig. 2), there
may be a need for a few introductory lectures on how research is done before launching
into journal article analysis. Also, more in-depth debriefing was called for, yet was not
performed because the class schedule called for two student-group presentations in one
50-minute period. More time needs to be made available for the professor to critique stu-
dent presentations, including explanation of the experimental design and methods used in
a particular report. This conclusion is buttressed by the finding that about half the class
gained little confidence in analyzing research (Fig. 4). Even so, the others did gain confi-
dence, in spite of analyzing only two papers under less than optimal conditions.

About half the class retained their comfort for listening to lectures (Fig. 3). Perhaps this
reflects their long history of receiving instruction via lecture format. On the other hand,
since half the class preferred this APRR experience over lecturing, perhaps the others
would change their preference once they had more exposure to teaching that required
more active learning than listening to lectures.

Both measures of student confidence (Figs. 5 and 6) showed large majorities had a new
appreciation for their capacity for creative and critical thinking. While this professor was
not particularly impressed with the rigor of their thinking or level of creativity, it is im-
portant for students to develop the confidence that they can get better at it. Moreover, had
debriefing sessions been more thorough, it is reasonable to expect that students would in
fact learn to be more rigorous in their analysis and more insightful. We need to remember
also that these are students fresh out of high school in their first semester of college. This
kind of experience early-on in a college career might help students gain more out of later
courses.

Comparison with Other APRR Studies

This present study differed from previous reports of APRR experiments in that the stu-
dents operated as a formally structured analysis team. Yet prior to group work, each stu-
dent had to document individual responses to the scaffolding questions provided to guide
analysis. Moreover, the analysis teams had to submit a tangible deliverable (class presen-
tation) rather than just participate in casual class discussion.

This teaching approach enabled coverage of eight adapted research papers and multiple
mini-lectures in a one credit-hour seminar format. Thus, a seminar course on any topic
could be conducted similarly with research papers selected to fit the seminar topic. This
same plan could be modified as part of a traditional four credit hour course, perhaps as a
substitute for some of the traditional lecture hours or recitation sections.

The results of improved student comfort, confidence, and interest in learning from re-
search reports is consistent with similar findings by Hoskins, Lopatto, & Stevens (2011).
They found that upper division and graduate students who were systematically guided through review of non-adapted research publications developed improved attitudes about the nature of science. Their post-course surveys revealed significant changes in students’ self-assessed confidence in their ability to read and analyze primary literature, understanding of the nature of science, and epistemological beliefs (e.g., their sense of whether knowledge is certain and scientific talent innate).

**Other Applications for APRR Teaching**

Professors in multiple STEM disciplines would ordinarily use APRR exercises as a change-of-pace supplement to their traditional teaching—perhaps to augment a particularly difficult or important component of the course. Options for deploying APRR activities include: 1) inserting them as homework after lectures have provided appropriate background, 2) substituting them for term papers, 3) substituting them for one or more lab or recitation activities, and 4) making them the core of an entire course, such as a seminar or honors course. Another option is for the professor to introduce the main issue in the APRR, ask students how they would address it, and then use the APRR to illustrate how it was actually addressed. Yet another option is a Citation Index exercise, wherein students create citation maps of the papers that cited the APRRs and explain how the citing papers relate to each other (Klemm, 1976. See also Klemm, 2009).

Professors could integrate popular media reports on the APRR, both to pique student interest and to present basic concepts before an APRR learning activity. Including popular media reports is also important because after graduation most students will receive science information mainly from popular media sources (television, newspapers, websites, etc.), and their APRR experiences will help them evaluate the content more meaningfully. Students without APRR experiences interpret popular media reports quite differently than experts (Zimmerman, Bizanz, & Bizanz, 1999).

These results suggest a way to enrich gateway courses with supplementary learning materials that are more engaging and authentic than typically found in lectures and textbooks. Expected benefits include:

1. More active learning,
2. A way to provide inquiry learning experiences without the cost and preparation needed in wet labs,
3. A stimulating change-of-pace from traditional classes,
4. An opportunity for developing critical and creative thinking skills,
5. Increased long-term student interest in specific research issues, student confidence building, and opportunities to recruit students to become college majors in science and engineering disciplines.

My impression, though not systematically measured, was that these APRR experiences accelerated the transition from high-school level learning styles to the more mature approach needed in college. The right choice and application of APRR activities in a course
could promote an academic culture that engages and inspires students, as well as prepares them for more mature approaches to learning in their later classes.

Finally, the APRR approach seems scalable. Certainly, the experience reported here indicates the suitability for small seminar classes. But even with hundreds or thousands of students in a class, direct professor-student interaction is simplified by the “command structure” of analysis-team captains and the systematic division of labor provided by team member roles. Large-class lectures can be replaced with didactic content presented on-line as videos, readings, and slide shows, with the complement of APRR as problem-based learning experiences that provide in-depth coverage of a topic, help develop collaboration and communication skills.

Conclusions

APRR activities help students focus on the issue of how we know and the nature of evidence. Paradoxically, argument and debate are common in science, but are virtually absent from science education (Osborne, 2010). Moreover, in this present implementation of research report analysis, the learning is spaced over time so students have time to find related information, ruminate, and debate among themselves. APRRs can teach how: 1) science and technology issues are identified and approached for testing; 2) ideas evolve from historical perspectives; 3) various experimental designs and methods have advantages and limitations; 4) data are illustrated and evaluated statistically; 5) experiments can test hypotheses (that is, the difference between data and evidence); 6) research relates to traditional course content; and 7) research is a necessary element of university education.

The simulated peer review of APRR gives students the opportunity to develop their capacity for insightfulness, helping students learn to think critically and creatively, not just memorize answers for multiple-choice exams. Knowing the WHAT of a given discipline is not enough. Students also need to know the WHY, HOW, AND SO WHAT. In-depth analysis of APRRs can enhance such skills such as questioning, predicting, connecting to prior knowledge, and summarizing. APRRs promote critical thinking skills such as persuasion, interpretation, consideration of multiple perspectives, evaluation, and application.

This application of APRR seems to be a useful and engaging way to teach a freshman seminar. Lessons learned include the need to provide more advance explanation about the nature of research in the field and more professor feedback on the students’ simulated peer review. The simulated peer review approach can accomplish something that is often neglected in introductory science and technology courses: require students to show insight. Students can develop insight capability if it is expected of them, but this present study revealed that beginning students have not generally developed capacity for creative scholarly thought.

Nonetheless, this approach has the rare benefit of engaging students at every level of Bloom’s Taxonomy of Learning Domains (Lightle, 2011). Moreover, the results do lend
some support to the claim of others that research reports can teach the nature of scholarship better than textbooks (McComas, Clough, & Almazroa, 1998).

References


Klemm, W. R. (1976). Teaching physiology with "Citation Index". The Physiology Teacher. 5(4), 8-9.


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Appendix. Research Paper Analysis Questions

Introduction.

1. Was there an explicit hypothesis? If not, what was the implicit hypothesis?
2. How reasonable does the rationale seem? Why or why not?
3. What are some alternative ideas that were not considered. Does this research seem scientifically important? Is it important in other ways? Why or why not?

Methods.

1. Is the design adequate? Why or Why not?
2. How well do the control groups serve as checks on variables that could influence results other than what is being tested? Why or why not?
3. Describe the negative control group and its function? Are there important variables that the control group does not account for?
4. Is there a positive control group or is one needed?
5. Is double-blind testing needed and used? Why or why not?

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6. Do the data-collecting approaches or devices seem appropriate? Are they sensitive enough for what is being tested?
7. Are there other approaches or devices that might have been better to use?

Results

1. Do the results support the hypothesis or not? How convincing is that support?
2. Do you notice anything of potential importance in the data that was not commented on by the authors?
3. Is the variance in data large enough to suggest that some variables are not being controlled? What might these be?
4. Apart from the statistical effect, what is the magnitude of the ‘treatment’ effect? Is it large enough to be of much practical importance?

Discussion

1. Summarize how the authors discussed the results in terms of their original hypothesis.
2. Did they point out implications that go beyond the hypothesis?
3. What implications did the authors perceive that go beyond the original hypothesis. Do you perceive any other implications?
4. What ideas for future research did the authors generate? What ideas for future research do you generate?
5. Note any important information that was not commented on by the authors.
6. Does the author state a “take-home” lesson?
7. How would you state the “take-home” lesson?
Student Research in an Introductory Psychology Course: Outcomes of Two Experiential Learning Projects and Implications for Instruction of Human Subjects Research

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Abstract

The present study describes student learning and personal outcomes associated with learning research methods in introductory psychology, via one of two semester-long projects: one involving performing naturalistic observation of the behavior of community members, and the other involving performing a 60-minute interview of local veterans regarding a psychological concept (incorporating features of service-learning). Both projects taught the same basic research concepts. Among students completing the observational project (n = 38), strong Time 1 scores on a research methods quiz declined slightly by Time 2 assessment; interest in aggregating and interpreting data declined; and personal attitudes about community service did not change over the course of the semester. Among students completing the service-learning project (n = 41), quiz scores and interest in research did not change, and attitudes about community service changed in some ways over time (depending on student age). It is concluded that encouraging original scholarly inquiry among introductory-level students can have various academic and personal benefits to students, but that service-learning elements in such projects may increase their attractiveness to students. Limitations and recommendations for future research are discussed.

Keywords: Service-learning, teaching research methods, teaching psychology, community service attitudes.

Undergraduate research projects have become a recommended means of teaching students how knowledge is generated in a variety of fields (Kardash, 2000; Seymour et al., 2004). The hallmarks of well-designed undergraduate projects include mentorship by faculty with expertise in that research approach; meaningful student input to the research process and product; application by the student of accepted research methods to the question at hand; and the ultimate creation of a product that can be subjected to appropriate review within the discipline (Hakim, 1998). Much of the existing literature on undergraduate research that meets these hallmarks focuses on senior capstone products. Such activities have been shown to increase student confidence in their professional abilities, deepen student knowledge of a given research topic as well as the research process, contribute to a sense of collaboration and collegiality with faculty (Seymour, Hunter, Laursen, & Deantoni, 2004), help students feel integrated into their chosen discipline.

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(Hakim, 1998), and improve student mastery of research-related tasks (Kardash, 2000). Accordingly, many institutions have undertaken to incorporate formal undergraduate research projects into their curricula (O’Quin, 1996; Searight, Ratwick, & Smith, 2010). The value of these projects to learning among advanced students is gaining empirical support; however, less attention has been paid to how such projects might be employed in introductory-level courses, such as introductory psychology (e.g., Kazmerski & Blasko, 1999), and what effects they might have on learning and attitudes about research at the 100-level (though Thieman, Clary, Olson, Dauner, and Ring (2009) is a notable exception). This is an interesting question for instructors of various introductory courses in psychology, sociology, history, and communications to consider, because fields such as these that use human subjects-based research methods can lend themselves well to the creation of active learning projects by instructors (Elias & Pratkanis, 2006). However, as many students who take such courses are not majors, instructors considering using such projects in their pedagogy should understand how introductory-level students respond to the task of carrying out such original empirical projects.

**Integrating Service-Learning Into Teaching Research Methods**

Service-learning is educational coursework that incorporates service to the community in classroom activity, either throughout a course or in specific projects (Bringle & Hatcher, 2009). Service-learning balances the learning goals of students, with the needs of community members or organizations (McCann, 1996). When college students are involved in service-learning, they are not only given a unique and emotionally engaging opportunity to explore and apply course concepts, they also are exposed to a diversity of ideas and experiences that are thought to enhance their personal maturing process and development as citizens (Conway, Amel, & Gerwien, 2009; Deeley, 2010; Moely, McFarland, Miron, Mercer, & Ilustre, 2002; Peterson, 2009).

Student outcomes associated with service-learning have been studied relatively more in relation to psychology than to other fields, possibly due to the ease with which psychological concepts can be demonstrated in real-world community work (Kretchmar, 2001). Such projects have been found to offer various benefits to students. For example, participation in service-learning in a psychology course may result in reductions in self-entitlement attitudes among college students (Hoffman & Wallach, 2007) and increased empathy (while students completing general interviews of individuals of their choice, or general research papers, showed no change; Lundy, 2007). In a meta-analytic study of various outcomes of service-learning (in which almost a quarter of all included studies involved psychology courses), Conway et al. (2009) found that service-learning enhanced academic, personal, social, and citizenship outcomes for students, with the largest changes found in academic outcomes and in attitudes about people receiving help through these activities.

Based on such studies, it seemed reasonable to believe that incorporating some service-learning into an introductory psychology course might confer similar benefits. However, none of the studies included in this meta-analysis or elsewhere have specifically examined projects involving service-learning as a forum for teaching human subjects research.
methods. Students new to fields which utilize human subjects research methods often view learning about such research as difficult, unpleasant, or both. Therefore, it seems important to see whether incorporating service-learning as the particular experiential learning approach to this material not only increases student engagement and interest, but also confers academic and personal benefits in addition to that typical of experiential learning. If such an integration showed promise, such projects might be useful to instructors in various fields doing research with human subjects.

**Research Project Descriptions**

Every student taking introductory psychology from the present author has completed one of the two original research projects described below as a course requirement. Most students have completed the Observational Project (OP), with the Service-Learning Project (SL) representing a more recently-added variant.

**The Observational Project**

The Observational Project was designed to reinforce the basic concepts of empirical research with human subjects in a student-centered way, encouraging their creativity within a firm and helpful structure of ethical and procedural guidelines. All students received a long and highly detailed document at the beginning of the semester outlining all requirements of the project, and were placed in groups on the first day of class to begin their work. In this project, groups of 4-6 students developed a simple hypothesis about a specific behavior they predicted they would observe in public. These hypotheses were initially based on student’s own beliefs about human behavior. For their first step in the project, students decided what interesting observable behavior they would like to study, and made a prediction about either who they would observe engaging in it (e.g., what age or gender of person will perform the behavior), or the circumstances under which they will observe it (e.g., what time of day, alone/with others, etc.). Students have most often been interested in social behavior, study behavior, eating behavior, hygiene behavior, driving behavior, or behaviors associated with personal appearance. Students then located and read two scholarly sources on that behavior (or a closely related one), made a plan for data collection that included date(s), location(s), operationalization of all variables, recording of data using a chart, and a plan for observing in a completely unobtrusive manner (e.g., such that no individual being observed would be able to find out that they were being observed). After these plans were agreed upon within the group, every group was required to propose their study to the instructor for consultation and approval (failing to complete this consultation would halt the project and result in a total project grade of 0). The consultation was aimed at providing each group specific and useful feedback about all aspects of their plans, and to ensure the ethical soundness of student ideas; students received significant mentoring in these meetings, as well as encouragement of group cohesion. Afterwards students submitted binding academic contracts detailing their research plans, signed by all members and the instructor. Students then set their own schedule for observing, aggregating, and interpreting their data relative to their hypothesis and previous research. Work days were included in the course schedule to ensure that students would have some time for face-to-face work on the project. All
groups presented their findings in class at the end of the semester, and were expected to be able to answer appropriate questions about their projects. All students also submitted a brief individual report of their work. Grades were assigned based 50% on the presentation given, and 50% on the individual written report. Individual students could also be penalized for lack of group participation through the results of an anonymous peer evaluation.

The Service-Learning Project

Some research has indicated that even very short-term participation in service-learning activity can confer benefits to college students (Reed, Hawley, Reber, & DuBois, 2005). Therefore, a variant of the project that focused on the same research and ethical concepts was developed, using interview methodology (rather than observational methodology). Students carried out the Service-Learning Project by planning, administering, and interpreting a 60-minute interview of local veterans. This focus was chosen for three reasons; 1) the surrounding community has a very high concentration of veteran residents (approximately 10% of county residents are veterans), so it was likely that the project would be meaningful for many students; 2) the campus has many students, staff, and some faculty who are veterans, so it was easy to connect with the local veterans organizations via this existing network; and 3) anecdotes from personal veteran contacts indicated that they often felt ignored, underappreciated, or misunderstood by civilian community members, and this project looked like an opportunity to address that. Having students interview veterans seemed a way to honor their service, and in so doing would meet the spirit of service-learning pedagogy (specifically of striving to meet a real community need).

In this project, groups of 4-6 students were required to choose a research topic from a predetermined list from the textbook; examples of project topics included obedience, memory, stress, personality, and development from adolescence to adulthood. Students proposed hypotheses about how a local veteran would view their topic, wrote interview questions that would test their hypotheses, sought approval from the instructor for their questions and interview plans, and received in-class training on how to conduct a sound research interview and record data. Students were also instructed on how to identify common themes in veteran responses to their questions, and how to present their findings after the interview was complete. In preparation for this project, the Commander of the local Disabled American Veterans (DAV) chapter (to which all veteran volunteers belonged) was heavily consulted. Strong assurances were also provided to the DAV members that 1) students would not be permitted to ask personal questions about wartime or distressing experiences; 2) the instructor would painstakingly review all questions to make sure they were appropriate and contained no sensitive wording or content, and 3) all veteran volunteers would have the opportunity to review all interview questions before the interviews took place. When students completed their proposal consultations with the instructor, reword or replacement of questions would occur as appropriate. Professional and respectful conduct during the interviews was also strongly emphasized as absolutely necessary to their group’s success. Students were also encouraged to consider their role in bearing witness to the thoughts and (if the veterans chose) experiences of their veteran interviewees as an act of service. Students were also reminded that the veterans were do-
ing a great service to them as students by volunteering time for the project. There were no adverse outcomes reported by the students or by the veterans in this project; rather, all verbal reports were positive in nature from both sides. Projects were graded in the SL the same way as in the OP. A summary of how these two projects compare in goals and tasks is presented in Table 1.

Table 1. Summary of Differences Between Observational and Interview Projects.

<table>
<thead>
<tr>
<th>Research Component</th>
<th>Observational Project</th>
<th>Service Learning Project</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overall goal of project</td>
<td>Learn psychological research methods by carrying out a quantitative study of publicly observable behavior</td>
<td>Learn psychological research methods by carrying out a qualitative study of veteran opinions about psychological topics</td>
</tr>
<tr>
<td>Research topic</td>
<td>Developed by students</td>
<td>Offered by instructor</td>
</tr>
<tr>
<td>Example</td>
<td>Relation between obesity and restaurant choices</td>
<td>Humanistic theory of personality</td>
</tr>
<tr>
<td>Research hypothesis</td>
<td>Regarding who would show specific behavior(s), or under what circumstances</td>
<td>Regarding themes emerging from veteran responses to student interview questions</td>
</tr>
<tr>
<td>Example</td>
<td>People with high body mass index (BMI) will more often choose to eat at buffet-style restaurants, than at similarly-priced deli-style restaurants</td>
<td>Veterans will tend to disagree with humanistic theory, especially with the assertion that all people are inherently good</td>
</tr>
<tr>
<td>Data collection method</td>
<td>Quantitative, observational</td>
<td>Qualitative, interview</td>
</tr>
<tr>
<td>Example</td>
<td>Students went to both types of restaurants, observing 20 males and 20 females eating at each restaurant, recording BMI estimates (referring to a standardized pictorial guide)</td>
<td>Students wrote questions assessing beliefs about humanistic theory, and recorded answers during an interview (audiotaping with permission)</td>
</tr>
<tr>
<td>Aggregating data, drawing conclusions</td>
<td>Typically averaging instances of target behaviors within groups (e.g., male/female, younger/older)</td>
<td>Team discussion and identification of most common themes emerging from veteran responses</td>
</tr>
<tr>
<td>Example</td>
<td>At the buffet-style restaurant, 75% of diners had BMIs within the obese range; at the deli-style restaurant, 30% of diners had BMIs within the obese range -Therefore, hypothesis was supported</td>
<td>Veterans shared mixed responses to questions about humanistic theory; though they referred to &quot;some bad apples,&quot; they stated many times that most people are basically good -Therefore, hypothesis was partially supported</td>
</tr>
</tbody>
</table>
Research Questions and Hypotheses

Each of these projects has been completed by more than one class over the past few years. Therefore it should be noted that this initial foray into assessing some important outcomes of these projects does not address every interesting aspect deserving of study, but focuses narrowly on the following hypotheses:

- that student knowledge of research methods would improve among students completing both projects (H1);
- that students in both groups would show increased interest in conducting research over the course of the project (H2);
- that only students completing the SL project would show changes in civic attitudes (H3); and,
- that veteran interviewees would report more positive attitudes about college students and our institution after participating in the SL project (H4).

Method

Participants

All student participants were enrolled in one of two introductory psychology courses during the fall of 2010 (total \(N = 81\) at Time 1). In the OP group, 39 of 44 enrolled students completed the survey measures at Time 1 (88.6%). These students had a mean age of 21.0 years (\(SD = 3.8\)), and were comprised of 22 females (56.4%), 31 freshmen and sophomores (79.5%), and 35 Whites (89.7%). In the SL group, 42 of 44 enrolled students completed survey measures at Time 1 (95.5%). These students had a mean age of 20.9 years (\(SD = 4.8\)), were comprised of 26 females (61.9%), 37 freshmen and sophomores (88.1%), and 39 Whites (92.9%). Eleven students (13.5% of the total sample) completed measures at Time 1 but not Time 2; 6 (54.5% of all noncompleters) of those students were in the OP group, while 5 (45.5% of all noncompleters) of those students were in the SL group.

All veteran participants were invited to complete a brief survey before they were interviewed by students in the SL group. Ten of the 12 participating veterans provided informed consent to complete the survey (83.3%) at Time 1. One of these respondents did not report age, gender, or past participation in activities at our institution, but answered other demographic items. Veteran age ranged from 26 to 66 years, with a mean of 53.22 years (\(SD = 13.74\)); 8 veterans were male (88.9%), 9 were White (90.0%), and 4 (40.0%) indicated that they had participated in an activity at our institution previously. Seven of these 10 veterans returned a mailed survey 8 weeks after their participation in the SL project was completed; demographics of the Time 2 participants were thus largely identical to Time 1.
Table 2. Items Measuring Student Knowledge of Research Methods in Psychology.

| The activities of human subjects researchers are carefully monitored by independent parties. |
| Human subjects researchers think a lot about the tools they use in their studies to measure human characteristics and behavior. |
| Human subjects researchers are only able to study people by performing experiments. |
| Human subjects researchers try to collect data to prove their own assumptions correct. |
| For a case study, a human subjects researcher studies a single person in great detail. |
| A “variable” in a research study is defined as the particular group of people that a researcher plans to study. |
| If a researcher uses random assignment in a study, it means that he or she is putting human subjects into study groups based on some characteristic they have in common (for example, putting all the men in one group, and all the women in the other group). |
| Deception of human subjects by researchers (that is, providing participants with misleading or untrue information) is permitted in some studies of human behavior. |
| Informed consent means informing human subjects of where they should go to participate in a study. |
| When collecting data with surveys, human subjects researchers should ask as many questions as possible to get as much data as they can on a topic. |
| A hypothesis is a statement the researcher makes about what he or she expects to find in a particular study. |
| Statistics are useful to human subjects researchers because they allow researchers to look at broad trends in their data, not just individual pieces of information. |
| “Sampling” refers to how the researcher selects what measurement tools to use in his or her study. |
| A correlation coefficient expresses the direction and strength of relationship between two study variables. |
| Once a researcher completes a study, its findings can be released to the public without any need for review by other researchers in that field. |

*Note.* This quiz was developed solely for this research project; students did not earn points towards their grade on this quiz. Students answered each item on this quiz as either True or False. Scores were calculated by totaling the number of correct answers students provided.
Measures

Knowledge of research methods. A standardized measure of knowledge regarding psychological research methods could not be located for this project. Therefore, a 15-item true-false quiz covering basic concepts covered in the course was developed, focusing on research with human subjects (items provided in Table 2). Scores were totaled based on number of items correct for each student. No grades were assigned for scores on this quiz, and the items were not taken from any other assessment tools in the course.

Interest in performing psychological research activities. A standardized measure of interest in performing various research activities could not be located. Therefore, 7 items (provided in Table 3) that corresponded to the main tasks of both the OP and SL were composed, asking students to indicate their interest in each aspect of research (on a 5-point scale from 1, not at all interested, to 5, extremely interested). Mean responses to individual items were examined in study analyses.

Community service attitudes. The Community Service Attitudes Scale (CSAS; Shiarella, McCarthy, & Tucker, 2000) is a 46-item, theoretically-driven measure of college student attitudes regarding community service. The items assess 8 aspects of these attitudes in separate subscales. Awareness of community needs (CSAS-Awareness) is assessed with 4 items; perception of Actions that can meet the need (CSAS-Actions) is assessed with 5 items; perceiving one’s own Ability to help (CSAS-Ability) is assessed with 3 items; one’s sense of Connectedness to one’s community that motivates helping (CSAS-Connectedness) is assessed with 6 items; one’s sense that personal or situational Norms obligate one to help (CSAS-Norms) is assessed with 5 items; one’s sense of Empathy for those in need (CSAS-Empathy) is assessed with 3 items; thoughts about Costs (CSAS-Costs) and Benefits (CSAS-Benefits) to oneself of helping, which are assessed with 6 items each; beliefs about the Seriousness of the consequences of not helping others (CSAS-Seriousness) is assessed with 5 items; and one’s Intention (CSAS-Intention) to engage in community service or not is assessed with 3 items. Regarding CSAS-Intention, one of the original items assessed student interest in doing “this service-learning activity,” an item that was only applicable to the SL group and thus not appropriate for this study. Therefore, that item was replaced with an item assessing past community service (“I have participated in a community service project in the past”). Students responded to all items on a 7-point scale, with 1 = strongly disagree or extremely unlikely, and 7 = strongly agree or extremely likely (with the scale points regarding likelihood applied only to CSAS-Costs and CSAS-Benefits). As indicated in Table 3, alphas for all scales were in the acceptable range at Time 1, and were nearly identical at Time 2. As past research has indicated few differences by gender on CSAS scores (Bauer et al., 2007), gender analyses were not attempted.

Veteran surveys. A standardized measure of attitudes about college students could not be located. Therefore, a 9-item measure was composed assessing various attitudes about college students aged 18-23 (see Table 4), containing 2 additional items regarding impressions of the institution. For the Time 2 survey, 7 items were added specifically regarding the SL. All items were answered on a 4-point scale from 1=strongly agree to
Table 3. Descriptive Statistics for All Study Measures by Student Project Group, Time 1.

<table>
<thead>
<tr>
<th>Item or Scale</th>
<th>OP Group n = 38</th>
<th>SL Group n = 41</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M</td>
<td>SD</td>
</tr>
<tr>
<td>Human Subjects Research Quiz</td>
<td>11.39</td>
<td>2.39</td>
</tr>
<tr>
<td></td>
<td>11.24</td>
<td>1.95</td>
</tr>
<tr>
<td><strong>Interest in Research Activities</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Developing an original research question</td>
<td>2.71</td>
<td>1.21</td>
</tr>
<tr>
<td></td>
<td>2.95</td>
<td>1.05</td>
</tr>
<tr>
<td>• Reviewing past research on that topic</td>
<td>2.74</td>
<td>1.03</td>
</tr>
<tr>
<td></td>
<td>2.88</td>
<td>1.17</td>
</tr>
<tr>
<td>• Creating a method for collecting data</td>
<td>2.55</td>
<td>1.20</td>
</tr>
<tr>
<td></td>
<td>2.78</td>
<td>1.23</td>
</tr>
<tr>
<td>• The act of collecting data itself</td>
<td>3.08</td>
<td>1.38</td>
</tr>
<tr>
<td></td>
<td>3.41</td>
<td>1.22</td>
</tr>
<tr>
<td>• Organizing and analyzing that data to make meaningful conclusions</td>
<td>3.05</td>
<td>1.18</td>
</tr>
<tr>
<td></td>
<td>3.12</td>
<td>1.19</td>
</tr>
<tr>
<td>• Presenting findings in a public forum (e.g., research presentation)</td>
<td>2.61</td>
<td>1.37</td>
</tr>
<tr>
<td></td>
<td>2.88</td>
<td>1.25</td>
</tr>
<tr>
<td>• Writing up findings for publication in a journal or other medium</td>
<td>2.26</td>
<td>1.06</td>
</tr>
<tr>
<td></td>
<td>2.63</td>
<td>1.09</td>
</tr>
<tr>
<td><strong>Community Service Attitudes Scale</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CSAS-Awareness</td>
<td>.86</td>
<td>6.23</td>
</tr>
<tr>
<td></td>
<td>.65</td>
<td>6.17</td>
</tr>
<tr>
<td>CSAS-Actions</td>
<td>.90</td>
<td>5.66</td>
</tr>
<tr>
<td></td>
<td>.77</td>
<td>5.65</td>
</tr>
<tr>
<td>CSAS-Ability</td>
<td>.90</td>
<td>5.26</td>
</tr>
<tr>
<td></td>
<td>1.04</td>
<td>5.30</td>
</tr>
<tr>
<td>CSAS-Connectedness</td>
<td>.90</td>
<td>5.10</td>
</tr>
<tr>
<td></td>
<td>1.07</td>
<td>4.84</td>
</tr>
<tr>
<td>CSAS-Norms</td>
<td>.94</td>
<td>5.92</td>
</tr>
<tr>
<td></td>
<td>.73</td>
<td>6.01</td>
</tr>
<tr>
<td>CSAS-Empathy</td>
<td>.72</td>
<td>5.59</td>
</tr>
<tr>
<td></td>
<td>.98</td>
<td>5.48</td>
</tr>
<tr>
<td>CSAS-Costs</td>
<td>.80</td>
<td>4.84</td>
</tr>
<tr>
<td></td>
<td>.90</td>
<td>4.77</td>
</tr>
<tr>
<td>CSAS-Benefits</td>
<td>.86</td>
<td>5.81</td>
</tr>
<tr>
<td></td>
<td>.89</td>
<td>5.81</td>
</tr>
<tr>
<td>CSAS-Seriousness</td>
<td>.86</td>
<td>4.79</td>
</tr>
<tr>
<td></td>
<td>1.01</td>
<td>5.01</td>
</tr>
<tr>
<td>CSAS-Intention to Engage</td>
<td>.84</td>
<td>4.99</td>
</tr>
<tr>
<td></td>
<td>1.60</td>
<td>4.85</td>
</tr>
</tbody>
</table>

Note. Data from two students, one in the OP Group and one in the SL group, were eliminated from these analyses due to being extreme outliers on the CSAS scales. T-tests of means over the two groups revealed no significant differences on any of these variables at the beginning of this study.
Table 4. Veteran Survey Items, and Reported Attitudes Towards the SL Project.

<table>
<thead>
<tr>
<th>Item</th>
<th>Time 1 FAV</th>
<th>Time 1 UNFAV</th>
<th>Time 2 FAV</th>
<th>Time 2 UNFAV</th>
</tr>
</thead>
<tbody>
<tr>
<td>I very much enjoy interacting with college students.</td>
<td>100</td>
<td>0</td>
<td>100</td>
<td>0</td>
</tr>
<tr>
<td>I believe that college students are very hard-working.</td>
<td>100</td>
<td>0</td>
<td>85.7</td>
<td>14.3</td>
</tr>
<tr>
<td>I believe that college students express gratitude for the benefits they enjoy in their lives.</td>
<td>100</td>
<td>0</td>
<td>57.1</td>
<td>42.9</td>
</tr>
<tr>
<td>I believe that college students are informed about current events.</td>
<td>90</td>
<td>10</td>
<td>85.7</td>
<td>14.3</td>
</tr>
<tr>
<td>I believe that college students mostly make choices that benefit only themselves.</td>
<td>10</td>
<td>90</td>
<td>42.9</td>
<td>57.1</td>
</tr>
<tr>
<td>I believe that college students are not very patriotic.</td>
<td>60</td>
<td>40</td>
<td>57.1</td>
<td>42.9</td>
</tr>
<tr>
<td>I believe that college students work hard to improve society.</td>
<td>90</td>
<td>10</td>
<td>57.1</td>
<td>42.9</td>
</tr>
<tr>
<td>I believe that college students hold themselves to high moral standards.</td>
<td>90</td>
<td>10</td>
<td>42.9</td>
<td>57.1</td>
</tr>
<tr>
<td>I believe that college students are not very respectful of others.</td>
<td>80</td>
<td>20</td>
<td>71.4</td>
<td>28.6</td>
</tr>
<tr>
<td>I think that college students should perform community service as part of their education.</td>
<td>-</td>
<td>-</td>
<td>100</td>
<td>0</td>
</tr>
<tr>
<td>My impression of IU Kokomo has been generally positive up to this point.</td>
<td>10</td>
<td>90</td>
<td>100</td>
<td>0</td>
</tr>
<tr>
<td>My views of students attending IU Kokomo are generally positive.</td>
<td>90</td>
<td>10</td>
<td>100</td>
<td>0</td>
</tr>
<tr>
<td>I found participating in this interview activity interesting.</td>
<td>-</td>
<td>-</td>
<td>100</td>
<td>0</td>
</tr>
<tr>
<td>I found this interview activity personally satisfying.</td>
<td>-</td>
<td>-</td>
<td>100</td>
<td>0</td>
</tr>
<tr>
<td>I felt that the questions students asked were interesting.</td>
<td>-</td>
<td>-</td>
<td>100</td>
<td>0</td>
</tr>
<tr>
<td>I felt that I personally benefited from participating in this activity.</td>
<td>-</td>
<td>-</td>
<td>100</td>
<td>0</td>
</tr>
<tr>
<td>I believe that the students found this activity beneficial.</td>
<td>-</td>
<td>-</td>
<td>100</td>
<td>0</td>
</tr>
<tr>
<td>I would be willing to participate in a similar activity at IU Kokomo in the future.</td>
<td>-</td>
<td>-</td>
<td>71.4</td>
<td>28.6</td>
</tr>
</tbody>
</table>

Note. Items 1-9 and 11-12 were administered at both Time 1 and Time 2; items 10 and 13-18 were only administered at Time 2. “FAV” refers to percentages of respondents indicating favorable attitudes toward students or the project, while “UNFAV” refers to percentages of respondents indicating unfavorable attitudes towards students or the project.
4=strongly disagree. Because of the very small sample size in this study, only descriptive data for individual items on these measures were examined.

**Procedure**

During the second week of the semester, a trained research assistant administered all student measures in class. This administration occurred 1 week after an in-class lecture overviewing research methods in psychology. The second administration occurred during the 12th week of class, after the students had spent several weeks working on their projects (either OP or SL) but before their final in-class presentations on their projects were given. At both administrations, students provided informed consent and were offered extra credit for participation. As noted above, veteran participants were asked for consent to participate when they arrived for their student interviews, before meeting the students; they received their Time 2 informed consents and surveys by mail 8 weeks after the interviews were concluded, and returned them in pre-addressed envelopes. All aspects of this study were reviewed and approved by IRB.

**Results**

Means and standard deviations by group for all student measures at Time 1, as well as alphas for the CSAS measures, are provided in Table 3. Examinations of these variables revealed that two variables, CSAS-Awareness and CSAS-Ability, were highly skewed; a square root transformation to correct this skewness was performed on these variables before running the necessary parametric tests. Independent sample *t*-tests of means for all Time 1 variables were nonsignificant, indicating that the two groups of students were equivalent on all variables at the beginning of the study.

To address H1 regarding knowledge about psychological research methods, paired *t*-tests for the human subjects research quiz scores from Time 1 to Time 2 were performed. In the OP group, scores on the research methods quiz decreased significantly from Time 1 to Time 2 (M’s 11.63 to 10.78, *t*(1, 31) = 2.47, *p* < .05). In the SL group, scores on the human subjects quiz did not change from Time 1 to Time 2 (M’s 11.31 to 10.89, *t*(1, 35) = 1.52, *ns*). This result was contrary to the hypothesis that students in both groups would improve on their knowledge of research methods. However, it should be noted that students first completed this quiz one week after having heard a lecture on the topic, perhaps contributing to inflated Time 1 scores; by the time they took this quiz again, 10 weeks had passed. So the appropriate interpretation of this finding may be that completing the SL project contributed to greater savings of information related to research methods, compared to completing the OP project.

To address H2 regarding interest in performing research activities, paired *t*-tests were performed, this time for each of the 7 measured activities associated with research. In the OP group, one of these comparisons resulted in a significant change from Time 1 to Time 2, with students reporting decreased interest in organizing and analyzing data (M’s 3.03 to 2.50, *t*(1, 31) = 2.79, *p* < .01). In the SL group, none of these comparisons were significant; that is, there were no significant changes in the SL group from Time 1 to Time 2.
in student interest in any measured research activity. This is interesting given that at Time 2, all students were in the stage of the project that required aggregating and interpreting the data they had collected; perhaps this finding can be interpreted to mean that students found quantitative data analysis to be less interesting than qualitative data analysis. This would imply that in terms of student experience of performing psychological research, the SL project was slightly better able to hold student interest than the OP project.

To address H3 regarding attitudes about community service, paired $t$-tests of each of the CSAS scales from Time 1 to Time 2 were performed. In the OP group, there were no changes in any of these variables from Time 1 to Time 2 (e.g., none of the $t$-tests were significant). In the SL group, there were also no changes in these variables from Time 1 to Time 2. As student age was thought to be a possible moderating factor in civic attitude change, each group of students (OP vs. SL) was divided into two age groups by median split. The median age in the OP group was 20 years, while the median age in the SL group was 19 years. In the OP group, no significant differences on any of the CSAS scales were found among younger or older students. However, among younger students in the SL group, CSAS-Empathy increased from 5.50 to 5.93, $t(1, 17) = -2.16, p < .05$. Among older students in the SL group, CSAS-Norms decreased from 6.14 to 5.73, $t(1, 18) = 2.87, p = .01$. In accord with hypotheses, then, civic attitudes changed significantly only among students completing the SL project; the few changes that were revealed, though, varied by age.

To address H4 above regarding attitudes of veterans participating in the SL project, I examined percentages of veterans generally reporting favorable or unfavorable views towards college students or the project before and after their participation (no inferential tests were attempted). It appears safe to conclude based on these descriptive findings (reported in Table 4) that attitudes towards college students may have changed pre to post participation in this project, perhaps becoming less idealized and more reality-based. Throughout the process, veteran interviewees reported overwhelmingly positive experiences of the project itself after participation, and participation in this project may have contributed to some desirable changes in their opinions about the educational institution.

**Discussion**

This study is unique in examining whether service-learning projects can serve as a vehicle for instructing college students about research methods using human subjects. Teaching research methods via experiential learning has been shown to be helpful in both course content mastery (Bringle & Hatcher, 1996) and personal development (Searight et al., 2010), important findings given that human subjects research is challenging to engage students in via traditional lectures or assigned readings. As service-learning is a form of experiential learning which appears to confer broad personal and academic benefits (Deeley, 2010; Kenworthy-U’Ren, 2008; Sessa, London, Natale, & Hopkins, 2010), it is important to investigate its potential in relation to teaching human subject-based research methods used in not only psychology, but also sociology, communications, public health, and even business and economics. Given concerns about the burdens on faculty regard-
ing the time required to arrange and assess service-learning projects (Heckert, 2010; Bulot & Johnson, 2006), it is especially important to assess the value of incorporating such projects into the curricula of introductory-level courses, where coverage is broad and time is limited.

The main findings of this study did not all conform to hypotheses. Scores on knowledge of research methods did not increase over the course of the term in either the OP or SL group (who scored equally well at Time 1), contrary to expectations. However, as already noted, this may have been due to the timing of administration of the measure relative to in-class coverage of research methods, resulting in inflated Time 1 scores in both groups of students. Interestingly, though, these high knowledge scores remained unchanged in the SL group through the end of the term, while they fell significantly in the OP group. This can be interpreted as evidence that service-learning projects may contribute to better retention of information about research methods compared to projects using other experiential methods to teach the same material. Such a finding should be viewed as significant given that introductory-level courses provide a foundation of knowledge that advanced courses later draw upon. Greater retention of knowledge of research methods may therefore confer benefits extending into upper-level courses in that discipline (though this is of course an empirical question requiring later investigation).

Also contrary to expectations, there was no evidence for overall increases in student interest in performing human subjects research in either group; in fact, students in the OP group actually reported decreased interest in aggregating and analyzing data by the end of the term. However, students in the SL group showed no such drop in interest in data analysis. In a mixed group of students such as that which typically enrolls in introductory psychology (or other introductory-level courses in the disciplines already mentioned), any pedagogy which does not “turn off” students to research methods deserves consideration by instructors. Therefore, service-learning may be a worthwhile option.

In accord with expectations, only students in the SL group showed changes in their attitudes about community service over the course of the term. However, those changes varied with student age, and were not in the direction that might have been anticipated. For younger students performing service-learning, significant increases in empathy were detected. This echoes past research (Lundy, 2007), and could be expected. For older students performing service-learning, however, significant decreases in one’s sense that personal or situational norms obligate oneself to serve others, were found. This finding seems counterintuitive and even undesirable at first; however, one possible (and less troubling) explanation for this is worth considering. Many of the older students in this study were local community members who may have been aware of community needs, but unaware of the ways in which veterans continued to serve the community long after their enlistments ended. These more mature and sophisticated students were observed to most often lead the interactions with the veterans during interviews, and during their interactions often inquired about various issues of local importance. Perhaps these interactions helped these students become more informed about the many ways in which local veterans were working to better the community. Therefore, when responding to survey items assessing present need for volunteers, these students may have recalled these con-

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versations and felt that community needs were being addressed more effectively than they had previously believed. If intentions to volunteer had correspondingly decreased in this group, this finding would be more troubling; however, there was no evidence for this. Therefore, this finding may simply represent students in this group becoming better informed about the active role of veterans in the community. Regarding instructor time to prepare each project, the SL project did require approximately 7-8 more hours of time to prepare than the OP project, but that investment appears justified by various results favoring the use of service-learning.

The inclusion of veteran surveys in this study was made to address a long-standing problem in research on service-learning: lack of attention to how community partners view their participation in service-learning projects (Bringle & Hatcher, 2006). For example, the meta-analysis previously discussed (Conway et al., 2009), did not attempt to quantify findings about community partners, possibly because the studies included in their analysis did not report such data. In this study, it was interesting to see how veterans viewed college students before and after interacting with them. It appeared that these veteran participants had some idealized notions about today’s college students (e.g., that students are hard-working, moral, grateful, informed about the world, and respectful of others), and that some of those ideas may have become more nuanced or even negative after the actual interactions. In addition, it was very interesting to see the wide divide between how these veterans viewed college students before the interviews (e.g., overwhelmingly positive) compared to how they viewed the educational institution (e.g., overwhelmingly negative). Given the prominent role that institutions of higher education often seek to hold in communities, it may be of use for researchers or campus administrators to learn more about how active and engaged members of the community view different aspects of their local campus. In this small but influential sector of the community, attitudes about the institution appeared to completely “flip” after participation in this project. Considering the various concerns that the veteran group had about what the experience would be like for these volunteers, it is very reassuring to know that this project appeared to be conducted appropriately and to their satisfaction.

Limitations and Recommendations

Several limitations must be acknowledged which may have impacted the study results. Assignment of students to conditions was nonrandom; it may be that students who enrolled in the class which did the SL project (which met in the morning) differed in motivation or conscientiousness from students who enrolled in the class which did the OP project (which met in the afternoon). However, whether this was the case is unknown. It is also possible that instructor investment of additional effort preparing the SL project changed student perceptions of instructor enthusiasm or expectations regarding that project. Changes in these perceptions might have been reflected in reported student attitudes about interest in research or community service. A limitation already acknowledged is that some measures used in this study were developed specifically for this research, and thus may be limited in their validity. It is also a limitation that the sample of veterans in this study was too small for inferential tests to be performed. Future studies should seek to address some or all of these issues if possible. In addition, studies which seek to un-
cover exact mechanisms of student change (rather than just the end outcomes of those changes; e.g., Sessa et al., 2010) should continue to be attempted, particularly among diverse groups of students in different kinds of communities.

Despite its limitations, the findings of this study may be useful to instructors in various fields who wonder whether incorporating service-learning into their courses is worth the effort and time. The standard coverage of most introductory-level courses in various disciplines includes the main research methods of that field, and in disciplines where human subjects research is performed, experiential learning has been shown to add pedagogical value. As it is a goal to have students recall information for the long term, the present findings indicate that service-learning may do that more effectively than some other kinds of experiential learning. In addition, the fact that younger students doing service-learning in this study developed greater empathy towards community members in need is also a finding that instructors in diverse fields should find persuasive. As college education ideally leads to not only better employment opportunities, but also a greater sense of oneself as a needed member of the community, increasing student empathy for others should be strongly encouraged.

References


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Student Perceptions of Teaching Transparency

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Abstract

The authors discuss the relationship between teaching transparency and active learning through the perspectives of their students. Active learning directly engages students in the learning process while transparency involves the instructor’s divulgence of logic regarding course organization and activity choices. After utilizing these teaching techniques, four instructors collected feedback regarding students’ positive and negative perceptions of both the activity and the transparency. The responses were overwhelmingly positive and indicate that students found that transparency gave them a better sense of purpose, motivation, clarity and connection to course objectives. In conclusion, we discuss ways in which the student feedback is essential for instructors’ reflection on teaching.

Keywords: Teaching transparency, active learning, sociology.

Active learning is a broad concept that is used to describe teaching techniques that directly engage students in the learning process. It represents a shift from teacher-centered to student-centered learning techniques. Students are encouraged to learn through reading, writing, discussion, and reflection. The teaching literature provides numerous examples of active learning techniques (Holtzman, 2005; Levy & Merenstein, 2005; McKeachie, 2011; Pedersen, 2010; Wills, Brewster & Fulkerson, 2005). While students often enjoy these activities, they may not necessarily understand the intent or purpose of the activity within the course context. One way of avoiding this problem is to be a more transparent teacher.

By transparency, we are referring to a teaching style that (1) clarifies to students the instructor’s choices for lesson plans and (2) specifies how those choices relate to course goals. This conceptualization leads us to ask how we can improve active learning techniques by being more transparent in our teaching. In this effort to employ reflective teaching, we connect teaching transparency to four different active learning activities and provide suggestions for improvements based on student perceptions and our perceptions as the instructors. This critical reflection helps instructors connect student learning outcomes to teaching techniques.

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Conceptualizing Transparency

Transparency in higher education is not a new idea. It has commonly been used in the context of institutional reform following public criticisms in the 1980s calling for more accountability of colleges and universities (McCormick, 2010). The assessment movement was a reaction to these criticisms, and transparency was integrated as a way to keep the public informed about decision-making processes in regards to the uses of taxpayer money in public institutions (McCormick, 2010). While debates about the virtues of assessment continue today, it is not hard to see that it is fully integrated at both the institutional and classroom levels. At the classroom level, transparency is part of course organization and teaching practices (Cuevas, Matveev, & Miller, 2010; Hativa, 1998). Lave and Wagner (1991:105) broadly refer to transparency as “a way of organizing activities that makes their meaning visible” and suggests that students need explicit knowledge and resources to move from legitimate peripheral participation to full participation in the learning process.

One key element of transparency at the classroom level is student learning outcomes. Course goals and objectives are the general competencies we hope students accomplish and demonstrate while student learning outcomes are a less abstract way to conceptualize the course objectives. Goals and student learning outcomes provide a clear framework for the course and is one way we communicate the fundamental disciplinary knowledge, skills, and abilities that students are expected to obtain (Goldsmid, 1981; Grauerholz & Gibson, 2006). Kean, Mitchell, and Wilson (2008) argue that to be transparent we have to be intentional, and student learning outcomes are a part of this process. They suggest that we clarify to students why they are being asked to learn certain outcomes. One way of achieving this level of transparency would be by explaining how student learning outcomes reflect fundamental disciplinary knowledge and skills.

Student learning outcomes are also measurable and can be evaluated through in-class activities and course assignments. Further, the choice of any teaching technique should reflect learning goals and outcomes. Cuevas et al. (2010) extend the notion of intentionality and transparency to include the deliberate alignment of course-level outcomes and instructional and learning activities. This could be accomplished by discussing the chosen teaching techniques with students, acknowledging that we have taken into consideration that students have different learning styles, and developing class activities and assessments with this in mind (Vesely, 2011). The use of student learning outcomes is consistent with Lave and Wagner’s (1991) notion of transparency where meanings are visible and student have explicit knowledge and resources pertaining to the course. However, Adler (1999) cautions against using too much transparency as it may potentially hinder student learning by not reflecting actual disciplinary practices.

Methods

We focus on whether or not students perceive transparency as effective in order to create more meaningful learning experiences and improve student learning. We argue that, at the classroom level, transparency provides students with a framework for the course
(McKinney, 1988), and gives students a better understanding of why particular class materials and activities are used. In other words, it is a way to help students “understand how and why they are learning course content in particular ways” (University of Illinois, 2011). In addition, it helps us to be more reflective as instructors in order to improve our teaching (Albers, 2008; Brookfield, 1995).

The literature on transparency provides us with a broad conceptualization of transparency at the institutional level (Lazerson, Wagener, & Shumanis, 2000). However, we are interested in how transparency unfolds in a classroom setting, particularly the ways in which clarifying the instructors’ choices for lesson plans and course goals are received by students. To better understand how transparency is received in the classroom, we collected student feedback after four active learning activities in four separate sociology courses. In each class, we integrated transparency into a different active learning exercise by orally discussing the rationale and the goals of the activities at their onset. The courses were taught during the summer of 2011 at a large public university in North Carolina. The university has an approximate enrollment of 35,000 students.

In order to maintain autonomy, each instructor engaged in transparency in the way that she saw fit for their classroom objectives and contexts. Engaging in transparency in different ways also allowed us to evaluate the differences in the students’ perceptions of differing methods of teaching transparency. Although each instructor divulged their rationale or their learning objectives at their own discretion, none of the instructors defined or explained that their divulgence was an act of transparency. Instead, at the end of each class activity, we each collected data from our students voluntarily. In each case, students filled out forms with open-ended questions concerning their likes and perceived strengths of our transparency and their dislikes and perceived weaknesses of our transparency. These forms were then placed in an envelope and sealed. As these were current students in our classes, no demographic data were collected in an effort to maintain the students’ anonymity. At the end of our data collection, each of the instructors completed a systematic analysis of the data and then reviewed the other instructors’ coding to ensure inter-coder reliability. Finally, the data were organized according to emergent themes.

Data were collected on two occasions in a Sociology of Family course following the use of transparency for two in-class activities, on three occasions in a Social Problems course where transparency was used in two in-class activities and at the end of the course as part of the course evaluation, on one occasion in a Principles of Sociology course following the use of transparency for an in-class activity, and on two occasions in a different Social Problems course following the use of transparency for one in-class activity and one group

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2 This study was approved by the IRB. Students granted their informed consent for participation in this study.

3 The exact questions posed to students were, “What did you like about my disclosing the logic behind the course layout? Or, what are the strengths of disclosing my logic behind the course layout?” and “What did you dislike about my disclosing the logic behind the course layout? Or, what are the weaknesses of disclosing my logic behind the course layout?”
project that spanned two weeks. The total sample size for this study was 90 students with a 71 percent overall average response rate.4

As part of our transparency, each instructor explained the value and logic behind using each activity. For example, one instructor used inquiry guided learning (IGL) because it is an inductive teaching practice where students are presented “a question to be answered, an observation or data set to be interpreted, or a hypothesis to be tested” (Prince & Felder, 2007:14). The instructor explained to students that with this type of active learning, the instructor is the “guide on the side” as students construct an understanding of disciplinary content, methods, and perspectives (Atkinson & Hunt, 2008). Another instructor chose a group peer teaching exercise because group work is well-documented as an effective means of active learning (Beckman, 1990; Caulfield & Persell, 2010; McKeachie, 2011). In addition, research shows that group peer teaching is a useful method for learning material as it promotes teamwork, planning abilities and confidence (McKeachie, 2011). An additional instructor used an atypical program (e.g. Wordle) that would make the class stand out as fun and interesting, especially since students can see what they and others have written (McNaught & Lam, 2010). The last instructor developed a content analysis project, similar to Taylor (2003) and Clark and Atkinson (2008), to help students recognize gender stereotypes in their respective contexts.

Analysis

The responses were overwhelmingly positive with most students indicating that transparency was a positive addition to the course. However, there were some students who had less than positive reactions and still others who seemed indifferent to the transparency revealed by their instructors. The students’ perceptions vary with the types and depth of transparency used by the course instructors.

Out of 73 responses, 50 were positive (68.5 percent), 7 were negative (9.6 percent), and 16 (21.9 percent) did not speak directly to teaching transparency (i.e. perspectives on the course, instructor or specific activity). Of the positive responses, respondents indicated that the transparency gave them a better sense of purpose, motivation, clarity and connection to other course material. Students with negative responses viewed transparency as a waste of time or an insult.

Students liked knowing why the activities were chosen for several reasons. One wrote that transparency “made class work seem less menial when we know how it was meant to help us.” Students liked being assured they were not just assigned “busy work”: “It put us on an even playing field. I think it also holds the instructor more accountable because they explain what/why/etc. we are doing so we don’t end up doing busy work that seems elementary to college students.” This aversion to “busy work” has been observed in other studies (Lizzio, Wilson & Simons, 2002; Nijhuis, Segers & Gijselaers, 2008) which

4 The total population was 90 students. Together, we collected a total of 73 responses for the four activities mentioned. We use responses as our unit of analysis.
found that when students perceive work to be meaningful and not just “busy work,” they approach it with a deeper level of learning.

One student responded, “I do think it is important to explain the reasoning behind an activity. Though I wasn’t initially excited about it, hearing more details made me more open to the activity.” Here, the student is making a connection between teaching transparency and motivation to perform which was also observed by Allen, Witt, and Wheeless (2006). Disclosing the logic behind an activity provided this student with insights into the activity and the instructor’s motives. Students who are provided an explanation of the value of the activity may be more likely to take the activity seriously and be motivated to participate.

Some students felt more confident knowing ahead of time what the instructor’s learning goals were for them. Further, they expressed that knowing those goals allowed them to spend more time thinking critically about the content. One student wrote that s/he “could concentrate on [what I would get out of the activity] rather than wonder what the heck it was about” while another student believed that more transparency would “help [students] to start thinking critically before [the activity] instead of after.”

Students responded positively to connecting course goals to the activities. They learned to think critically and were able to recognize that critical thinking is necessary for learning. For example, students indicated that the IGL activity required “a greater level of cognitive development” and that they had to “do more analysis and interpretation”, and use “our sociological imaginations.” These responses show that students connect what they have done in class with the student learning outcomes and levels of learning which is consistent with preliminary findings from the Illinois Initiative on Transparency in Learning and Teaching in Higher Education (2011).

The student responses spoke to how transparency helped both in understanding the general focus of the course as well as the purpose for particular assignments. For instance, students completing the course project reported: “I understand why we did this project because of what I have learned throughout the class,” and “In most classes, if we are assigned group projects, it feels like the teacher is just lazy and doesn’t want to come up with a lesson plan for that week. Through transparency, I was able to see that this wasn’t busy work or a waste of time, but that thought had been put into the planning.” Students also suggested that being transparent about the purpose of this project helped them approach it with explicit goals: “I think that the activity was done more efficiently because a connection was made to the course. I wanted to know what the project had to do with my education.”

Some students, however, noted that the transparency did not change the way that they approached and completed the course project assignment. One student responded that “While the information was appreciated, it didn't change how I attacked the project.” Still, 65 percent of students reported that the transparency allowed them to approach the activity with a positive outlook and with a better understanding of particular objectives. Thus, being transparent provided students with clearer objectives that they used to ap-
proach and complete projects and exposed purposeful teaching strategies that linked individual assignments and overall course goals.

Still four out of the 73 responses described transparency as an insult or manipulation. One student stated,

I am old enough and smart enough to figure out why a movie/article relates to what we are studying. If you have to talk about why you chose a movie/article - ask us why we think you chose it. That way it encourages us to tie the information into what we know. You telling us just seems rude.

Another wrote, “I feel like in college you shouldn’t have to be told why you’re doing something.” These responses show a very different reaction to teaching transparency than those mentioned above. These students demonstrate that teaching transparency, in some cases, can seem to be condescending. Another student wrote, “Sometimes I would think less if I could already connect the end idea.” This student addresses an environmental tension in college: on the one hand, students are expected to be ambitious learners, while on the other hand, the pressure that can accompany taking a full course load often leads students to take shortcuts with their learning, especially if the course is not required for their majors or is not a subject of interest to them. Instructors might find it beneficial to accomplish transparency by using a more inductive or inquiry guided learning approach: asking the students to speculate how an activity or reading is connected to learning goals or other course material. For example, instead of stating student learning outcomes at the onset, an instructor might frame these as questions throughout the course of the activity.

**Discussion**

Teaching and learning are interactive processes where instructors and students construct a meaning of the educational experience (Blumer, 1969). As instructors, we have the potential to change routinized education through our social interactions in the classroom (hooks, 1994). Instruction through active learning, coupled with teaching transparency, allows students to actively engage in their learning.

It is important to note that liking transparency is not the same as developing deep learning. As this is an exploratory study, our goal is to assess the perceptions of the students broadly and hope that they found transparency helpful to their learning experiences. However, while our form asked students to disclose what they liked and the strengths of the transparency and/or what they did not like and weaknesses of the transparency, some of the responses spoke directly to deep learning. This is evidenced in the comments regarding the necessary use of critical thinking. We speculate, as argued by Lizzio et al. (2002) and Nijhuis et al. (2008), that our being transparent created an environment in which students were more invested in class activities and were better able to engage in a deeper level of learning.
In our classes, students responded positively when exposed to the details in course planning and the logic used in determining teaching strategies. Further, students appreciated the clear connection of course material to overall course goals and objectives. This gave students a “general sense of direction” (Goldsmid, 1981:263) by providing them with a framework for the course (Grauerholz & Gibson, 2006; McKinney, 1988; Persell, 2010; Wagenaar, 2004). However, not all of the students responded positively. Some students may not have perceived transparency as a productive use of class time because they are used to a teaching relationship in which instructors do not explain reasoning behind their lesson plans. To a student who is accustomed to learning in this manner, transparency might seem foreign, as if it has no legitimate place in classroom instruction.

Furthermore, students’ experiences and skill levels might make them feel as if a transparent instructor is not acknowledging their ability to discover the logic behind the lesson plan or the connection to learning outcomes. This could be viewed as an insult, as was the case with the student who responded that (s)he was annoyed that the instructor thought the class was too “dumb” to figure out why a movie or article was chosen for the course. Also, classes at the introductory level often include students who are majoring in the discipline and students who have enrolled in the course to fulfill a university’s general requirements. The students in these courses also vary in academic level. Therefore, the instructor must teach to students with various skill levels. Students who do not recognize the variance of skill levels of their classmates might feel that the instructor is being manipulative or belittling his or her students.

In an effort to minimize these negative reactions to teaching transparency, instructors might consider a few strategies. For students who might feel as if transparency is a waste of class time, transparency disclosures should be kept brief and discussed in conjunction with learning goals (Goldsmid, 1981; Grauerholz & Gibson, 2006). Our findings suggest that tying transparency to learning goals encourages connectivity to an end result. All of the students whose instructors connected the transparency to learning objectives provided positive responses regarding transparency. This is likely because connecting the transparency to goals helped the students understand that they were not given “busy work” or a “stand alone” assignment. Therefore, connecting transparency to goals may help some students situate the transparency into the course design more clearly (McKinney, 1988). Instructors with students at more advanced skill levels might also consider actively engaging students to discover the logic of activities and assignments and how they connect to other course material. This might be accomplished through class discussion, small group discussion, or individual reflection. These strategies might also help students feel as if they have agency in their learning rather than feeling as if they are being manipulated by instructors.

When considering incorporating active learning and teaching transparency in their classrooms, instructors might want to consider a few things when conceptualizing these techniques. Active learning, as a teaching strategy, is well-documented in the teaching literature. However, the lingering question that many instructors have after an active learning activity is whether or not their students got “the message” (Taylor, 2003:309). In response, we argue that transparency should be coupled with active learning (Arvidson &
Student Perceptions of Teaching Transparency

Huston, 2008; Taylor, 2003). Transparency can be managed according to each instructor’s preference. However, in our study, we found that instructors who connected their activities to overall learning outcomes and course goals during their transparency did not receive any of the negative responses previously discussed. Active learning combined with teaching transparency, then, is valuable and worthwhile for instructors to consider when conceptualizing their course strategies.

Future research would benefit from examining transparency in different institutional and classroom contexts. For example, would students at a small liberal arts university respond in the same way as our students at a large research university? Are there important demographic differences in how students respond to transparency? Our study was conducted in four classrooms of 29 students or less. Active learning activities and teaching transparency endeavors are likely to differ in larger, lecture-style classrooms. Would students in these larger classrooms respond to transparency in a similar way as our students? Future research also might want to consider approaching the study of transparency using the “sociology of the classroom” (Atkinson, Buck, & Hunt, 2009), and specifically examining how transparency shapes the interactive processes within the classroom and influences the learning relationship between instructors and students.

Finally, our study investigates students’ perceptions of the effectiveness of teaching transparency, an important first step in this investigation. Most of the instructors did not measure student performance as the in-class activities were ungraded. However, the group project was evaluated with a grade, and students who shared their perspectives regarding the transparency for this assignment noted that the transparency helped them to “understand the purpose” which resulted in their motivation to “put in more effort” and work more “efficiently”. Future research should investigate other measures of student learning for further examination into the relationships between teaching transparency and deep learning.

References


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Undergraduates’ Perceived Knowledge, Self-Efficacy, and Interest in Social Science Research

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Abstract

This study investigated the relationship between perceived knowledge of research methods, research self-efficacy, interest in learning about research, and interest in performing research-related tasks in one’s career. The study also investigated the effect of a research methods course with both didactic and experiential components on these variables. Participants were 33 undergraduates enrolled in a research methods course for the social sciences. At Time 1, perceived knowledge of research was related to all variables; at Time 2, it was related to research self-efficacy and learning interest only. Both perceived knowledge and research self-efficacy increased significantly over the semester; however, interest did not. Implications for teaching and outcome assessment are discussed.

Keywords: Research self-efficacy, undergraduates, research training.

Over 1,650,000 bachelor’s degrees were awarded by U.S. postsecondary granting institutions in 2009-2010 (National Center for Educational Statistics, 2012). The majority of these new degree-earners will enter the workforce (versus pursue graduate studies); this places great pressure on recent graduates to be competitive employment candidates (Landrum & Harrold, 2003). One way to improve one’s competitiveness in the workforce is to increase one’s knowledge and skills in domains that employers desire most. Employers desire a broad variety of abilities from new workers; for example, communication, decision-making, and time management skills (Aubrecht, 2001; Casner-Lotto, Barrington, & Wright, 2006; Landrum & Harrold, 2003). Critical thinking ability is another domain often identified as desirable by potential employers; this domain encompasses statistical and research abilities (Casner et al., 2006; Landrum & Harrold, 2003).

Knowledge of Research

Institutions of higher education make great efforts to prepare undergraduates to competently perform job functions that involve research and statistical skills. Undergraduate research and statistics course offerings have increased across the United States, along with expansion of efforts to involve undergraduates in institutional and extramural research experiences (Ciarocco, Lewandowski, & Van Volkom, 2013; May, Cook, & Panu, 2012; Shostak, Girouard, Cunningham, & Cadge, 2010). Despite the proliferation of re-

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search and statistics course offerings (Bertelsen & Goodboy, 2009; Perlman & McCann, 2005), a challenge to workforce readiness exists: undergraduates often hold negative attitudes toward these courses and do not wish to learn about these subjects (Rajecki, Appleby, Williams, Johnson, & Jeschke, 2004; Sizemore & Lewandowski, 2009). Undergraduates’ attitudes toward research are of particular importance given their influence upon motivation for research preparedness training; students show greater persistence and motivation for better performance for academic tasks that they value and perceive to be relevant (Eccles & Wigfield, 2002; Wigfield, 1994; Wigfield & Eccles, 2000). If undergraduates’ attitudes toward research could be improved, it is possible that they will seek out greater opportunities to learn about and perform research-related tasks.

Several researchers have investigated factors that may be associated with undergraduates’ negative attitudes toward research and statistics. For example, questions regarding the utility and validity of research and biases regarding the relevance of research to career practice have been associated with attitudes toward research methodology instruction (e.g., Bolin, Lee, GlenMaye, & Yoon, 2012; Manning, Zachar, Ray, & LoBello, 2006). Previous research has investigated the utility of research methods education as a tool to improve students’ interest in research. Results of these studies, however, have been mixed; research methodology education has been associated with improved and diminished interest in research (e.g., Harlow, Burkholder, & Morrow, 2002; Manning et al., 2006; Sizemore & Lewandowski, 2009). Given that repeated exposure to a topic tends to improve attitudes toward it (Jones, Young, & Claypool, 2011; Zajonc 1968, 2001), the current study hypothesized that research methods education would increase undergraduates’ familiarity with the topic and in turn, improve their attitude toward it.

Research Self-Efficacy

Another possible avenue for improving undergraduates’ marketability is research self-efficacy. Self-efficacy refers to individuals’ confidence that they possess the skills necessary to execute a task or accomplish a goal (Bandura, 1977). Self-efficacy can be broad, but it can also be narrow and vary from domain to domain (Bandura, 1977, 1982). For example, an individual may possess high self-efficacy for art but low self-efficacy for athletics. As self-efficacy for a task increases, so does the likelihood that the individual will attempt that task again in the future (Bandura, 1977, 1982, 1989). Self-efficacy is also dynamic and evolves in response to experience. For example, individuals engage in positive self-attributions following perceived successes. These positive self-attributions heighten the individual’s confidence in future success. With a heightened sense of self-efficacy for the task, the individual is more likely to seek out additional domain-specific goals in the future (Bandura, 1989). Research self-efficacy is a form of self-efficacy and is defined as confidence in one’s ability to successfully execute research-related tasks (Bieschke, Bishop, & Garcia, 1996). It has been associated with increased interest in conducting research as well as actual research productivity (Bishop & Bieschke, 1998; Kahn & Scott, 1997; Lambie & Vaccaro, 2011; Syzmanski, Ozegovic, Phillips, & Briggs-Phillips, 2007). Given research self-efficacy’s relationship with increased interest and productivity in research, it is possible that improving undergraduates’ beliefs about
their ability to successfully perform these tasks may improve their attitudes and interests toward additional research training as well as research-oriented career paths.

**Purpose of Study**

Given the importance of research skills to workforce readiness, the purpose of the current study was to investigate the relationship between perceived knowledge of research, research self-efficacy, interest in learning about research, and interest in performing research-related tasks in one’s career. It was hypothesized that participants’ perceived knowledge of research would be significantly related to research self-efficacy, interest in learning about research, and performing research-related tasks in their careers. Additionally, this study investigated the effect of a research methods course on these variables. The semester-long research methods course contained both didactic and experiential components. It was hypothesized that there would be significant increases in students’ perceived knowledge of research, research self-efficacy, interest in learning about research, and interest in performing research-related tasks in a career.

**Method**

**Participants**

Power analysis was conducted using G*Power 3 (Erdfelder, Faul, & Buchner, 1996; Faul, Erdfelder, Lang, & Buchner, 2007). A power of .80 and an alpha level of .05 were used to calculate the minimum number of participants needed to detect a medium effect size. The analysis indicated that data from a minimum of 24 participants would be needed for the study. Participants (n = 33) were ethnically diverse; 20 (60.6%) identified as Latino/a, six (18.2%) identified as Black, five (15.2%) identified as White, and two (6%) identified as other. The sample contained 24 (72.7%) females and nine (27.3%) males. The sample was predominantly composed of upper-division students (75.8%; junior, n = 12; senior, n = 13). Lower-division students (first year student, n = 1; sophomore, n = 5) comprised 18.2% of the sample. Two participants (6.1%) identified their college classification as other. Participants reported their major as either psychology (n = 28, 84.8%), sociology (n = 2, 6.1%), athletic training (n = 2, 6.1%), or criminal justice (n = 1, 3%). All participants reported that they enrolled in the course because it was a graduation requirement for the major. Participants were recruited from a research methodology for the social sciences courses at a medium-sized, open-enrollment university in the southwestern United States. All participants had previously completed a statistics for the social sciences course.

**Measures**

**Demographic information.** Participants completed a questionnaire to gather information about age, sex, ethnicity, college class, and major.

**Perceived knowledge of research and statistics.** Participants completed the Research Methods Proficiency scale (Cassidy & Eachus, 2000), a measure of perceived knowledge of research methodology and statistics. The scale contains 38 items that are rated on a
scale of 1 (I have never heard of this) to 5 (I am very confident about my understanding of and use of this). Sample items are “a hypothesis,” “chi-square,” “counterbalancing,” and “inferential statistics” (Cassidy & Eachus, 2000, p. 321). The scale is scored by averaging each participant’s answers; higher scores indicate greater perceived knowledge of research and statistics. Cassidy and Eachus (2000) reported high internal reliability for the scale, $\alpha = .94$, and also found evidence for its construct validity. The internal reliability coefficient for the scale was $\alpha = .89$ in the current study.

Research self-efficacy. Participants completed the Research Self-Efficacy Scale (Holden, Barker, Meenaghan, & Rosenberg, 1999), a self-report measure of confidence in one’s ability to execute research related behaviors. The scale contains nine items that are rated on a scale of 0 (not at all confident) to 100 (very confident). Examples of scale items are, “How confident are you that you can formulate a clear research question or testable hypothesis?” and “how confident are you that you can effectively present your study and its implications?” (Holden et al., 1999, p. 470). A total score is derived by averaging the participants’ answers on all nine items; higher scores are indicative of greater research self-efficacy. Holden et al. (1999) reported high internal reliability for the scale, $\alpha = .94$. In the current study, the internal reliability coefficient for the scale was $\alpha = .95$. Holden et al. (1999) also found evidence for construct validity of the measure.

Interest in learning about research. Participants rated their degree of interest in learning about research using a 7-point, Likert-type scale. The scale ranged from 1 (not at all interested) to 7 (very interested).

Interest in performing research-related tasks in a career. Participants rated their degree of interest performing research-related tasks as a part of their careers using a 7-point, Likert-type scale. The scale ranged from 1 (not at all interested) to 7 (very interested).

Procedure

A within-subjects (pre-test, post-test) design was utilized to examine change in participants’ perceived knowledge, research self-efficacy, and interests over the course of the semester. Participants received a verbal and written description of the study; they were informed that participation was voluntary and that they could withdraw from the study at any time without prejudice or penalty.

To protect participants’ identity and maintain confidentiality, names or other identifying information (ex: student identification number) did not appear on any study questionnaires. To enable matching of data for study analyses, each participant created a unique code name that was used to match pre-test and post-test questionnaires. Participants completed all study measures during class time; measures were administered on the first and last days of class. The university’s Institutional Review Board reviewed and approved this study.

Over the course of a 16-week semester, participants attended classroom sessions and completed outside reading on topics germane to research methodology in the social sci-
ences. Topics were diverse and included the scientific method, qualities of good research hypotheses, ethics, constructs and operational definitions, and various research designs. Additionally, participants also developed an original research proposal for a research question of their own interest. Participants developed this proposal through a series of homework assignments; they progressed through literature searches, annotations and American Psychological Association formatting, refinement of research hypotheses, selection of study measures, composition of an introduction and literature review, development of a methodology, and selection of appropriate statistical analysis. Each participant received personalized feedback files after the submission of each assignment. Participants created a final research proposal and presented this to the class. Portions of class time were devoted to discussion of individual research projects throughout the semester; this allowed students to see the link between research activities and classroom modules. It also allowed participants to collaborate with classmates as they encountered practical concerns during the proposal process.

Results

Bivariate correlations for perceived knowledge, research self-efficacy, interest in learning about research, and interest in performing research-related tasks in one’s career at Time 1 and Time 2 are presented in Table 1. As predicted, at Time 1 perceived knowledge of research was positively correlated with interest in learning about research ($r = .52$, $p = .01$), interest in performing research-related tasks in one’s career ($r = .40$, $p = .05$), and research self-efficacy ($r = .50$, $p = .01$). At Time 2, perceived knowledge of research was again correlated with interest in learning about research ($r = .47$, $p = .01$) and research self-efficacy ($r = .66$, $p = .01$), but not interest in performing research-related tasks in one’s career.

<table>
<thead>
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<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
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</thead>
<tbody>
<tr>
<td>1. Perceived Knowledge</td>
<td>--</td>
<td>.50**</td>
<td>.52**</td>
<td>.40*</td>
</tr>
<tr>
<td>2. Research Self-Efficacy</td>
<td>.66**</td>
<td>--</td>
<td>.27</td>
<td>.28</td>
</tr>
<tr>
<td>3. Learning Interest</td>
<td>.47**</td>
<td>.26</td>
<td>--</td>
<td>.63**</td>
</tr>
<tr>
<td>4. Career Interest</td>
<td>.32</td>
<td>.13</td>
<td>.62**</td>
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</tbody>
</table>

*Note.* Correlations for Time 1 are presented above the diagonal; bivariate correlations for Time 2 are presented below the diagonal.

A RMANOVA was conducted to determine study variables changed over the course of the semester; it was predicted that all four variables would increase over time. As predicted, perceived knowledge and research self-efficacy significantly increased over time; however, neither interest in learning about research nor interest in performing research-related tasks in one’s career changed over time. Means, RMANOVA results, observed power, and effect sizes are presented in Table 2.
Table 2. Means, Repeated Measures Analysis of Variance for Study Variables.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Mean</th>
<th>Pre</th>
<th>Post</th>
<th>( F(1, 32) )</th>
<th>( p )</th>
<th>Observed Power</th>
<th>( \eta^2 )</th>
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</thead>
<tbody>
<tr>
<td>Perceived Knowledge</td>
<td>3.68</td>
<td>4.42</td>
<td>80.50</td>
<td>&lt; .001</td>
<td>1.00</td>
<td>.72</td>
<td></td>
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<tr>
<td>Research Self-Efficacy</td>
<td>62.69</td>
<td>89.31</td>
<td>37.70</td>
<td>&lt; .001</td>
<td>1.00</td>
<td>.54</td>
<td></td>
</tr>
<tr>
<td>Learning Interest</td>
<td>5.61</td>
<td>5.58</td>
<td>0.03</td>
<td>.86</td>
<td>0.05</td>
<td>.00</td>
<td></td>
</tr>
<tr>
<td>Career Interest</td>
<td>5.00</td>
<td>5.03</td>
<td>0.02</td>
<td>.89</td>
<td>0.05</td>
<td>.00</td>
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</table>

Discussion

The present study investigated the relationship between perceived knowledge of research methods, research self-efficacy, interest in learning about research, and interest in performing research-related tasks in one’s career. The study also investigated the effect of a research methods course with both didactic and experiential components on these variables.

Perceived Knowledge

With respect to perceived knowledge of research, participants reported a significant increase over the course of the semester. This may be attributable to the combined didactic/experiential (active-learning) approach of the course. An approach that engages students in discussion, activities, and writing, such as the one employed in this course, typically produces better learning outcomes than passive approaches (e.g., students attend lecture only) (Malik & Janjau, 2011; Prince, 2004). Although the absence of a control group in this repeated-measures study does limit causal interpretation of the data, this finding does have important implications for the outcome assessment. Participants perceived that their knowledge of research increased following participation in a semester-long research methods course; this indicates that one of the main objectives (increased knowledge) of the course was met. In addition to enhancing students’ knowledge base, this increase in perceived knowledge may also enhance students’ attractiveness to potential employers. With greater perceived knowledge of the mechanics of research, undergraduates may be better able to speak from an informed perspective about job tasks involving research-oriented skills. Additionally, students may be better able to present themselves as a “good fit” for employers looking for individuals with analytical skills.

Perceived Knowledge and Interest

Consistent with study hypotheses, perceived knowledge was significantly related to interest in learning about research at both the beginning and end of the semester. Individuals with greater knowledge of research tended to possess greater interest in learning about research. This relationship may be attributable to the exposure’s effect on attitude (Zajonc 1968, 2001); individuals with greater exposure to information about research methodology may develop more favorable attitudes toward it, including interest in learning...
more about it. Improving undergraduates’ attitudes toward research could be particularly fruitful given that students’ motivation to persist or even attempt particular academic tasks is in part governed by their beliefs about the value of the activity (Eccles & Wigfield, 2002; Wigfield & Eccles, 2000). An increase in undergraduates’ knowledge and interest in research could influences students to become more involved in research-related activities. However, the correlational nature of this portion of the study prohibits a causal interpretation of the data; it is possible that individuals with greater interest in research had previously sought out learning opportunities, either formal or informal. Indeed, results of the analysis of interest in research’s change over time support the latter of these two possible explanations of the data; participation in the didactic and experiential research methods course produced no significant change in participants’ interest in learning about the topic. Perceived knowledge was significantly related to interest in performing research-related tasks in one’s career at the beginning of the semester; individuals with greater interest in executing research-related tasks on the job tended to report greater amounts of perceived knowledge. This finding was consistent with study hypotheses. However, the significant relationship between these variables disappeared by the end of the semester. Moreover, interest in performing research-related tasks in one’s career did not change over the course of the semester. Taken together, these findings are consistent with that of Manning et al. (2006); their research found students to be less interested in research following completion of a research methods course. Undergraduates may begin research coursework with a positive bias toward the subject (Manning et al., 2006); this positive perspective toward research may be related to a lack of understanding of the technicalities of the research process (Sizemore & Lewandowski, 2009). As students gain greater experience with the detailed mechanics of research over the course of the semester, their interest in it may wane. Additionally, students may lose interest in learning about and conducting research because they perceive research-related tasks to be unrelated to their post-graduation plans. For example, students who do not plan to attend graduate school for advanced discipline-specific training may perceive research methods courses as having little personal value (Vittengl et al., 2004). Moreover, students who are interested in careers in applied environments (e.g., licensed social worker, counselor) may view research-related skills as unrelated to their specific career goals (Sizemore & Lewandowski, 2009).

**Perceived Knowledge and Research Self-Efficacy**

Consistent with study hypotheses, participants’ research self-efficacy was significantly related to perceived knowledge at both the beginning and end of the semester. Individuals with greater perceived knowledge tended to rate themselves as more capable of completing research-oriented tasks. Furthermore, the relationship between these variables was larger at the end of the semester; this suggests the more one learns about research, the more confident one becomes in the ability to perform it. This conclusion is supported by the analysis of research self-efficacy’s change over time. As hypothesized, participants’ self-efficacy for research-related tasks increased over the course of the semester. Participants reported greater confidence in their ability to execute research-related tasks spanning from conceptualization of a research idea to presentation of a final project. Students likely benefited from the step-by-step approach to completion and presentation of the re-
search project. Following completion of each step of the project, participants received individualized feedback and suggestions for improvement from the course instructor. Additionally, participants were able to utilize sections of class time to consult with their peers regarding the practical concerns of the research process (e.g., suggestions for refining research hypotheses, methods to operationalize variables). Participants’ likely engaged in positive self-attributions for success during these experiences; in turn, participants’ self-efficacy for research was enhanced. This interpretation is consistent with that of self-efficacy theory (Bandura, 1977, 1982) which states that confidence in one’s ability to perform a task is dynamic – perceived success in the execution of increasingly complex tasks improves expectations for completion of future tasks in that domain.

**Implications for Scholarship of Teaching and Learning**

This study’s findings have multiple implications for the scholarship of teaching and learning. First, this study’s design (a pre- and post-course assessment) is an example of the scholarship of teaching and learning in practice (Lambie, Ieva, & Ohrt, 2012). Measuring perceived knowledge at the beginning and end of the semester provides a way to assess the degree to which students believe that they profited or learned from a course. Additionally, change in research self-efficacy may also provide an additional means of outcome assessment in teaching. If students perceive that they are truly learning material, they likely will view themselves to be more capable of performing tasks related to that material. These methods of outcome assessment could be utilized in addition to current approaches (ex: completion of projects, attainment of a specific grade).

**Limitations and Future Directions**

The self-report nature of the data is a limitation of the current study. Students perceived greater knowledge of research methods and greater confidence in their ability to perform research-related tasks; however, they may have overestimated their abilities. Participants may not actually possess the enhanced knowledge and competence for research.

The absence of a control group is also a limitation to the current study. Because of this, it is not fully possible to draw causal inferences about the effect of this approach to social science research methodology instruction. Although participants’ perceived knowledge and research self-efficacy changed over the course of the term, in the absence of a control group, the effect of this change may not be fully attributable to participation in the experiential and didactic components of the course. This author is planning a future study that will utilize a control group, better enabling causal inferences to be drawn regarding the effect of participation in an active-learning research methods course.

**References**


Educational Innovation in the
Design of an Online Nuclear Engineering Curriculum

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Abstract

The purpose of this paper is to describe the development and implementation phases of online graduate nuclear engineering courses that are part of the Graduate Nuclear Engineering Certificate program at Virginia Tech. Virginia Tech restarted its nuclear engineering program in the Fall of 2007 with 60 students, and by 2009, the enrollment had grown to three times its initial size. In this paper, we present the innovative ways we employed to differentiate the program from other programs nationwide. Starting in 2009, with education grants from the Nuclear Regulatory Commission (NRC), we began transforming the distance courses from video conferencing to an online format that uses asynchronous and synchronous technologies. We used design principles drawn from research and theories in disciplines such as adult learning, cognitive science, motivation, and education. During these phases we worked closely with the distance learning institute at Virginia Tech which employs a structured life cycle methodology for online course development. We discuss the instructional design approaches used to provide a meaningful learning experience for adults, particularly non-traditional students. In addition we examined observational data to indicate instances for experiential learning.

Keywords: Nuclear engineering graduate courses, online learning, adult learning theories, motivation, MUSIC Model of Academic Motivation.

In recent years, the growing energy needs (U.S. Department of Energy, 2008) due to the projected increase in electricity demand in the U.S. and the world (Energy Information Administration, 2007), has led to increasing interest in nuclear power, and thus, to a nuclear renaissance. One of the challenges of this nuclear renaissance is the lack of an appropriate workforce. There is a significant need for educating nuclear engineers who can engage in research in designing newer, safer, better, and advanced reactors, as well as design and optimize nondestructive detection systems and monitoring systems for nuclear security and safeguards.

Virginia Tech responded to the nuclear engineering industry’s immediate needs by restarting its nuclear engineering program in August 2007 and offering undergraduate and graduate nuclear engineering courses. Enrollment in these courses for the 2009-2010 academic year was 217 students, consisting of 161 undergraduate students and 56 graduate students. Most of the graduate students were located off-campus and employed in the nu-

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clear industry at various sites within Virginia. Given this enrollment population, the graduate nuclear engineering courses were offered via live video teleconferencing to remote sites. Although the classes were offered at a distance, this delivery format required students to attend the classes at particular sites as scheduled.

The classes are recorded for later viewing, yet even so, students who had extensive travel schedules or heavy workloads during the week were unable to enroll in these classes. These barriers prevented some employees from enrolling in any of these graduate courses. Even some of those who could attend classes experienced significant stress in balancing classroom and homework deadlines with family and work obligations. In addition, the program had received frequent requests to transmit the classes to sites that could not support high resolution live video teleconferencing or to sites out of Virginia. These demands led to the need to create an asynchronous online option for the Graduate Nuclear Engineering Certificate program.

One of the appeals of asynchronous technologies is that learners can access materials, complete assignments, participate in discussions, and take exams according to schedules that they largely determine themselves. The hypermedia learning environment offers particular advantages to adult learners who are inherently self-directed (Knowles, 1990). To be inclusive of the diverse educational needs of the off-campus students, as well as accommodate and enhance the on-campus nuclear engineering program, we proposed to incorporate innovative educational approaches derived from current research and theory in the areas of adult learning, cognitive science, motivation, and education.

This paper presents the development and implementation of online graduate nuclear engineering courses that are part of the Graduate Nuclear Engineering Certificate program at Virginia Tech. These courses were made possible with education grants from the Nuclear Regulatory Commission (NRC). This certificate program consists of the following four courses: Nuclear Engineering Fundamentals, Nuclear Fuel Cycle, Radiation Detection and Shielding, and Nuclear Power Plant Operations and Systems. In the following sections, we present the main factors that influenced the design decisions and the iterative approach employed to design, deploy, and assess the effectiveness of these four graduate nuclear engineering courses. At the time we wrote this paper, the Nuclear Engineering Fundamentals course was the only one that had been taught, which allowed us to collect and report data related to this course. To respond to the needs of industry personnel, as well as increasing enrollment and interest in nuclear engineering, the focus of our approach has hinged on balancing current pedagogical methods and best practices, fundamental learning and motivation research and theory, and participants’ personal experiences.

Course Design

In this section, we discuss four design factors that guided the design of the online courses. One factor was the profile of the students likely to enroll in the courses. A second factor was the life-cycle model, which was the approach we adopted for the design of the online courses. A third factor was the consideration of students’ math skills, which led to
the design of a refresher module on math to help those who needed additional help with these concepts. The fourth factor was the technology that was available.

**Design Factor 1: Profile of Students Interested in the Online Offering of a Graduate Nuclear Engineering Certificate Program**

The majority of engineers hired by the nuclear industry are not nuclear engineers; instead, they are mechanical engineers, electrical engineers, structural engineers, chemical engineers, among others. These types of engineers must apply their specialized engineering field toward nuclear power plant applications. Having a solid foundation in nuclear engineering basics could provide significant gains for those engineers who were hired without ever having any knowledge about nuclear power. A graduate certificate in nuclear engineering could provide this foundation. In fact, we found that about half of our industry distance-learning students were interested in obtaining only a graduate certificate and not continuing on to complete a Master’s degree of any kind. In addition, we had had a large demand for these courses in just the short time since we started the program. Consequently, there was a clear need that could be served by providing the certificate program in asynchronous online format. We designed the Graduate Nuclear Engineering Certificate Program to meet that need.

**Design Factor 2: Life-Cycle Model**

Although a classical approach to design and delivery of online courses is a linear model relegating assessment of teaching and learning to the end of the course, the method employed for course development at Virginia Tech emphasized a parallel model that integrated consideration of the various factors influencing the learning environment into the initial phases of the online course development. This systems-based approach was designed to allow for more effective integration of course objectives with online strategies, pedagogies, and best practices (Royce, 1970). We worked with the Virginia Tech distance learning institute and used their process that follows a life-cycle model with seven phases: (1) Planning Phase, (2) Analysis Phase, (3) Design Phase, (4) Development Phase, (5) Testing Phase, (6) Implementation Phase, and (7) Evaluation, Support, and Maintenance Phase. Each phase is distinguished by activities, techniques, best practices and procedures that combine to construct viable, sustainable, efficient, and useful online courses. The design choices are driven primarily by the learning objectives associated with a given course. This methodology for eLearning course development leads to reduced errors associated with haphazard instructional design and development and fewer technical support issues. These benefits are coupled with quality standards that are designed to create sustainable and efficacious eLearning systems that result in higher levels of learning and eLearner satisfaction, and improved understanding of instructional design and online teaching among faculty.

**Planning Phase of Online Courses: The Role of Self-Regulation**

The design of the nuclear engineering courses was associated with mapping the current face-to-face or video conferencing lecture course into an online format to ensure align-
ment across the associated course objectives, activities, technology used, feedback mechanisms, assessments, and other key components. During this effort, we examined what the instructor and student each did to support or meet course objectives in the traditional format, and then considered alternatives to accomplish these objectives in the online format. Both students and instructors face many challenges when making the transition from the face-to-face courses to an online format where: (a) in the computer-mediated learning environment, social presence (i.e., vocal tones and/or facial expression) may be reduced, therefore, the instructors have to rely on students to communicate his/her challenge in learning the material; and (b) online learning requires students to exhibit higher levels of self-regulated learning (SRL) behavior than the students in a traditional classroom setting.

Schunk (2001) defined self-regulated learning (SRL) as “learning that results from students’ self-generated thoughts and behaviors that are systematically oriented toward the attainment of their learning goals” (p. 125). Pintrich and Schunk (2002) have shown that successful self-regulated learners possess higher levels of motivation (personal influences), apply more effective learning strategies (behavioral influences), and respond more appropriately to situational demands (environmental influences).

The level of self-regulated learning required of students in the online paradigm represents a paradigm shift for many students as the study habits that have brought them success in traditional learning environments are not always effective in the new settings (Hmelo-Silver, 2004). To facilitate students with self-regulated learning, the assessment has to be formative and promote continued improvement in student performance in addition to assisting students in reflecting on their own learning during the assessment exercises.

Students must have motivation to use the SRL strategies and regulate their learning efforts. The instructional strategy in a recent study by Shih, Zheng, Leggette, and Skelton (2011) addressed three motivational components from Pintrich’s (2000) model for promoting use of SRL by enhancing self-efficacy, increasing task value, and goal orientation (instruction designed to help students to shift their focus from comparing their performance with peers to self-comparison towards an intrinsic goal orientation). To enhance students’ awareness of their learning process, for example, students were asked to report the number of hours they had studied, how many points they would have to achieve to be satisfied with their performance (satisfaction goal), and how confident they were about achieving their satisfaction goal. Students’ performance was better when the instructor explicitly supported their use of self-regulated learning strategies (Shih et al., 2011). In the design of our online courses, we operationalized these principles (self-efficacy, task value, goal orientation) using personal, behavioral, and environmental aspects of SRL strategies. In addition, formative assessment was used to facilitate self-regulation learning in students. One example of promoting SRL in our instructional approach was that we asked students in the first week what they expected to get from the course. We used their responses in the design of the discussion forums topics. Another example was to provide timely corrective feedback that was positive and motivating.
Theoretical Foundation for Teaching and Motivating Adult Learners

Instruction is more effective for adult students when they are motivated to learn (Hofer, 2009; Jones, 2009; Wlodkowski, 1999, 2003). Quiñones (1997) draws the same conclusion in the context of corporate training: that improving the participants’ motivation to learn the content increases the program’s effectiveness. We mapped our instructional design to the five attributes of a learning environment that, according to Jones (2009) and Wlodkowski (1999), have motivational effects on adults. The factors that Wlodkowski (1999) identified as being important to motivating adults are shown in the left-hand and center columns of Table 1 and include expertise, relevance, choice, praxis, and groupwork.

Table 1. Factors that Motivate Adult Learning.

<table>
<thead>
<tr>
<th>Factor (Wlodkowski, 1999)</th>
<th>Rationale (Wlodkowski, 1999)</th>
<th>MUSIC Components — Can lead to students’ increased perceptions of: (Jones, 2009)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Expertise of presenters</td>
<td>Adults expect their teachers to be experts in the material being taught, well-prepared to teach it, and knowledgeable about the interests, needs, and problems of their audience.</td>
<td>• Success • Individual Interest</td>
</tr>
<tr>
<td>2. Relevance of content</td>
<td>Adults may quickly become impatient with material they cannot easily relate to their personal interests or professional needs.</td>
<td>• Individual Interest • Usefulness</td>
</tr>
<tr>
<td>3. Choice in application</td>
<td>Adults respond well when given options about whether, when, and how to apply recommended methods, and are skeptical of “one size fits all” prescriptions.</td>
<td>• Empowerment • Usefulness</td>
</tr>
<tr>
<td>4. Praxis (action plus reflection)</td>
<td>Adults appreciate opportunities to see implementations of methods being taught and to try the methods themselves, and then to reflect on and generalize the outcomes.</td>
<td>• Usefulness • Empowerment • Success</td>
</tr>
<tr>
<td>5. Groupwork</td>
<td>Adults enjoy and benefit from sharing their knowledge and experiences with their colleagues.</td>
<td>• Caring</td>
</tr>
</tbody>
</table>

Felder, Brent, and Prince (2011) explain that How People Learn (HPL) criteria is compatible with Wlodkowski’s (1999) motivational factors. HPL, a cognitive-based framework for effective instruction, has been shown to provide a good basis for the design of engineering instruction (Bransford, Brown, & Cocking, 2000; VaNTH-ERC, 2010). HPL criteria are based on a learner-centered approach and take into account the learners’ knowledge, skills, and attitudes. This approach promotes relating the materials to learners’ knowledge and providing freedom to make choices in learning tasks. HPL is also knowledge-centered which gives prime importance to the most important principles of
the subject. The instruction in HPL is designed to enhance skills. It is assessment oriented with timely feedback to learners to help them gauge their attainment of the program objectives. Lastly, HPL is community-centered and is based on a supportive environment among learners deemphasizing competition. Jones’ (2009) MUSIC Model of Academic Motivation provides a means through which instruction could be designed to operationalize the theories presented in the HPL criteria and in Wlodkowski (1999, 2003) to motivate adult learning.

In the MUSIC model, MUSIC is an acronym for five important motivational components that should be considered when designing instruction to motivate students: eMpowerment, Usefulness, Success, Interest, and Caring (see www.MotivatingStudents.info for more information). These components were derived from a synthesis of the research and theory in the field of motivation and related fields (Jones, 2009). When these five components are present in an educational learning environment, students have been shown to be more motivated and engaged in their learning. The empowerment component refers to the amount of perceived control that students have over their learning. Instructors can empower students by providing them with choices and allowing them to make decisions. The usefulness component involves the extent to which students believe that the coursework (e.g., assignments, activities, readings) is useful for their short- or long-term goals. One implication is that instructors need to ensure that students understand the connection between the coursework and their goals. For the success component, students need to believe that they can succeed if they put forth the appropriate effort. Instructors can foster students’ success by doing such things as making the course expectations clear, challenging students at an appropriate level, and providing students with feedback regularly. The interest component includes two sub-components: situational interest and individual interest. Situational interest refers to the interest in and enjoyment of instructional activities, whereas individual interest refers to one’s longer-term personal values and interest in a topic. Instructors can create situational interest by designing instruction and coursework that incorporates novelty, social interaction, games, humor, surprising information, and/or that engenders emotions. Instructors can develop students’ individual interest in a topic by providing opportunities for them to become more knowledgeable about the topic and by helping them understand its value. The caring component includes the degree to which students feel cared for by others in their academic pursuits. To support caring, instructors can demonstrate that they care about whether students successfully meet the course objectives and that they care about students’ general well-being.

Our instructional design approach was informed by HPL criteria, Wlodkowski’s motivational factors, and Jones’ MUSIC model. The right-hand column of Table 1 shows the MUSIC model components that Wlodkowski’s motivational factors would likely affect most directly. Of course, changes in any one of the MUSIC model components might affect changes in other components as well for any one particular student. For example, if a student begins to see the usefulness of the material, she might also become more interested in it, which could lead to increased engagement with the material and success in learning it.
Implications to Instructional Development: Students’ Data

The profile of students participating in the Graduate Nuclear Engineering Certificate program consists of industry personnel and graduate students who typically have significant experience and knowledge about the nuclear industry and are interested in building a solid understanding of nuclear engineering basics. The online version of the program was developed using Wlodkowski’s (1999, 2003) five principles along with HPL criteria and Jones’ MUSIC model (2009) to accommodate these learner characteristics. In addition, course design took into account students’ survey responses from those who completed the previous video teleconferencing version of the Nuclear Engineering Fundamentals course. To demonstrate connections between theory and practice we include some of these responses below followed by the possible implications of these responses on students’ perceptions of the MUSIC model components (as noted in brackets).

- “I have to say that it is an extremely valuable resource to be able to view the recorded lectures. Repeating sections really helps the concepts sink in.” [The recorded lectures help students feel that they can succeed and empowers them by providing the option of repeating recorded sections.]
- “The annotated class notes and video are great. These features are new to me and I am very happy with the notes and videos. An improvement would be to somehow make those two media available to the students via a long term library. I would very much like to be able to depend on access to these files (notes and video) as a long-term reinforcement to the learning that took place this semester.” [The annotated class notes and videos help students feel that they can succeed.]
- “I really enjoyed the class, it has helped me in my job more than you can imagine!” [The class is situationally interesting (enjoyable) and is seen as useful to this individual’s goals.]
- “Most of us talk and will help each other along the way. I am sure that you can tell by the emails when we have problems.” [Students have caring relationships with other students that can increase their academic success.]
- “It is fun when you believe you suddenly understand how to solve a problem!” [Success can lead to situational interest (enjoyment).]
- “I have all but decided to drop this course. My reasons for dropping are: (1) I am struggling with the calculus required for this course, primarily because I have not done any calculus since I completed engineering undergrad 18 years ago. (2) I have a wife and two young sons, a full time job, and other demands on my time (such as coaching a soccer team) that prevent me from devoting the amount of time that I believe I need to commit to re-learn calculus and study for this course. (3) Completing each of the two HW [homework] assignments for this course took me an inordinate amount of time. I estimate that I have about 15 hours in completing HW#1 and about 12 hours in completing HW#2. Though I received a grade of 100 on HW#1, I do not feel confident because a significant amount of collaboration with classmates was involved. As a result of the above three issues, I am extremely concerned that I would not pass the up-coming mid-term exam.” [Several issues led to this individual’s perception that he would not succeed.]
The above quotations demonstrate that there are many challenges faced by graduate students from the nuclear industry while working at a job, completing coursework, and balancing other personal demands. We identified the aspects that were favorable, which included that the program empowered them with choices, helped them to see the usefulness of the material, helped them to succeed, created interest, and fostered a caring learning environment. In our course re-design we attempted to address most of the identified issues in the redesign of the Nuclear Engineering Fundamentals course and the subsequent Graduate Nuclear Engineering Certificate courses. Data collected from student survey responses indicated that the two key factors desired most by students for effective instruction were (a) providing an asynchronous self-paced course with just-in-time modules (such as mathematics) and (b) providing a virtual collaborative environment among fellow students with multiple channels for communication.

**Design Factor 3: Mathematics Review**

The Nuclear Engineering Fundamentals course that was offered online in Spring 2011 required some background knowledge of ordinary differential equations and atomic and nuclear physics. We provided review modules to accommodate these needs using online resources without taking time away from the course material. This was helpful to students who were not up-to-date in some of the prerequisites and these “just-in-time” modules would be used as needed for a refresher on the appropriate subject. This was found to be a particular issue for new students from industry who had not been in a classroom environment for over 10 years. Even learning to use natural logarithms and exponentials for radioactive decay equations was difficult at first for some of the students. By incorporating some of the common mathematics skills in review modules with practice sets, those students who needed a review got up to speed much quicker and the more competent students got a quick review. It allowed students to take the path through the course that was most appropriate given their current knowledge of mathematics. Doing so empowered students through choices that enabled them to succeed in the courses. Given the success in relation to student learning we plan to incorporate this format into our online courses.

**Design Factor 4: Technology Use**

The course management system at our institution is a local implementation of open source Sakai software called Scholar. Tools offered through Scholar include: discussion forums, chat rooms, electronic assignments, calendar, announcements, lesson modules, resources, document folders, class listserv, electronic grade book, online quizzes, blogs, podcasts, and collaboration wikis. We also used Centra for synchronous virtual sessions including online tutoring and interactive virtual office hours. Centra is a powerful tool for online multiple-user interaction and course organization that includes real-time two-way audio, application sharing, web browsing, white boarding, and text chatting.

We used Camtasia to create course videos. These videos were coordinated with the class notes that were created in PowerPoint format and saved in Scholar in the Resources section in PDF format. These notes were annotated using a tablet PC inking tool and also as an electronic white board. We used the Assignment features in Scholar to outline the
weekly expectations in terms of readings, corresponding videos, notes, homework, quizzes, forums postings, and other appropriate additional materials. We used as few navigation buttons as possible to avoid burdening students with locating the materials. The Home page and the course syllabus provided straightforward directions about how to access the materials and the expectations of the course. We pilot tested these features with similar students in previous terms to ensure that the use of the tools and technology were not overly demanding and simple enough to increase the likelihood that students would feel that they could succeed in using the course tools and technology.

First Distance Online Offering of Nuclear Engineering Fundamentals

The first course we revised and taught in the new online format was titled Nuclear Engineering Fundamentals. The faculty members teaching the nuclear engineering fundamentals courses were experts in the subject of nuclear engineering. This corresponds to the first factor in Table 1, which should also lead to students’ increased perceptions of success and individual interest. For course materials, the third edition of Introduction to Nuclear Engineering (Lamarsh & Baratta, 2001) and other supplementary materials were used. The topics in the course included: Atomic and Nuclear Physics, Interaction of Radiation with Matter, Nuclear Reactors and Nuclear Power, Neutron Diffusion and Moderation, Nuclear Reactor Theory, and The Time-Dependent Reactor. To increase students’ perceptions of usefulness, we also prepared course notes to be relevant and applicable to students who worked in industry for a number of years. The PowerPoint slides were posted online in advance and were annotated using the inking features provided by a Tablet PC. We prepared videos of the lectures with appropriate examples for solving problems and discussed additional interesting topics (e.g., a video about Chernobyl accident). Further, in the first week, to assess students’ individual interests and career goals, we asked students to tell us what they expected to get out of course.

The discussion forums allowed students to ask questions about homework, quizzes, tests, or any other topics. Our hope was that students would feel that the instructors cared about their learning and that this would lead them to believe that they could succeed. The topics in the discussion forums were designed parallel to topics discussed to allow opportunities for students to communicate and discuss the materials without the pressure of being graded. In addition, these forums allowed students to communicate their conceptual understanding of the materials with application examples. As an example, in one of the discussions, we asked:

If you were the Vice-President of Nuclear Operations for an electric utility company and were in charge of deciding whether to build a pressurized water reactor (PWR) or a boiling water reactor (BWR) for your next nuclear power plant, which type would you recommend? Please fully explain your decision. In doing so, state at least four reasons why.

Students’ responses are included in the Appendix. All the students participated in the discussion and applied what they had learned to the case. However, responses from the students clearly differentiate those with nuclear industry experience from those without.
Those with industry knowledge discussed the case by couching the reasoning in their experiences and using conversational words and phrases common among engineers in the work place. In contrast, the last response provided in the Appendix, although accurate, lacks of familiarity with industry verbiage and was from a graduate student. This is an example of experiential learning as well as using interactive technology to facilitate peer learning and combining disciplinary knowledge with real-life situations.

We provided online office hours to allow students to ask questions and have a live discussion. These were recorded for further viewing. The assessment consisted of two to three online weekly quizzes depending on the materials covered. Students received feedback on these quizzes after the deadline. The feedback was available to students throughout the term for reflection and preparation for final exam. All of these design elements were included to help support students’ success.

Homework problems were provided for each of the topics covered. We provided additional online help for some of the homework. For example in the case of estimating the current lifespan of the world’s uranium, they used a “Nuclear Fuel Supply Calculator” which is an online resource (http://www.wise-uranium.org/nfcs.html) that was needed to make assumptions about the input data. Assignments were graded using PDF annotator and re-uploaded to Scholar. Detailed feedback was provided through these homework assignments to help foster a deeper understanding of the materials. The final exam was a comprehensive take-home exam and students uploaded their solutions in Scholar.

A summary of the course design elements discussed in this section with the corresponding design principles from Wlodkowski (1999), HPL (Bransford et al., 2000), and the MUSIC model (Jones, 2009) are provided in Table 2.

Observations and Discussion

The first online offering of Nuclear Engineering Fundamentals was distributed through the distance learning institute at Virginia Tech. Observational data (students’ actions observed through Scholar) revealed that distance students in an industry setting appeared to be very comfortable in using all the tools offered. One noteworthy observation is the interaction that took place among students in the discussion forum. Students’ responses to open-ended questions in forums reflected the influence of their work experience on their learning. This was a valuable experiential learning opportunity to those students who did not have nuclear work experience because they were able to learn from the responses of those who did have work experience. In the first offering of the Nuclear Engineering Fundamentals course, we did not provide a feedback rubric nor did we grade postings to these discussion forums because our previous research (Hall, Dancey, Amelink, & Conn, 2011) showed the value of grades associated with these postings was useful only for the undergraduate students.

A survey was administered to students by the Virginia Tech distance learning institute at the end of the course (reported on a Likert-type scale ranging from 1 = strongly disagree to 6 = strongly agree). The mean value was a 6 for the following items: “The instructor
Table 2. Instructional Elements and Design Principles.

<table>
<thead>
<tr>
<th>Instructional elements</th>
<th>Wlodkowski</th>
<th>HPL</th>
<th>MUSIC model</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Using faculty experts in nuclear engineering</td>
<td>• Expertise of presenters</td>
<td>• Learner-centered</td>
<td>• Success</td>
</tr>
<tr>
<td>2. Course notes relevant to students in industry</td>
<td>• Relevance of content</td>
<td>• Learner-centered</td>
<td>• Individual interest</td>
</tr>
<tr>
<td>3. Annotated PowerPoint slides posted online</td>
<td>• Relevance of content</td>
<td>• Knowledge-centered</td>
<td>• Usefulness</td>
</tr>
<tr>
<td>4. Videos of lectures with interesting topics</td>
<td>• Relevance of content</td>
<td>• Knowledge-centered</td>
<td>• Situational interest</td>
</tr>
<tr>
<td>5. Asking students what they want in course</td>
<td>• Choice in application</td>
<td>• Learner-centered</td>
<td>• Usefulness</td>
</tr>
<tr>
<td>6. Discussion forum</td>
<td>• Groupwork</td>
<td>• Community-centered</td>
<td>• Empowerment</td>
</tr>
<tr>
<td>7. Online office hours</td>
<td>• Praxis</td>
<td>• Learner-centered</td>
<td>• Individual interest</td>
</tr>
<tr>
<td>8. Weekly quizzes with feedback</td>
<td>• Praxis</td>
<td>• Assessment-centered</td>
<td>• Usefulness</td>
</tr>
<tr>
<td>9. Homework problems with online help</td>
<td>• Relevance of content</td>
<td>• Assessment-centered</td>
<td>• Success</td>
</tr>
</tbody>
</table>

was well prepared”, “The instructor presented the subject matter clearly”, “The instructor provided feedback intended to improve my course performance”, “The instructor fostered an atmosphere of mutual respect”, and “My interest in the subject matter was stimulated by this course.” On the open-ended question: “What did the instructor do that most helped in your learning?” one student wrote “Posting hints to some of the homework problems was quite helpful. Most of the time the huge time consumption came from first understanding and setting up the problem to be solved.”

These comments provide evidence that the factors presented in Table 1 led to some of the anticipated outcomes. These findings also show the inherent limitations discussed in our previous research (Hall, Amelink, Conn, & Brown, 2010) in regard to asynchronous technology in engineering courses requiring real-time interaction during problem solving. For example, we offered synchronous office hours to take advantage of aspects of technology and real-time interactions. Sometimes students would participate in these sessions, but when they did not, the instructor would use the time to record the steps to solv-
ing some example problems. Students communicated that they found these recordings helpful in doing their homework.

**Conclusion and Future Plans**

The first online offering of the Nuclear Engineering Fundamentals course was successful in meeting our expectations to provide a meaningful learning experience for adult students. Although we designed the online course based on current theory and empirical research, we made many adjustments during the actual offering based on observational data and plan to make other adjustments in the future. As an example of a possible adjustment, a few of the students were not native English speakers which made some of the communications with the students difficult. Their forum responses tended to be directly from the notes and textbook, which was not as helpful as they could have been if they had done more to elaborate on these ideas and provide further examples. In the future, we plan to provide a rubric for the online discussion forums and help improve the interactions among the students for these asynchronous learning opportunities. Because upper-level undergraduate students sometimes participate in these Graduate Nuclear Engineering Certificate courses, expanding the use of these online discussion forums should provide an experiential learning setting for collaborations between these students and those with industry experience. To further improve the course quality, we will continue collaborating with the distance learning institute at Virginia Tech.

The asynchronous nature of the course helped those with heavy travel schedules as they completed the coursework. We expect to expand the reach of our online nuclear engineering graduate courses nationwide. We are currently developing our Master’s-level courses for online asynchronous delivery. We attribute the success of this first offering to the research based approach taken to align the design and delivery of this online course with students’ profile, prior knowledge, and their expectations from these courses. The framework discussed offers a platform for instructors and administrators to examine their own student populations, available technology, various learning obstacles and opportunities that should be addressed before developing a course online.

**References**


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Appendix:  
Students’ Responses to the Forum Question Presented in Section 3

Students’ responses to the forum question in section 3 are below. All identifying words are removed from these responses.

**Student 1 Response**

If I were the VP of such a company I would look at the new Generation III Reactor design that has been recently been certified by the NRC. This is a Westinghouse AP1000, a PWR that has been vastly simplified in a standardized design. This standard design shrinks the overall footprint of the core and site facilities, and it's projected cost is ~$1200 per KW. The AP1000 will have a gross power rating of 1200 MWe, and an estimated build time of 36 months.

It's almost a toss up decision between the Advanced BWR and The AP1000 because the latest generation designs have many safety improvements along with standardized designs, but the PWR design still has some inherent advantages.

1. The control rods are electromagnetically actuated from above the core so if power is lost they can SCRAM the reactor and the CRs would use gravity to drop into the core and shutdown the reaction.
2. The obvious reduced exposure to radiation due to the containment of the radioactivity in the primary cooling loop inside the primary containment. It's best to just not have your workers worry about radiation exposure limits. Such as 100 millirem per hour.
3. Its ability to follow the power demand load on the steam turbines and adjust power accordingly by control rod actuation.
4. Its power density is high, which makes for a smaller core and smaller footprint.

**Student 2 Response**

I am strongly biased because my Company has most experience with PWRs and I am an Electrical Systems Engineer for my Company. As Vice President, I would recommend a PWR for the following reasons:

1. There is truly a lesser spread of contamination. Therefore it is safer to the workers and safer to the public.
2. The ability of using gravity for rod insertion during scram conditions makes the PWR ideal for Nuclear Safety.
3. Seeing that my Company’s experience greatly is centered around the PWR, building new PWRs would be cost effective to the company. Persons from within the company can be used for training new employees to staff the new PWR.
4. The ability of dumping steam directly to atmosphere allows for a rapid and simple method for cool down. Cool down during emergent conditions becomes complicated for the BWR and therefore the PWR design would be preferred.
Student 3 Response

From this week's lectures, I have concluded that I prefer PWRs over BWRs and would recommend building PWR reactors if I were the VP of NO. I prefer PWRs because:

1. With a PWR the reactor power follows the electrical load. I find this to be an amazing feature that is completely automated by the reactor itself. When an ISO/energy market tells a nuclear plant with a PWR that it needs to output more power (if possibly not at a peak) or reduce its output power, the operator just has to set the generator and allow the reactor to compensate. I imagine this is a huge help in operating a PWR.
2. The PWRs use of gravity to move the reactor control rods during SCRAM. In a BWR, a hydraulic system is needed to push the control rods up into the reactor, which adds costs, complexity, and more chances of failure.
3. PWR's have non-radioactive steam systems, allowing for all access during reactor operation, which I can see as being extremely beneficial in an failure of a (non-critical) component or a full-on emergency. This benefit also reduces radiation exposure, making it safer for all workers.
4. Less core instrumentation is required in the core of a PWR than a BWR, reducing some costs/complexity/chances of failures.
Improving the Quality of Instruction Through a Service Teaching Framework

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**Abstract**

Many professors lack sufficient pedagogical training needed to teach their courses effectively. In an effort to aid professors in improving the quality of instruction in their courses, this article distills the principles embedded within a service teaching framework for instruction. The principles discussed throughout this article pertain to: establishing relationships with students, formative assessment practices, responding to negative issues in a positive manner, valuing and validating students’ perspectives, and exceeding course requirements. I conclude with a discussion of three important actions needed for this framework to be implemented successfully.

**Keywords:** Service, teaching, quality.

Many professors report feeling inadequately prepared by their graduate school experiences to fulfill their teaching responsibilities effectively (Beckerman, 2010). While many professors have an extensive knowledge base in their respective academic fields, they have very little knowledge about how to teach their content in effective ways (Beckerman, 2010). Unfortunately, this lack of adequate pedagogical preparation often leads to the implementation of poor-quality courses for students. Given the ever-increasing pressures for professors to conduct research and serve at the department, college, and university levels, many professors have very little time to reflect on the philosophical principles that guide their teaching practices. Because one’s teaching philosophy directly impacts one’s practices within the classroom (Gossman, 2008), it is imperative that professors closely examine the principles that guide their teaching. The purpose of this article is to outline the philosophical principles embedded in a service teaching framework for teaching quality. Inevitably, the courses that professors teach are likely to vary in objectives, student demographics, assessment measures, and delivery formats. Hence, this framework is not presented as a panacea for all instructional issues or concerns within all courses. Instead, this framework highlights a broad set of principles for professors to apply, amend, and adapt in their respective contexts to improve the quality of instruction for students. This paper concludes with a discussion of three prerequisite actions that professors must embrace for the service teaching framework to produce effective results.

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Service Teaching Framework

It is not a novel idea for professors to create and alter course content to provide opportunities for students to learn through service learning activities (Levesque-Bristol, Knapp, & Fisher, 2010). While it is common for professors to think of themselves metaphorically as conductors, coaches, or facilitators in the classroom, few professors think of themselves as a “servants” of students. Being experts in their respective fields of study, most professors view teaching as an opportunity to share their knowledge, expertise, and skills with students, rather than an opportunity or responsibility to serve students. To date, very little scholarship examines the role of teaching as a means of serving students or teachers as being what Bowman (2005) calls servant leaders. If we give deference to Bowman’s notion of teachers as servant leaders, an important question arises inevitably. How might professors teach in ways that allow them to use their expert knowledge, skills, and resources to better serve the different needs, interests, and abilities of students in their courses?

Recently, I enjoyed a wonderful night out on the town with my family at a nearby restaurant. The meal was delicious and the service was exceptional. While reflecting on this experience, a metaphor emerged that aptly responds to the aforementioned question. Namely, when a patron visits a dining establishment, he or she orders, eats, and pays for a meal. While the price of the meal is fixed and publicized on the menu, the patron offers gratuity based on the quality of service they experienced. A tip in the amount of 10% or less of the total cost of the meal typically indicates that the patron was not very satisfied by the service they experienced. In contrast, a tip in the amount of 20% or greater of the total cost of the meal typically signifies that the patron experienced exceptional service. Finally, a tip in the amount of 15% of the total cost of the meal typically indicates that the patron had a satisfactory experience. If we apply this metaphor to the quality of instruction professors implement in their courses, there are five specific principles professors should carry out to ensure their patrons (students) receive excellent service. These principles pertain to: showing genuine concern for students’ needs, interests, and abilities, examining students’ progress regularly, responding to issues and challenges in a positive manner, valuing and validating students’ perspectives, and exceeding official course requirements. Further, the acronym S.E.R.V.E is used to summarize the principles within the service teaching framework.

(S) Show genuine concern for students’ needs, interests, and abilities

Excellent servers typically begin their interactions with patrons by welcoming them (patrons) to the establishment, introducing themselves, and establishing a working relationship. Then the server typically begins asking questions related to patrons’ needs and desires. In this same vein, professors should begin their courses by establishing a working relationship with their students and assessing their students’ needs, interests, and abilities. One way that professors can achieve this objective is by administering a pre-course survey on the initial day of class to clearly identify students’ personal concerns, learning preferences, and background experiences related to the course requirements and objectives. This assessment data should be used to determine the broad scope and sequence of
the course. Professors should use these data to make negotiations between what is already available on the course syllabus (menu) and what best responds to and supports students’ needs, interests, and abilities. Professors should also refer to this initial data throughout the course when making subsequent pedagogical, curriculum, and assessment decisions. Inevitably, professors will encounter students with needs and interests that cannot be easily accommodated within the broader scope and sequence of a course. Just like excellent servers typically offer other suggestions when a patron requests a specific item that is not readily available on the menu, professors should willingly suggest other alternative choices when they encounter students who have needs and interests that cannot be easily accommodated within the scope and sequence of a particular course. The goal of this practice is to negotiate a course experience that is closely suited to the needs, interests, and abilities of the students involved.

Professors can also show genuine concern for students’ needs, interests, and abilities by demonstrating a willingness to differentiate instruction and content (where feasible) to respond to these different needs, interests, and abilities. Much has been written (e.g., Anderson & Algozzine, 2007; Minnott, 2009; Subban, 2006) about the benefits of differentiating instruction. Yet and still, relatively few professors take this concept into serious consideration when making pedagogical and curriculum decisions in higher educational contexts (Doolittle & Siudzinski, 2010). Far too many professors develop courses with uniform instructional practices, assignments, and assessment measures (Doolittle & Siudzinski, 2010). In keeping with the goal of showing genuine concern for students’ needs, interests, and abilities, professors should be willing to differentiate (where feasible) instruction and content within each course they teach from section to section and from semester to semester. In this same vein, professors must also be willing to differentiate instruction and content as students’ needs, interests, and abilities shift throughout a particular semester. Referring to the original metaphor, if a patron decides (after taking one bite of the lasagna) that they would prefer to have the chicken instead of the lasagna, an excellent waiter is more than willing to meet their patron’s newly emergent desires. Similarly, professors who are committed to enacting this principle within the service teaching framework should also be willing to differentiate instructional choices and curriculum content within their courses as students’ needs, interests, and abilities shift throughout the semester. Further, as Anderson and Algozzine (2007) point out, students tend to be more engaged and demonstrate higher academic outcomes in classroom contexts where the instructor adapts the instruction to content to match changes in students’ needs, interests, and abilities over time.

(E) Examine Students’ Progress Regularly

Exceptional waiters “check in” with patrons regularly throughout the dining experience to ensure that the patrons’ needs are being adequately met. In keeping with this metaphor, it is likely that students will demonstrate varying degrees of understanding and proficiency with course content at varying times throughout the semester. While some students may understand and apply the concepts presented in a course quickly, other students will need these same concepts to be re-presented in multiple ways to attain the same level of understanding and application. One way for professors to readily identify
and monitor students’ needs and abilities regularly is to incorporate formative assessment practices at the end of each class session in their courses. In short, formative assessments are assessments that provide teachers and students with on-going feedback about student progress toward identified learning goals (Noyce & Hickey, 2011). More often than not, professors develop and implement courses wherein summative assessment practices are used more often than formative assessment practices (Joughin, 2010). Summative assessment practices evaluate student learning at the end of the teaching and learning experience (Joughin, 2010). Summative assessment practices tend to provide few opportunities for professors to make substantive changes to their courses to better assist students in reaching desired learning goals and objectives. Research studies (i.e., Hargreaves, 2005; Pemberton, Borrego & Cohen, 2006; Roediger & Karpicke, 2006) suggest that students perform higher in classrooms where professors assess content more frequently and in smaller increments than in classroom where professors only use only a mid-term and final exam in their courses to assess student learning. Hence, formative assessment practices tend to improve the quality of teaching and learning in the classroom in three ways (Joughin, 2010). First, formative assessment practices provide opportunities for professors to check for understanding while the learning process is still taking place. As a result, professors are afforded more opportunities to adjust their instructional practices to better meet students’ needs and abilities. Next, formative assessment practices provide students with on-going feedback about their own performance and progress toward a particular learning goal. Hence, students no longer have to wait weeks to find out how well they are or are not performing in a particular course. Instead, based on formative assessment data, students will have a general idea about their level of proficiency in a course from session to session and week to week. Students can use this data to determine which concepts need to be reviewed and or studied in greater depth. Third, formative assessment practices provide additional opportunities for students to practice and apply the information, concepts, and skills presented in each class. Some formative assessment practices professors might consider implementing at the end of each class session include but are not limited to: observations, checklists, exit slips, learning logs, graphic organizers, written response assignments, demonstrations, discussions, self-reflections, and peer rubrics (Noyce & Hickey, 2011).

Another way for professors to examine students’ progress periodically throughout a course is by administering a mid-course survey to students (Brown, 2008). This survey should include four open-ended questions related to students’ experiences in the course thus far. The first question should solicit feedback related to what students’ perceive to be the most positive aspects of the course thus far. This question will provide valuable insight into the instructional and curricular practices that should be maintained and or strengthened throughout the remainder of the course. The second question should solicit feedback related to what students’ perceive to be the negative aspects of the course. This question will provide valuable insight into the instructional and curriculum practices that might need to be adjusted or negotiated to better meet students needs, interests, and abilities. The third question should solicit feedback related to what students can or need to do to improve the overall quality of the course. The rationale behind this question is to encourage students to take responsibility for their roles within the teaching and learning process. The fourth question should solicit feedback related to what the professor can do.
specifically to improve the overall quality of the course. The rationale behind posting this question is that it provides an opportunity for professors to learn from students about specific ways of improving the quality of the course. Data from this survey should be summarized into a table or graph and shared with students during the subsequent class sessions. Finally, professors should engage students in a short discussion related to the results from the survey and what changes will be made during the remainder of the course to better accommodate students’ needs, interests, and abilities.

A third way professors can evaluate student progress regularly throughout the course is by having a mid-course conference with students (Gunlaugson & Moore, 2009). A mid-course conference provides an opportunity for professors to engage in authentic and meaningful dialogue with students related to the course objectives, expectations, and assignments as a way of deconstructing the conventional power boundaries between teachers and students that typically impede the teaching and learning process in most classrooms (Freire, 1970). Once these boundaries are deconstructed, students are more likely to reveal deeper needs and interests they have that were not documented by the mid-term survey. In keeping with this strategy, professors should arrange a time within each course (typically one or two class sessions at the most) to host a mid-semester conference with each student. Professors who teach courses with large numbers of students enrolled may have to plan for more than two course sessions to accomplish this goal. Moreover, professors who teach courses with large numbers of students enrolled may also have to adjust their regular office hours during this time to provide time to meet with each student. Students should sign up for conferences that range anywhere from 10 to 15 minutes in length. During these conferences, professors should pay close attention to the themes that emerge related to students’ needs, interests, and abilities. Wherever feasible, professors should then use the information gained during these conferences to make positive improvements to their courses.

(R) Respond to Issues and Challenges Positively

Inevitably, issues, challenges, and concerns are likely to arise throughout the duration of any course. In as much as it is important for a waiter to respond to issues that arise while serving a patron in a positive manner, it is equally important for professors to respond to issues that arise within the course and among the students in a positive manner. Although this line of thinking almost goes without saying, Amada (1999) points out that professors tend not to respond to the issues and challenges that arise in a course in a positive manner. Even more so, professors tend to respond in an apathetic or overly negative manner when students are perceived to be responsible for causing these issues or challenges (e.g., paper not in APA format, poorly written paper, poor test performance, lack of engagement during class). In much of the same way that excellent waiters are willing to respond to negative occurrences (i.e., a spilled drink, underprepared entrée, change of appetite, etc.) that transpire while serving patrons in a positive manner, professors should be willing to respond to negative occurrences that transpire within their courses in positive ways to improve the overall quality of the teaching and learning experiences within their courses.
How then should professors respond to students who are, in fact, solely responsible for the issues and challenges that transpire within a course? It is important to note that this principle (respond to issues and challenges positively) does not suggest that professors should ignore the issues or challenges that may develop throughout the duration of a course. Instead, this principle simply challenges professors to maintain a positive stance while seeking solutions to these issues or challenges. Further, by establishing and maintaining this commitment to positivity, the overall quality of the students’ experience within the course is likely to remain high.

(V) Value and Validate Students’ Perspectives

For students to feel comfortable sharing their needs, interests, and abilities throughout a course, professors must work to create a classroom environment that value, respect, and affirm the perspectives and positions of students. Renn (2000) points out that professors tend not to acknowledge students’ perspectives during classroom discussions when these perspectives are inconsistent with the dominant perspectives presented within the course or field of study. Even more so, many professors use their professional experience and expertise as a means of invalidating or discrediting students’ perspectives and positions on various topics (Renn, 2000). These kinds of non-dialogic and oppressive interactions between professors and students do very little to enrich or empower the students involved (Freire, 1970). Students tend to be less engaged and contributive in classroom contexts where their personal input is not valued and or incorporated into the learning experiences (Freire, 1970). Hence, professors must be willing to value and validate the perspectives of their students to improve the overall quality of teaching and learning in their courses.

One relatively simple way for professors to value and validate the perspectives of students in their courses is to develop and implement a method of facilitating classroom discussion that actively and strategically solicits input from each student in the classroom. Quinn and Zhixia (2010) provide an excellent example of how professors might actively and strategically solicit feedback from each student in a class session. For example, students have an opportunity to earn a maximum of 10 points for actively participating in classroom discussions. Each student is given colored cards with different point values prior to the time designated for classroom discussions. The red card is worth 4 points; the orange, green, and blue are worth 3, 2, and 1 point, respectively. One student begins the discussion by responding to a question posed by the professor. To determine who comments next, the previous speaker selects someone who indicates readiness by raising his/her highest point value card. For a comment made by a student to be awarded points, it must be responsive to the current line of discussion, include something new, and be of appropriate length. A students is penalized (by losing his or her lowest point value) if his or her comment does not meet this previously mentioned criteria. By losing the lowest point value instead of the highest point value the student can still attain maximum of 9 out of 10 points during the discussion. The professor serves as the judge and assigns point values to students’ responses. Quinn and Zhixia (2010) note three important results associated with using this method of discussion regularly in their courses. First, in contrast to other traditional methods of classroom discussion, this method provides students with more opportunities to hear and respond to other students in the classroom. While tradi-
tional methods of facilitating classroom discussion tend to center on teacher-to-student discussions, this method of classroom discussion centers on student-to-student dialogue. Next, this method of classroom discussion provides additional opportunities for the professors to gain insight into students’ thinking. Finally, the authors note that the students who participated in this method of discussion reported experiencing greater overall enjoyment with the course. Thus, by using this and similar methods of facilitating classroom discussion, professors are able to establish a classroom environment where students feel valued and validated. Further, this validation is likely to translate into higher student achievement outcomes, because students tend to engage more and work harder in classroom contexts where they (students) believe the instructor sincerely cares about what he or she has to say (Barnett, 2011).

(E) Exceed Requirements and Extend Efforts

Excellent waiters are willing to exceed what is minimally required of them in an effort to better meet patrons’ needs. In like manner, the service teaching framework encourages and challenges professors to go beyond what is “officially” required of them to better meet students’ needs, interests, and abilities. In keeping with this principle, professors must be willing to do more than what is officially required in a course to ensure that students have quality experiences within their courses. Some ways professors might extend themselves beyond the official course requirements include but are not limited to: agreeing to provide feedback on drafts before official due dates, meeting with students outside of office hours, connecting students with the academic and social resources necessary to be successful, making study guides and notes readily available to students, re-teaching unlearned content. In a study involving course evaluation data from 283 professors, Helterbran (2008) found that students tend to form more favorable overall perceptions of professors who are willing to extend themselves beyond the official course requirements. More importantly, Helterbran also found that students are willing to work harder in courses where they perceive that the professor is willing to provide additional assistance where needed. Thus, professors must be willing to extend themselves beyond what is officially and normally required to improve the quality of teaching and learning experiences for students in their courses.

In addition to exceeding the official course requirements, professors must also be willing to establish relationships with students that extend far beyond the current time period. An excellent waiter works to develop relationships with patrons that are reoccurring and long-term in nature. In like manner, professors who are committed to teaching in ways that allow them to use their expert knowledge and skills to serve students’ needs, interests, and abilities must be willing to work toward developing mentoring relationships with students that transcend the current period in time as well. One way that professors can achieve this goal is by making the resources, lectures, and texts discussed in each course from semester to semester and from year to year available to previously enrolled students. This information can be easily catalogued and maintained though a professional course website, wiki, or blog. As new texts, developments, and findings emerge within a particular field of study, professors are likely to accommodate these texts, developments, and findings into their courses. While the students who are currently enrolled in a partic-
lar course will benefit from these new texts, developments, and findings, former students are not afforded these same opportunities. Hence by making material available to previously enrolled students via a course website, wiki, or blog, former students can integrate and apply these new texts, developments, and findings in their current coursework and or career experiences. At the same time, former students will have an opportunity to engage in and benefit from on-line discussion boards with current students. Further, this practice of making new course content available to former students will provide opportunities for professors to serve in a mentoring capacity to students for many years after the class has come to an official end.

Discussion

In this paper I have outlined and discussed a 5-part service teaching framework for improving the quality of teaching in college courses. For professors to implement this framework in their courses in a manner that will lead to effective results, professors must first be willing to embrace three important changes related to how they currently think about and carry out teaching practices in their courses. First, professors must be willing to change the way they look at teaching. In many institutions of higher education (both non-teaching and teaching institutions) today there is an ever-increasing amount of pressure for professors to improve the quantity and quality of scholarship they produce as a means of meeting tenure and promotion goals (Hansen, 2008). Consequently, a disproportionate amount of time, effort, and resources are directed toward assisting and supporting professors in conducting research, presenting at national conferences, securing grant funding, and writing for publication while teaching is viewed as a secondary and less important responsibility within the broader tenure and promotion equation (Henson, 2008). Hence, for the principles embedded within the service teaching framework discussed in this paper to be implemented in a way that produces effective results, professors must be willing to think of teaching as equally important as research and scholarship—even if the institutional context where they work does not necessarily hold the same view of teaching.

Professors must also be willing to change how they interact with and relate to students in their courses. Essentially, professors must be willing to deconstruct traditional relational boundaries between students and teachers that position the professor as the only source of legitimate knowledge in the classroom. Unfortunately, far too many college professors work to establish and enforce distant relationships between themselves and their students as a means of maintaining their status and their authority as expert in the classroom (hooks, 1994). While these types of relationships work to grant power and privilege to professors, they work to deny power and privilege to students (hooks, 1994). Thus, for the service teaching framework to be implemented in a way that leads to effective results, professors must be willing to change how they interact with and relate to students in and out of the classroom. They must be willing to see students as co-teachers in the classroom and the teaching and learning process as one wherein both teachers and students co-construct knowledge and learn from each other.
Finally, professors must be willing to rethink their roles and responsibilities as the teacher in classroom. Professors must be willing to see themselves as more than an instructional leader in the classroom. Instead, they must develop a more expansive view of themselves as an advocate for students. Embedded within the service teaching framework is the underlying assumption that professors will position themselves as advocates for students’ best interests. For that reason, professors must be willing to think of teaching as a means of working with students to improve students’ professional, political, and intellectual power and position within the world (Freire, 1970). Professors must be willing to move beyond seeing teaching as a process of merely transferring knowledge and skills and toward a more politicalized view of teaching as process of precipitating social and intellectual change in and among students they serve. Further, while the former view of teaching works to maintain the current quality and status of teaching in many higher educational contexts, the latter view of teaching labors to make radical improvements that students deserve.

References


Is Truthiness Enough? Classroom Activities for Encouraging Evidence-Based Critical Thinking

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Abstract

Teaching students how to think critically and develop lifelong habits of evidence-based inquiry outside of the classroom is a primary goal for educators today. This paper describes nine activities designed to promote evidence-based critical thinking in college or high school classrooms in any discipline. We have developed a seven step process for critical thinking, with teaching modules designed to build skills in these steps in an engaging, active way. The modules involve a variety of teaching methods, including use of video, discussion, debate, and homework assignments. We begin with fun, engaging, less emotionally-laden topics such as toys that claim to read brain waves or pictures of ghosts and then progress to more serious topics such as use of medical marijuana and racial profiling in airports. The modules were designed to stimulate interest in our students and could easily be modified to encourage students to think more deeply about current issues in the news or local community. There is evidence that these modules can increase motivation to think critically outside the classroom (Burke, Sears & Kraus, 2012) and help students evaluate their own belief systems (Burke, Sears, Kraus, & Roberts-Cady, in press). Further, we report on data suggesting that, when combined with deductive reasoning activities, these modules can boost students’ critical thinking skills.

Keywords: Critical thinking, teaching, classroom activities, paranormal beliefs.

Today’s students are drowning in ‘facts.’ They have information readily available at every moment on their internet-connected devices. Google and Wikipedia alone can answer most questions at the touch of a screen or click of a mouse. Easy access to information makes the memorization of basic facts—once the hallmark of education—largely irrelevant in the modern world. The vast amount of information available calls instead for honing of different skills. While students are repeatedly reminded not to believe everything they read or see on TV or other media devices, many still consider on-line open source sites to be acceptably reliable sources of information. Thus, choosing which information merits attention and knowing how to weigh the evidence for supposed ‘facts’ are critically necessary skills for the information age. Consumers of information must be able to delineate between well supported claims and those that rely on ‘truthiness,’ or using a gut-sense feeling instead of empirical evidence or thinking to determine truth (Colbert, 2005). Truthiness is also defined as “the quality of preferring concepts or facts one wishes to be true, rather than concepts or facts known to be true” (Merriam-Webster,

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A major challenge for educating young and emerging adults is helping them to develop critical thinking skills that translate beyond the classroom walls and will allow them to make informed choices based more on truth than truthiness (Paul, 2005; Wyer, 2009).

Critical thinking is a complex concept that has been defined in a number of ways, including as metacognition (Paul, 2005), as logical argument analysis (Watson & Glaser, 2006), and as careful weighing of the evidence to support a claim (Bensley, 1998). While most educators agree that it is vital to teach critical thinking (Flores, Matkin, Burbach, Quinn & Harding, 2012; Wyer, 2009), we do not always agree on the definition or specific skills we are hoping to instill in students (Chenault & Duclos-Orsello, 2008). With this challenge in mind, we set out to create classroom modules that promote critical, empirically-based thinking skills. We based the modules on Bernstein’s (2007) five steps for critical thinking. He proposed that students needed to think about the claim (‘what am I being asked to believe?’), evaluate the evidence, consider alternative interpretations of the evidence, and, finally, draw conclusions. These steps are similar to the subtests in the Watson-Glaser critical thinking test (inference, recognition of assumptions, deduction, interpretation and evaluation of arguments; Watson & Glaser, 2006). In addition to these constructs, we sought to address potential barriers to critical thinking, such as biases, emotional reasoning, overuse of personal experience or small case studies, and reliance on authority (Myers, 2009) directly in our modules. We therefore created the following seven steps to critical thinking as the foundation around which we then designed our classroom teaching modules.

**Critical Thinking: Seven Steps**

1) What am I being asked to believe or accept?
2) What evidence is available to support the claim?
3) What alternative ways are there to interpret the evidence?
4) Rate the evidence/alternatives on 0-10 scale based on validity/strength
5) What assumptions or biases came up when doing the above steps?
   (e.g., using intuition/emotion, authority, or personal experience rather than science)
6) What additional evidence would help us evaluate the alternatives?
7) What conclusions are most reasonable or likely?

We were aware that students might be initially resistant to focusing on critical thinking, as this type of thinking requires more cognitive effort than simply relying on authority or intuition (Browne & Freeman, 2000). We were thus careful in our design to choose engaging and timely topics as well as utilize considerable active learning to optimize student motivation. We designed nine brief critical thinking (CT) modules for use about once per week throughout the semester. We tested these modules in a wide variety of college psychology classrooms, ranging from introductory psychology to research methods and senior seminar, before ultimately implementing them in a newly designed course called “Critical Thinking in Psychology.” The activities were structured such that, each week, we built upon the steps that had been the focus of the previous week’s module.
example, the first activity centered on identifying claims and evidence, and the next module added in brainstorming about alternative interpretations of evidence. Each module featured an informational presentation and associated class activity (e.g., discussion, debate, or writing assignments) about a different controversial topic or issue such as medical marijuana, whether vaccines can cause autism, ghost photos, racial profiling, dog breed bans, and psychic powers. The topic areas could easily be modified to follow current debates of interest to students, but we believe that active learning is important to student engagement in the material. For development of critical thinking, our impression is that scaffolding the seven steps across sessions would be optimal. However, instructors could use and adapt individual exercises depending on the context and goals of their course.

We will discuss several of these modules in depth to illustrate how we present critical thinking in an active way in the classroom, as well as other modules with less detail to provide ideas for you to build from in your own classrooms.

**The Modules**

**Module 1: Star Wars Force Trainer** - This module is a stimulating introduction to the steps of critical thinking. We bring a Star Wars Force Trainer to class ($45; Uncle Milton, 2009). This is an educational toy that claims that by “utilizing dry neural sensor technology, the headset reads and interprets your brainwaves” (NeuroSky, 2011). The learning guide that accompanies the toy discusses various types and functions of brain waves and compares the toy to EEG machines that develop relaxed concentration (presumably theta waves). The guide claims that the user’s relaxed brain waves cause a small ball to move up a tube attached to the sensor. Students read the material that comes with the toy, along with an article on the future of brain-controlled devices that hypothesizes that the future holds help for Alzheimer’s patients and kids with ADHD through these devices that use electrodes to monitor concentration (Hammock, 2009). The students then watch a short clip on YouTube to illustrate how the toy works: [http://www.youtube.com/watch?v=6MFOduNUE8U](http://www.youtube.com/watch?v=6MFOduNUE8U).

We have students identify the claims the manufacturer is making about the Force Trainer. Encouraging brainstorming of claims before looking at evidence is an important first step to critical thinking, one that is often overlooked in the rush to judgment. Once we generate a list of claims (such as that the machine is accurately reading and interpreting brain waves, and objects can be moved by developing certain brain waves), we ask students to test the device. This is when the fun begins. Many students do think that when they concentrate carefully the ball is moved farther, and they begin to be convinced that the initial claims might be true. Testimonials from parents of autistic children who claim the force trainer helped their child learn to relate better with others and other YouTube evidence also exist to support these claims.

We then move to step 3, generating other ways to interpret the evidence, as well as ideas for testing alternative hypotheses for how the Force Trainer works (which is part of step 6). These range from trying the Force Trainer on non-animate objects (which does not

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work, supporting the manufacturer’s claims) to trying it on dogs (which is possible but difficult, so we push for other ideas) to trying it on things that conduct electricity but do not have brain waves, like root vegetables. Left to brainstorm long enough, most groups develop the idea to try the force trainer on other parts of their own bodies. Not surprisingly, most students’ knees have the same ability (if not greater) to move the ball ‘with the force of theta waves’ as their heads. This is an obvious problem for the manufacturer’s claim (we are not aware of any brain waves in our legs) and a memorable lesson in critical thinking. Students learn that there might be multiple explanations for the evidence they see with their own eyes, and may start to think that critical thinking can be fun and valuable.

**Module 2: Photos of Ghosts** - The second module also focuses mainly on identifying claims and thinking of alternative explanations for the existing evidence. We start with a few statistics from a 2011 Rasmussen poll that suggests that 31% of adults believe in ghosts (Rasmussen Reports, 2011). We then show a PowerPoint slide show of supposed ghost pictures and have students evaluate the claims and the evidence. It is important not to skip the first step of evaluating claims. Many students want to simplify the claim to state that ghosts exist, but if prodded, they will recognize that there are more embedded claims, such as that ghosts can be photographed with certain technology. We then move to the evidence of ghosts provided by the photographs. Being skeptical of photos found on the web is second nature to today’s students, but we ask them to come up with other explanations beyond Photoshop. In one classic picture of a ghost hugging a child, for example, the ghost in question could be smoke from the photographer’s cigarette. We also discuss optical illusions such as the Muller-Lyer illusion where you ‘see’ something that does not exist by filling in missing parts of a pattern you expect to find (Muller-Lyer, 1889).

We end this discussion by questioning whether the alternative explanations for the photographic evidence actually mean that ghosts do not exist. When we first ask what we have concluded, often students jump directly to ‘ghosts do not exist’ but, if questioned, they conclude that ghosts may or may not exist, but they cannot be photographed. Astute students will point out that we have not actually supported that claim either, and that we simply think that these photos are probably not of ghosts. This final discussion is most useful in evaluating claims, evidence, and alternatives, and is an important caution to not over-step one’s data. It also introduces the fact that using critical thinking does not necessarily mean you cannot believe in paranormal phenomenon—rather, it simply requires you to examine the evidence for your beliefs. As an instructor and scientist, maintaining this openness to possibility is important, especially early in the modules so as not to alienate students.

**Module 3: Astrology activity** - Many students read their horoscope regularly, with some degree of belief in those predictions, so this module is highly relevant for them and may engender resistance if not handled carefully. As with each module, we ask students to brainstorm about the basic claim of astrology (step 1). One simple claim is that personality types are associated with particular Zodiac signs. We ask students to tell us what evidence there is to support this claim (step 2). They generally offer personal anecdotes or
stories in which their horoscope was correct or where the description given based on their birth Zodiac sign has been accurate. Because we have already focused on step 3, alternative ways to interpret evidence, in this module we spend more time discussing step 5, biases and assumptions. We discuss cognitive biases such as illusory correlation (Hamilton & Gifford, 1976) and confirmation bias (Nickerson, 1998; Watson, 1960). We then ask students to brainstorm how they could use the scientific method to test the claim (step 6). After brainstorming about methods, we give students a handout with 12 personality profiles that come from a book on astrology (March & McEvans, 1982). We ask them to circle the description that best describes their personality. Once they have made their choice, we show them the “correct” answers, that is, which descriptions go with what birthdates according to the astrology book. We then count how many students circled the personality description that is supposed to correspond to their birthdate. As the “correct” answers are revealed, those students who have chosen the right answers rejoice, and those who did not have a match are usually more subdued. We can see the attraction of confirmation bias clearly. This leads to a discussion of how many students should match before we are convinced that the correct answers represent more than chance. In a class of 25 students, for example, one would expect about two or three to guess correctly if the choices were random since the odds are 1-in-12. We can also discuss how small numbers that occur naturally by chance can be over-interpreted. Students who are really thinking critically will point out that astrology could still be correct, but that our descriptions may have come from a weak source (i.e., outdated book), for which they get bonus points. We end with a brief review of the scientific literature that shows no empirical support for predicting personality using birth dates (Saklofske, Kelley, & McKerracher, 1982; Tyson, 1980).

Module 4: Psychic abilities - In this module, we use a short video clip of Uri Geller to introduce the claims of his psychic abilities (we show the first 6 minutes of http://www.youtube.com/watch?v=M9w7jHYriFo). We then ask students to individually write down what they see as the claim (step 1), the evidence that supports the claim (step 2), alternative explanations for the evidence (step 3), and to create a study design that would fairly evaluate the claim (step 6). After they have each designed a study, we show the students the next 7-minutes from the same video (above) that shows Uri Geller failing to produce results on the Tonight Show. We discuss the ironic finding that after the show aired, belief in psychic ability actually increased. We then visit the James Randi Educational Foundation website (http://www.randi.org/site/), which is devoted to the scientific study of psychic claims. We discuss their one million dollar challenge, which states that “the JREF will pay US$1,000,000 (One Million US Dollars) ("The Prize") to any person who demonstrates any psychic, supernatural, or paranormal ability under satisfactory observation.” (JREF, 2012). This challenge has existed since 1964, and well over a thousand applicants have tried to win the prize. To date, not one single person has been able to prove their psychic abilities in a scientific test. This website also provides interesting examples of tests designed by the Foundation.

Module 5: Pit bull Ban - In module 5, we start with a newspaper article about banning pit bull dog breeds in Denver, CO (Kass, 2005). As in the previous module, we have students write individual answers for step 1, the claim, and step 2, the evidence provided.
We then focus squarely on step 4, evaluating the existing evidence. We write all the evidence from the article on the board and have students rank order each statement from most convincing to least. This ranking process, done in discussion with peers, is an effective way to get students thinking about what constitutes compelling evidence and why. The goal for this module is not to come to a conclusion about the pit bull ban, but rather to recognize that we do not yet have enough information to make a decision. We end with a discussion of what additional evidence would be needed to make a fair decision about whether pit bulls should be banned. Note that this module can easily be modified to focus on virtually any currently newsworthy event (e.g., did the FBI or CIA miss something years earlier in the case of the Boston Bombers?).

Module 6: Deal or No Deal – In this module, we focus primarily on step 5, the biases that come into play when making decisions. We emphasize metacognition here, which is thinking about your thinking. We begin with a clip of the TV game show Deal or No Deal at http://www.youtube.com/watch?v=hmZFHiQlx-q and ask students to think about biases that might come into play and lead the contestant to make decisions that they later regret. Screening in over 40 countries, Deal or No Deal became an international television sensation in the 21st century (Deal or No Deal Countries, 2012). Once students are introduced to the game, we show a clip of a contestant who was offered $603,000.00 and ended up with $1.00 (http://www.youtube.com/watch?v=MQ40bwT-0fU), directing students to pay particular attention to the biases in the advice given to the contestant. We then have students make a plan for how they would make decisions in this game, and ask a volunteer to play the game while other students give them (hopefully) solid advice (http://www.nbc.com/Deal_or_No_Deal/game/flash.shtml). This is an excellent exercise to show how difficult it is to stick to a rational plan in the face of high emotions and peer pressure.

A scientific study of the show (Post, van den Assem, Baltussen, & Thaler, 2008) found that several cognitive heuristics come into play that can explain contestants’ decisions. Notably, the break-even effect causes losers to take greater risks due to incomplete adaptation to prior losses, and the house-money effect leads contestants who do well in early rounds to make riskier decisions later because the money they currently hold does not seem like it is theirs. Ironically, risky decisions in this instance lead to both the biggest losses AND the biggest winnings in Deal or No Deal, while rational strategies typically yield more moderate amounts of prize money. This interactive experience in decision-making may help students identify the pressures that could lead to poor choices in other life situations. Social pressure to stay at a party and drink, for example, often sways students who have rational plans to get a good night’s sleep or study. Students can generate their own examples of situations in which critical decision-making would be valuable.

Module 7: Autism and Vaccines - This module is similar to module 4 on psychic phenomena in that we start with a video presentation and evaluate the evidence for the claims. However, in this instance, we are focusing on real-world problems and families who are making life and death decisions with high emotional load. We show a CBS news segment about a court case in which Michael and Theresa Cedillo tried (and failed) to prove that vaccines were responsible for their child’s severe autism.
(http://www.youtube.com/watch?v=r0GOkS0uXWE). The video provides a forum for both sides to present their evidence. Students are asked to pay close attention to the types of evidence presented by each side, and weigh strengths and weaknesses of these arguments (step 4). Students then draw conclusions and explain what evidence they used to reach those conclusions (step 7). The emotional component of the mother’s grief over her child’s condition is also discussed, and links can be made to the student’s own experience with *Deal or No Deal*. With more class time, instructors could also show Jenny McCarthy and Jim Carrey, two popular celebrities, discussing their beliefs about the vaccine-autism link on *Larry King Live* at http://www.youtube.com/watch?v=HX-SCdjDOra; despite the lack of scientific basis for their beliefs, these movie stars have convinced many parents to forego essential vaccinations for their children (step 5). Almost one quarter of parents currently believe that vaccines might be dangerous, and, accordingly, child vaccination rates are declining at a rate of 3-4% per year (Nixon, 2010). We invite students to think about what information they would need to make a sound decision about vaccination for their own families, and, finally, we present scientific evidence that children who are vaccinated tend to have lower rates of developmental disorders, including autism (Andrews et al., 2004).

**Modules 8 & 9: Topics in the news: medical marijuana and profiling** - These last two modules will be considered together, as they each involve debate methods and are designed to get students thinking about real-world controversies and social issues using our seven-step method. The medical marijuana issue is an examination of a recent decision by our college campus to ban the use of medical marijuana, which is legal in our state. We divide the students into two groups based on their initial leaning for or against the ban. Students are assigned to argue the alternate point of view from their own initial reaction. Those who do not have strong feelings pro or con are divided in such a way as to balance group size. The homework is for all students to bring in at least three pieces of evidence for their assigned side of the debate (step 2). We then have an in-class debate in which each side presents its case, uninterrupted, using their best evidence. After each group has presented their case, they may directly question each other. Following the debate, students are then asked to write an individual essay on their own beliefs, and support their view with evidence (steps 4 and 7). Many mention that arguing a point they did not originally believe caused them to look more closely at the evidence, and many either changed their view, or became more open to the other side’s argument. The goal was clearly to formulate an informed decision for themselves while being mindful of the evidence used to form this opinion.

The module about racial profiling took the process a step farther. We examined evidence for and against racial profiling, beginning with a discussion of current use of racial profiling by airline security, and expert views on profiling by TSA (Press, 2009). We then discussed the case of racial profiling by Maryland State Police (ACLU, 2010) as well as local profiling by looking at ads in our city newspaper that list “no dogs, no smokers, no students.” Many students have had experiences of similar discrimination, because many landlords believe that students might in fact be worse renters on average. This leads to a lively discussion of when/if scientific evidence trumps moral reasoning. Is it right to profile in the name of public safety? Should your 80 year-old grandmother be searched in the
airport as often as a strong young man? Do landlords have the right to only rent to people over 30 years old or people with full time jobs? It is important to note that critical thinking is one way to answer these questions, but social justice and morality might also be a necessary part of the equation.

Empirical Support for the Modules

We examined the effectiveness of these modules with 128 college students and found that they encourage students to use critical thinking more in their daily lives and to critically evaluate their own beliefs, particularly about paranormal phenomena (Burke, Sears, Kraus & Roberts-Cady, in press). Although our modules significantly reduced paranormal beliefs from pre- to post-semester testing, they did not, when used by themselves, change scores on the Watson–Glaser Critical Thinking Appraisal, Form S (WGCTA–FS; Watson & Glaser, 2006), which is primarily a test of deductive reasoning. For an in-depth discussion of these findings and a critique of the current literature examining testing of critical thinking, see Burke, Sears, Kraus & Roberts-Cady (in press).

Because our initial study did not show increases in deductive reasoning skills, in the Spring of 2013, the third author (BLB) modified his “Critical Thinking in Psychology” (CT) course to include 10 minutes per week of deductive reasoning practice along with several of the modules described above and some new ones along student interest (e.g., the value of a college degree, critical thinking of religion). The deductive reasoning practice used problems similar to the Watson-Glaser test although with psychology examples. These problems typically present a short statement with a variety of possible conclusions. Test takers are asked to evaluate the strength of each conclusion and identify assumptions that appear to have been made. Students completed problems individually, and then discussed their answers in small groups, explaining their reasoning to their peers. The entire class later discussed the correct answers.

In this current study, we compared the CT class (n=20) results to those of an introductory math class, which was used as a control group (n=19). Pre and post semester testing included The Revised Paranormal Belief Scale (RPBS; Tobacyk, 2004; Tobacyk & Milford, 1983) and the WGCTA-FS test of critical thinking skills (Watson & Glaser, 2006).

Mixed model 2(pre/post) X 2(CT/math) ANOVAs with alpha set at .05 were used to examine results. As expected from previous studies of our modules, we found a significant interaction between pre-post measures of paranormal belief and class, $F(1, 35)=9.60, p = 0.004, \eta^2 = 0.215$. The math group had pre and post test scores of 84.76 ($SD=20.86$) and 84.97 ($SD=20.91$) respectively. The CT class had pretest scores similar to the math students with an average of 81.85 ($SD=21.89$), but a significantly lower posttest average of 65.85 ($SD=20.29$).

Critical thinking scores also showed significant interactions, $F(1, 32)=5.03, p = 0.03, \eta^2 = 0.136$. The math scores on the WGCTA-FS were virtually identical throughout the semester, averaging 21.50 ($SD=2.96$) at pretest and 21.29 ($SD=4.53$) at posttest. The CT students started higher, perhaps because they are more advanced students. Their pretest
average was 28.10 (SD=5.87) but they also improved significantly over the semester, with a posttest average of 32.30 (SD=5.51).

Although these results are preliminary in nature, they show clear promise for our method of teaching critical thinking. It is interesting to note that the students who had the deductive reasoning with the modules increased their CT scores by an average of 17%, while in our previous study, philosophy students, who were trained in deductive reasoning without use of the modules, increased only 8% on average (Burke, Sears, Kraus & Roberts-Cady, in press). It is therefore possible that the active, engaged learning promoted by the modules is useful above and beyond standard deductive logic skill training and may be optimal when combined with them.

Conclusions

These modules are suggestions for how to get students to exercise their critical thinking muscles. They can be used individually or as a series of building modules in almost any class—psychology or beyond—that has critical thinking as one of its goals. Each could be adapted to fit the interests of your students and hot topics of the day or of your city/campus. It is our hope that the descriptions of these modules herein will spur teachers into creating their own interactive ways to foster more critical thinking in the classroom. Many researchers argue that critical thinking is a vital life skill and lament the lack of effective critical thinking training in higher education (Flores, Matkin, Burbach, Quinn & Harding, 2012; Paul, 2005; Wyer, 2009). Our modules contain the key features proposed by Browne and Freeman (2000) for critical thinking classrooms: active learning, developmental tension, and fascination with the contingency of conclusions.

Recent reports suggest that many people are using YouTube as a daily source of news, and that reliance on sources that have no established standards for accuracy is growing rapidly (Pew, 2012). Clearly, students (and society) would benefit from more practice at looking deeper than the surface ‘truthiness’ of information. Our hope is that this habit of mind will become engrained with repeated practice, and will be used in everyday life such as medical decisions, better informed consumer choices, and political decisions. If educators work together toward this goal, we can encourage a generation of students who know how to think for themselves and do not simply believe whatever they read or see on the internet.

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Is it Incivility or Mental Illness? Understanding and Coping with Disruptive Student Behavior in the College Classroom

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Abstract

Rising rates of incivility in the college classroom can generate stress for both faculty and students. However, incivility can take multiple forms, have different causes and require different management techniques. In some cases disruptive behavior is the result of student-faculty interactions, and can be ameliorated by improved communication or behavioral strategies. In other cases the behavior is symptomatic of more serious forms of mental illness. This paper will focus on helping faculty to distinguish incivility from mental illness, and to develop effective strategies for coping with disturbing behavior.

Keywords: Classroom incivility, mental illness, coping.

In recent years the world has watched in disbelief as four disturbed college-age students inexplicably shot and killed multiple people in public settings. While the circumstances differ, it is now known that all four shooters had shown signs of mental illness prior to their attacks. Jared Loughner, the former community college student who went on a shooting rampage at a gathering hosted by US Congresswoman Gabby Giffords, was described as hostile and dark by classmates and teachers, and has subsequently been diagnosed with schizophrenia. On the basis of his behavior he was eventually suspended from his school, which did not have a counseling service on campus. Cho Seung-Hui, the student who shot numerous people at Virginia Tech University in 2007, had a history of severe anxiety and had received psychological treatment on and off since he was a teenager. James Holmes, the young man who shot and killed multiple people at the Batman movie premier, had recently been denied admission to a graduate neuroscience program and had also been treated for psychiatric issues. Adam Lanza, responsible for the mass shooting at the Sandy Hook Elementary school in Connecticut, was described by friends and family as a loner, with social and emotional problems. While news pundits and the public speculated on how and why these young men were able to commit such atrocities, faculty members in classrooms across the country found themselves wondering if the occasionally disruptive, confusing, or disturbing behavior exhibited by their students was indicative of another tragedy in the making.

Unfortunately, even experienced law enforcement and mental health professionals cannot always predict a person’s future behavior. However, knowing how to differentiate un-
civil behavior from mental illness and determining when either sort of behavior is serious enough to warrant outside intervention is a start. The irony is that few college professors entered academics thinking that managing disruptive behavior in the classroom, and working with disturbed students, would be an integral component of their future career.

Typically academics don’t spend much of their time in graduate school learning to teach. Fagen and Wells (2004) reported that a significant number of doctoral students at institutions of higher education felt they had not received the necessary preparation for teaching. While many graduate programs do offer students the opportunity to teach, and some even have training programs in place, most graduate students spend far more time learning to talk about the content of their discipline, than mastering the interpersonal and communications skills necessary to teach effectively. Even when graduate programs provide specific courses on how to teach, the focus is often on how best to deliver course content, apply teaching techniques, and use technology to promote learning. Typically, far less emphasis is placed on teaching new faculty how to manage the interpersonal dynamics they are going to face in the classroom (Wingert & Molitor, 2009). As a result, many faculty members find themselves at a loss when they encounter a student who is disruptive, disrespectful, angry, excessively anxious, or irrational. In some cases such behavior is merely annoying, or distracting. However, if it escalates, or increases in severity, it can disrupt the learning environment for everyone, and can also cause significant stress for faculty members.

Learning to determine whether behavior is uncivil, or symptomatic of an underlying mental issue, and determining how best to respond to such challenges, can benefit both students and faculty members. The first step is to assess the disruptive or disturbing behaviors and to attempt to understand why they are occurring. The second is to have a plan in place to respond appropriately, both in terms of maintaining control of the classroom, and addressing the underlying needs of the person who is caused the disruption.

What is Classroom Incivility and Who Does It Affect?

Certainly poor behavior in the classroom, and tension between faculty and students, is nothing new. In previous centuries students at Harvard and Yale expressed their displeasure with faculty members by rioting and throwing rotten fruit (Harvard Crimson, 1963). Fortunately, students don’t typically throw things at faculty anymore. However, disruptive and even hostile behaviors do occur with regularity, and in fact appear to be on the increase (Kitzrow, 2003; Knepp, 2012). Consequently, researchers have begun to systematically explore student and faculty perceptions of bad behavior in the classroom (Appleby 1990; Meyers, Bender, Hill, & Thomas, 2006; Swinney, Elder, & Seaton, 2005).

Student Behaviors That Bother Faculty

Research on incivility suggests that disruptive student behaviors can be classified as immature, inattentive, or hostile. Immature and inattentive behaviors, include talking during lectures, coming in late, clowning around, sleeping, reading non-course material, cutting
class, and packing up to leave before the end of the class period. Such behaviors, while annoying, are not typically serious (Connelly, 2009). Disruptive or hostile behaviors tend to be more serious and typically include more dramatic actions such as arguing about grades, lying about missed work, cheating, disclosing personal information inappropriately, and attempting to intimidate or criticize the professor or other class members. Alberts, Hazen, & Theobald (2010) argue that the incidence of hostility or threats towards instructors have been increasing for the past 20 years. Although such behaviors have been termed “classroom terrorism” this suggests that the students involved are actively trying to disrupt the classroom or harm the professor, and can only be controlled by punitive measures. The work of Robert Boice (2000), however, suggests that students are most likely to disrupt class when they are frustrated with the classroom atmosphere, their own performance, or the instructor’s behavior towards them.

Faculty Behaviors That Bother Students

Faculty behaviors that bother students include giving poorly organized lectures, providing ineffective reviews and visual aids, exhibiting irritating mannerisms, showing condescension or favoritism towards students, failing to provide grades and feedback in a timely manner, and being unavailable (Appleby, 1990). Not surprisingly, failing to fully explain evaluation processes and criteria, grading inconsistently, and being unclear about what students need to know for tests also distressed students. According to a survey by the Indiana University Center for Survey Research (2000), students are also bothered by faculty who appear aloof or uncaring, or let students ridicule their classmates. In a study of faculty student conflict, Tantleff-Dunn, Dunn, and Gokee (2002) reported that the three most common sources of student faculty conflicts were grades, exams, and excuses for missed work. Although unhappiness with faculty behavior and willingness to work with students accounted for almost one third of conflicts they studied, most students who reported a grade conflict with a faculty member also said that they were more interested in how the faculty member treated them than in whether their grade was changed or not.

Student Behaviors That Bother Other Students

Students can also irritate other students with their behaviors. Lynch and McNaughton-Cassill (2004) surveyed students at a large state university regarding the behaviors they found most frustrating on the part of other students. The top 5 behaviors cited were failing to contribute to group projects, using cell phones in class, cheating, belittling others, and talking during class. Bjorklund and Rehling (2010) found the most frequent uncivil behaviors involved coming to class late or leaving early, and using electronics in distracting ways in the classroom. In this study, students ranked talking in class after being asked to stop, coming to class under the influence of alcohol or drugs, and allowing a cell phone to ring, as the most uncivil behaviors. The Lynch and McNaughton study also indicated that the majority of students want and expect faculty to manage and control disruptive student behaviors, and will blame the faculty member if they fail to do so. Ausbrooks, Jones, & Tijerina (2011) report that many students believe faculty don’t address incivility as often or as strongly as they should. Clearly, both faculty and students have concerns about the behavior of others in the classroom. In addition to impacting the
learning of those involved, incivility in the classroom has been shown to correlate with lowered student perception of their academic development and decreased commitment to their university (Hirschy & Braxton, 2004).

Factors That Influence Incivility

Robert Boice (2000) argued that faculty often set the stage for conflict by coming across to students as uncaring, disparaging, and unfair in terms of testing and grading. Students then respond by disrupting class, behaving disrespectfully, and failing to participate in classroom activities. Berger (2000) argues that faculty who do not make the effort to connect with students in prosocial ways (making eye contact, using an encouraging not a disparaging tone of voice) actually fuel incivility. Although faculty may contend that teaching should be about content, not personality and social interactions, the reality is that as social beings we are constantly monitoring and adjusting our interactions with others. By definition, the faculty member in the classroom is the authority who sets the rules, determines the content of the course, and sets the tone of interactions. Building rapport, showing control, and responding appropriately to feedback are all characteristics we admire in coaches, politicians, CEOs and leaders outside the classroom. It is not unreasonable then, for students to look to us for the same sort of leadership from faculty in the classroom.

Faculty Characteristics and Incivility

Unfortunately, some faculty experience more challenges and incivility from students, than others. Research suggests that new, inexperienced teachers and women are most likely to experience rude disrespectful behavior in the classroom (Boice, 2000; Alberts et al., 2010). Specifically, younger teachers and women report more frequent student incivility, and women are more likely to rate such incidents as severe. Presumably, student perceptions of the competence or personal characteristics of a faculty member influence how they respond to that person in the classroom. While experience will only come with time, faculty who appear confident, organized, and caring seem to experience less overall classroom conflict (Tantleff-Dunn et al., 2002).

The relationship between faculty gender, and incivility is complex as well. Hart and Cress (2008) reported that as full professors women teach more classes than men. Furthermore, at the associate and assistant levels women taught the same number of courses, but women worked with more students on an individual basis. Respondents also indicated that they felt that students expected greater nurturing from female than male teachers, while still wanting the female professor to come across as an authority in the classroom. In another study, 82% of female faculty women reported having been challenged about their professional identity or expertise in the classroom and 83% of students admitted that they have different standards for male and female faculty members, and often expected females to be more caring than males (Goodyear, Reynolds, & Gragg, 2010). Research also indicates that female faculty members spend significantly more time on mentoring and service than do their male counterparts (Misra, Lundquist, Dahlberg Holmes, & Agiomavritis, 2011), receive more student email (Duran, Kelly, & Keaton 2005) and are
more likely to receive inappropriate emails from students (Bruner, Yates, & Adams, 2008). Such findings suggest that female faculty members often teach more, and encounter more challenges from students than do male faculty, and so have to spend more time and energy managing their courses.

Managing Classroom Incivility

The good news is that there are things teachers can do to create a positive, constructive, civil atmosphere in the classroom, and in their interactions with their students (Boice, 1996; Twale & DeLuca, 2008). These include being very clear about behavioral expectations, and grading policies (Matejka & Kurke, 1994; Morrissette, 2001). McKeachie and Svinicki (2006) present an overview of strategies for effective teaching in the college classroom. In addition to presenting clear, organized lectures, and being fair about grading policies, the use of active learning strategies and interactive techniques has been shown to promote learning and classroom civility. It is also useful to establish rituals for the beginning and ending of class so students know what to expect. Explicitly telling students what you will cover in a given day is an easy way to enhance their sense of control.

Faculty can also build a sense of camaraderie with students by acknowledging and rewarding those who are trying to succeed in class. Using humor to engage students, and paying attention to their nonverbal signals can be helpful too. It is even possible to gauge the success of these efforts by integrating active learning exercises and question and answer sessions into lectures so students can discuss what they are learning, and let faculty know what they don’t understand. Such feedback can also be collected formally through the use of mid-term feedback surveys giving faculty the opportunity to improve the classroom environment and demonstrate their willingness to attend to help students learn (Morrissette, 2010).

Interpersonally, making eye contact with students, learning their names when possible, moving around the class to chat individually when handing out papers, or during group activities, and being available after class and during office hours to talk, can also decrease the chance of uncivil behavior. Kearney and Plax (1992) view such situations as opportunities for faculty to model prosocial behaviors that in turn generate prosocial responses from students. When student behavior is inappropriate, or hostile, faculty also need to learn how to respond effectively. Letting students know that such behaviors won’t be tolerated, validating alternative opinions, and promoting a spirit of conversation, not confrontation in the classroom can all serve to reduce tension and conflict (Warren, 2000). Acknowledging differences in opinion, without defensiveness, clarifying misperceptions, and not humiliating people can be difficult in the heat of the moment, but modeling such behavior in the classroom can serve as a valuable learning tool for students (Kandelbinder, 2008).

In some cases such discussions may even need to occur outside of the classroom. Alberts et al., (2010) surveyed faculty members and reported that three quarters of their respondents had spoken to students about incivilities outside the classroom, and most found it to be an effective approach. Dealing with students one on one without an audience can sub-
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stantially change the interaction. One approach when students self-disclose too much, is to suggest that they save their comments for office hours so the faculty member can better address them. This strategy can diminish the behavior without conveying the message that the faculty member doesn’t care about the student’s concerns. However, no matter how emotionally, and verbally skilled the faculty member is, there will occasionally be students whose behavior is impervious to normal social and behavioral cues. At that point faculty are faced with determining whether they are dealing with a student who is acting out, or with someone who is mentally ill.

A relatively new source of student faculty stress involves electronically communication. Nworie and Haughton (2008) argue that technology has changed the nature of incivility in that it provides increased opportunities for distraction and disruption both in and out of the classroom. Thirty-five percent of nursing students taking online courses reported that their peers were rude online, and 60% felt that a faculty member was uncivil to them online (Rieck & Crouch, 2007). Even when faculty report that email serves a useful purpose in facilitating communication, they still feel pressured by student’s expectations that they will be available 24/7. They also report that they believe that students say things in email they wouldn’t be willing to say in person (Duran et al., 2005). While it is sometimes difficult to resist the urge to retaliate electronically to student’s attacks, the reality is that such exchanges can both escalate the conflict, and reflect badly on the faculty member if the conflict escalates into complaints to administrators or campus judicial bodies. Saving written conversations with students can also help to bolster your position if they reveal that you responded professionally to an impolite missive.

In some cases uncivil behaviors are simply the result of tired, overbooked, or underperforming students attempting to manage their stress by multitasking during class, pretending they don’t care, or have better things to be doing, or distracting themselves and those around them during class. In other cases uncivil behaviors may reflect frustration with a teacher, rebellion, or unrealistic expectations about college (Knepp, 2012). However, if students fail to respond to verbal and behavioral efforts to manage their actions, faculty members may need to move beyond simple behavioral rewards and punishments. If in fact the student’s behavior is associated with mental illness, faculty may need to adopt alternative strategies. Learning to recognize the signs of mental illness, and knowing who to consult on your campus, can be a crucial component of dealing with disturbed and/or disturbing students.

Managing Online Incivility

A relatively new source of academic stress involves electronic communication. Nworie and Haughton (2008) argue that technology has changed the nature of incivility in that it provides increased opportunities for distraction and disruption both in and out of the classroom. In addition, many more courses are now being offered either partly or wholly online. Certainly, communicating online can change the nature of faculty-to-student and student-to-student interactions. Galbraith and Jones (2010) characterized online incivility into four categories including challenges to authority, offensive remarks, a sense of entitlement, and academic dishonesty. While all of these behaviors could also occur in a face-
to-face classroom, the sense of anonymity or distance created by mediated communication has the potential to create conditions that promote such behaviors. For example, Duran et al. (2005) suggested that students are often willing to say things in email they wouldn’t be willing to say in person.

The prevalence of online grading recording systems has also changed the nature of faculty student interactions. I find that my efforts to make my grading policies transparent by including explicit guidelines about how to calculate grades at any given time can result in students attempting to bargain for extra points throughout the course, instead of waiting until the final grades are posted. Electronic communications also carry with them the potential for misunderstanding because they lack the social cues often transmitted via tone of voice and facial expressions (Byron, 2008). Even attempts to communicate via emoticons and conventions such as capitalizing words for emphasis may not be interpreted the same way by students and faculty. Furthermore, such misunderstandings can go both ways. Thirty-five percent of nursing students taking online courses reported that their peers were rude online, and 60% felt that a faculty member was uncivil to them online (Rieck & Crouch, 2007).

Even when faculty report that email serves a useful purpose in facilitating communication, they still feel pressured by student’s expectations that they will be available 24/7. At a more philosophical level Forni (2008) writes that faculty and students often differ greatly in their approach to the use of the Internet in learning. He speculates that a natural conflict can emerge between faculty, who spent much of their professional life learning and memorizing information, and younger students who treat learning as a retrieval process based largely on looking material up as needed.

The solution to these misunderstandings however, may not differ that much from suggestions for managing civility in the classroom. While it is sometimes tempting to respond to students with our own annoyance, the reality is that such exchanges can both escalate the conflict, and reflect badly on the faculty member if the conflict escalates into complaints to administrators or campus judicial bodies. Being very clear about course expectations, monitoring online chat sites for the appropriateness of activity, and checking the intent of student’s messages before reacting can all help promote civility. Saving written conversations with students can also help to bolster your position if they reveal that you responded professionally to an impolite missive.

**When Incivility Stems From Mental Illness**

Research suggests that the numbers of students dealing with mental illness on college campuses is on the rise (Sharkin, 2006; Guthman, Iocin, & Konstas, 2010). There are a number of explanations for this increase. In some cases the trend may simply reflect improvements in the identification and detection of mental conditions. But in addition, more people than ever are going to college. Since many psychiatric conditions first emerge in late adolescence and early adulthood, it isn’t surprising that college age students experience the first symptoms of mental illness while at school. Ironically, improvements in the treatment of mental illness are also influencing this pattern. Before the advent of psy-
chotropic medications people with serious mental health conditions were often unable to function well enough to gain admission or continue to attend college. However, the advent of psychotropic medication means that even students with serious forms of mental illness can successfully compete for college admission, and succeed academically, in ways they couldn’t before such treatment was available. A survey by the American College Counseling Association (2011) found that 44% of students who seek counseling on college campuses have been in psychological or psychiatric treatment before coming to school. Changes in the laws regarding equal access to education for people with disabilities also means that students with serious problems are more likely to be accommodated on campus. Of course, the stress of leaving home, going to school, establishing a social life, and meeting academic expectations can exacerbate ongoing symptoms, or result in students failing to sleep, take their medication, or engage in other mental health care efforts. Perhaps it is not surprising then, that students are increasingly seeking counseling for a variety of concerns ranging from adjustment disorders related to leaving home, formulating career goals, and dealing with relationship stress, to depression and anxiety, eating disorders and substance abuse, and chronic conditions such bipolar disorder and schizophrenia. In 2006, the American College Health Association reported that 10% of college students suffered from depression during their college years. Even more disturbing The American Academy of Child and Adolescent Psychiatry reports that 11.4% of college students think about suicide and over 1,100 college students commit suicide a year (Douglas et al., 1997).

**Indicators of Mental Illness**

While it is unrealistic to assume that faculty members will recognize and diagnose mental illness based on their classroom observations of student behaviors, humans are actually remarkably good at recognizing social and behavioral deviations from the norm. Even small children make quick decisions about whether they approve or disapprove of someone else’s behavior, and we often seek to avoid those people whose actions seem inexplicable or disturbing. However, faculty don’t have the option of simply ignoring inappropriate behavior in their classroom.

Signs of mental distress can include inappropriate emotional reactions, disclosing too much personal information in the classroom, showing disregard for the rights and feelings of others, misinterpreting communications from the faculty, poor impulse control, memory and attention problems, poor hygiene, and expressing evidence of hallucinations, delusions, paranoia, or thoughts of harming themselves or others (Norwood, 1998). Academic indicators such as the deterioration of work, missed assignments, and absenteeism can also be signs of difficulty. Students may also tell professors about self-injurious or worrisome behaviors such as suicidal or depressive thoughts, substance use, cutting, or engaging in disordered eating behaviors (Wingert & Molitor, 2009). Occasionally, a student may even focus on the professor in a hostile, sexual, or obsessive manor (Meunier & Wolfe, 2006), either by contacting them repeatedly electronically, misinterpreting their actions or even stalking them. In such cases faculty need to take action to protect themselves, as well as to get help for the student. If your own safety is in doubt it is advisable to contact the police immediately. It is always better to be safe than sorry.
Is Veteran Student Mental Health an Issue?

Recent media attention on Veteran’s mental health issues are beginning to concern college personnel who are seeing an influx of student veterans using their educational benefits. While the majority of veterans will never exhibit disruptive behavior in the classroom, as a population, veterans of the Iraq and Afghanistan conflicts are more likely to be dealing with PTSD, suicidal ideation, and mild traumatic brain injuries (mTBI) (Church, 2009; DiRamio & Spires, 2009; Rudd, Goulding, & Bryan, 2011). The symptoms of PTSD include hypervigilance or sensitivity to cues in the environment that remind the individual of trauma, difficulty concentrating and staying in the moment, and the paradoxical combination of rapid anger, and dampened emotional responsivity. Brain injuries, which can range from concussions to major head trauma, can cause a host of changes in cognitive abilities, impulse control, alertness, attention, and mood, all of which can impact the student’s ability to interact with others and function in the classroom (Trudeau et al., 1998). Both PTSD and TBI can be associated with depression and suicide as well (Hoge et al., 2008).

For some veterans adjusting to college itself can be traumatic. Combat veterans often report feeling uncomfortable in crowds, or being confined in classrooms. In others cases they complain of having trouble paying attention in class or focusing on tests. Other veterans exhibit inappropriate emotions such as anger or anxiety that can be directed towards other students or the faculty members. Some Veteran students are already receiving mental health treatment, but this is not always the case. Should the Veteran’s behavior begin to cause disruption in the classroom, or stress for you as a faculty member, it is key to approach the student, try to figure out if they are aware of how they are coming across, and to help them get help. Campuses are also starting to improve their student Veteran’s services, and often are creating Veteran’s liaison services, which can be a good source of information for faculty seeing help for a Veteran student (McNaughton-Cassill, 2012b).

Seeking Help for Mentally Ill Students

Faculty often worry that their concerns about a student are vague or implausible. But according to Ellen Gecker (2007), a psychiatric nurse who has worked on several college campuses, faculty need to learn trust their gut feelings. If you feel that a student is not functioning well it never hurts to consult with other faculty members or your supervisor in order to see if others who interact with the student mirror your concerns. Sharing mail or essays, and even inviting a colleague to sit in on a class with you can help you to gain perspective on the student’s behavior and state of mind.

Sokolow and Lewis (2007) argue convincingly that campus responses to signs of mental illness on the parts of students need to be organized and integrated. Fortunately, in recent years most colleges have organized teams of personnel trained to respond to students with mental illness. Such teams may include staff from the Campus Counseling Center, Disability Services, Judicial Affairs, Housing, Police Officers and faculty. Unfortunately,
many faculty are not aware of such resources, so it would behoove Universities to be more open and vocal about the mental health resources available on their campus. Once a faculty member has decided that a student’s behavior is not a simple matter of incivility, they need to take action. Even if it is after hours, know how to contact the first responders on campus. If your concerns are based on written materials, share them with responders, and if they stem from behavioral observations, or verbal comments document them. The more information you can provide about the student’s state of mind, and behavior, the easier it will be for response teams to determine the severity of the problem. If you think a student will go willingly you can refer them to your campus counseling facility, or walk them over. However, if you are concerned about a student committing suicide or hurting someone else, university police can check on the student, or contact community police to do so.

Ironically, when faced with disturbed student behavior many faculty worry about losing a students’ trust or confidence if they raise their concerns with the student, or insist that they get help. Accustomed as they are to supporting individuality and diversity, faculty may also be hesitant about judging or reporting a student for idiosyncratic behavior. However, once a student has disclosed or demonstrated disruptive or potentially harmful behavior to you, your duty is to insure their safety, and the safety of those around them, over and above concerns about their reactions to your seeking help for them.

Faculty may also fear that they are over-reacting, or exacerbating a student’s behavior by their responses. The reality though is that just as stopping someone from driving drunk doesn’t make that person more of an alcoholic, seeking help for a student who is struggling won’t make him or her more mentally ill. And, as with drunk driving, failing to seek such help can have tragic consequences. In fact, mental health professionals argue that it is better to err on the side of caution, than to overlook symptoms (Renninger, 2008). Research on suicide suggests that contrary to popular belief, talking about suicide does not prompt students to harm themselves, and in fact ignoring signs or symptoms of distress can contribute to feelings of hopelessness. Even when the students’ immediate well-being is not in question, untreated mental illness can take a toll on physical health, social interactions, and academic performance.

Figuring out who to consult with, and who can follow up with students on your campus is a major component of coping with students who are experiencing mental difficulties. Unfortunately, even with increased emphasis on campus responses to mental illness, finding effective help for mentally ill students can be difficult. Sometimes family members are no longer willing or able to help students, many college age students don’t have adequate insurance to cover extensive psychological treatment or in-patient services, and many community based services are over-extended, and can have long waiting lists for care. If the student’s behavior is disturbed enough to warrant immediate treatment both campus and community police can and will seek hospitalization.

If your University has a Counseling Center, familiarize yourself with their services and policies. Sometimes students don’t know they are there, or will go with a push from a caring professor. Colleges with graduate training programs in psychology or counseling
may also offer low cost treatment for students and community members if they don’t wish to seek counseling on campus. Mentally ill students may also qualify for Disability services (American Council of Education, 2012). Keep in mind though, that although Universities are required to make reasonable accommodations for students with physical or mental disabilities (ACPA, 2012), receiving such help does not give them the right to disrupt the learning environment for other students. If you feel a student is abusing their privileges, consult with your Disability Services Office to see what how best to respond. Many campuses also have people on their housing or judicial affairs staff who are trained to respond to aberrant student behavior, and can help you determine how best to respond to a student who is disturbed.

Finally, faculty who are dealing with uncivil behavior or mentally ill students often find themselves stressed as well (McNaughton-Cassill, 2012a). Dealing with disrespectful, hostile, or inexplicable behavior can take its toll. Balancing the teaching, research, and service demands common in academia can be stressful enough without factoring in student disruptions. Talking with colleagues, getting more information about mental illness, taking care of yourself in terms of getting enough sleep and time to relax, and even seeking personal mental health care can be helpful. Whether the ivory tower was ever really an escape from reality is debatable, but in today’s academic world many faculty feel they are spending as much time in the moat as they are in the towers.

**Conclusion**

In conclusion, managing behavior in the classroom can be one of the most challenging tasks a faculty member undertakes. Whether students are engaging in incivility because they are stressed, bored, rebellious, or experiencing a mental illness, faculty still bear the responsibility for responding to the student appropriately, getting them help if necessary, and continuing to provide a comfortable learning environment for other students. In many cases creating a calm, cooperative classroom atmosphere can be enough to promote student civility and collaboration, and at the very least may help students who are struggling with mental issues to manage their condition while in the classroom.

However, mentally ill students may require more care and support than faculty members are trained, or able to give. If you find yourself dreading a particular class or encounters with a difficult student, it is well worth taking the time to articulate your concerns to a colleague. If reasonable efforts to connect with a student don’t work, then calling for support is not only necessary, but also the ethical thing to do. Faculty members often pride themselves on their ability to identify problems, integrate information, and solve problems in innovative ways. Applying such strategies to understanding and managing disruptive behaviors in the classroom is a necessary skill if we as faculty are going to create effective learning environments for our increasingly diverse student population.

Ironically, when faced with disturbed student behavior many faculty worry about losing a students’ trust or confidence if they raise their concerns with the student, or insist that they get help. Accustomed as they are to supporting individuality and diversity, faculty may also be hesitant about judging or reporting a student for idiosyncratic behavior.
However, once a student has disclosed or demonstrated disruptive or potentially harmful behavior to you, your duty is to insure their safety, and the safety of those around them, over and above concerns about their reactions to your seeking help for them.

Such efforts are made even more salient in light of highly publicized cases in which students who were having personal or academic problem shot and killed faculty at their institution Lauren (2003). While such well-publicized events are actually rare relative to other forms of campus violence, they are also extremely threatening (Carr, 2004). Faculty, who are expected to maintain academic rigor, may find themselves at odds with students who are desperate to get the grade they need to meet their future career goals. Graduate students in particular, may focus their academic or personal frustrations on the faculty members they are working with Lauren (2003). Certainly, Universities need to take security measures to protect and promote safety. Fortunately, the report of the National Campus Safety and Security Project (2009) indicated that 85% of colleges have emergency preparedness plans in place. Such efforts include creating procedures to make it easier for people to identify and report suspicious behavior, and developing plans for assessing and responding to such responses.

However, prevention is typically preferable to waiting to respond when a tragedy occurs. Recognizing, acknowledging, and responding effectively to signs of mental distress are the keys to preventing disturbing or violent behavior. This however, can be daunting to faculty who already feel overwhelmed about managing their teaching, research, and service commitments. Teachers may also fear that they are over-reacting, or exacerbating a student’s behavior by their responses. The reality though is that just as stopping someone from driving drunk doesn’t make that person more of an alcoholic, seeking help for a student who is struggling won’t make him or her more mentally ill. And, as with drunk driving, failing to seek such help can have tragic consequences. In fact, mental health professionals argue that it is better to err on the side of caution, than to overlook symptoms (Renninger, 2008). Research on suicide suggests that contrary to popular belief, talking about suicide does not prompt students to harm themselves, and in fact ignoring signs or symptoms of distress can contribute to feelings of hopelessness. Even when the students’ immediate well-being is not in question, untreated mental illness can take a toll on their physical health, social interactions, and academic performance.

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