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CALL FOR PAPERS

The Journal of Effective Teaching is accepting submissions for review for the Spring 2013 issue. Manuscripts will be due October 31, 2012. 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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- Typeset in English using MS Word format and 12 pt Times New Roman
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- Tables and figures should be placed appropriately in the text.

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Letter from the Editor-in-Chief:
The MOOCs Are Coming

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

Chances are, if you have not heard about MOOCs by now, you will soon. In this time of budget tightening at colleges and universities, schools are looking more and more at online offerings. There have been recent headlines about the packaging of free courses from universities like MIT and Stanford and the growing number of educational free videos from the Khan Academy. We have become used to seeing free online lectures on YouTube and in iTunesU. But, can we use these online classes to create virtual learning communities, providing global access to course that are affordable, tuned to learning outcomes, and that lead to some level of certification of its participants? This is not a vision of the distant future. This year there are a couple hundred courses, called MOOCs, taking place with tens of thousands of students from around the world in each course. In this letter, I will describe these MOOCs and their history. In a future letter I will address the question of how one can get one hundred thousand students in one class to learn.

A MOOC is a Massive Open Online Course. It is an open, free to many, course delivered online, ideally with no requirements or prerequisites to join, taken by potentially thousands of people from all over the globe. George Siemens and Stephen Downes led an open online course in 2008 for 25 paying students at the University of Manitoba and was free to an extra 2300 students. Dave Cormier and Brian Alexander later called this type of course a MOOC. Peter Norvig and Sebastian Thrun opened up a course on Artificial Intelligence at Stanford University to 100,000 student from over 200 countries. They granted over 20,000 certificates at the end of the course. Another Stanford University professor, Andrew Ng, similarly taught a course with 100,000 students in October 2011.

George Siemens talked about MOOCs last year in an interview with Howard Rheingold. There he describes his philosophy of MOOCs and what he learned from his first experience. He proposes that courses can be open where students do not pay for participating and the work is shared by all people. They engage with the content and connect, collaborate, and network with students and experts not typically available to the traditional classroom. The participants build a distributed knowledge base together, leading to lifelong learning, independence, and the creation of networks that last beyond that class. Students can repeat the class often and could eventually become experts that can teach others.

1 Author’s email: hermanr@uncw.edu
2 See his TED talk http://www.ted.com/talks/peter_norvig_the_100_000_student_classroom.html
3 http://www.youtube.com/watch?v=VMfipxhT_Co

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Siemens also discusses learning outcomes and the need to provide statements in our syllabi like, “at the conclusion of the course the learner will ….” In the traditional university the students pay for our feedback on learning outcomes based upon our expertise. However, Siemens found that the nonpaying students had set self-defined targets. They were validated by a social network of thousands commenting on their posts. This form of peer interaction is embraced by MOOCs in the form of discussion forums and peer grading.

The technology over the past decade has made it possible for MOOCs to take hold. The growth of online courses is well documented⁴ with over six million students taking at least one online course Fall 2010. Free online lectures have been available through Massachusetts Institute of Technology’s (MIT) OpenCourseWare (http://ocw.mit.edu/) and other offerings from universities such as Stanford and Berkeley through iTunesU. MIT led the way ten years ago by posting course materials from almost all its classes. Its free OpenCourseWare now includes nearly 2,100 courses and has been used by more than 100 million people. Also during the past decade, Carnegie Mellon University’s Open Learning Initiative had created free online courses.

The real beginning of the MOOC revolution was sparked at Stanford University last fall with courses being offered to over 100,000 students each. MIT started a free class project, MITx, in December. Sebastian Thrun and others founded Udacity⁵. In April, Stanford, Princeton, the University of Pennsylvania and the University of Michigan joined forces with Coursera⁶ to offer free classes. In May, Harvard teamed with MIT. to create edX⁷ (MITx + Harvardx + BerkeleyX). Not only are universities getting on board, but the Bill and Melinda Gates Foundation recently announced a round of 10 grants for the creation of MOOCs for remedial coursework. The growth in the number of MOOCs is now underway with the appearance of several organizations partnering with major universities to provide a variety of courses. A complete list of free online courses offered by Stanford, Coursera, edX, and Udacity can be found at http://www.class-central.com/.

As noted, a big player in the MOOC industry is Coursera. Its first partners as of April 18, 2012 were Princeton University, Stanford University, the University of Michigan and the University of Pennsylvania. Now Coursera has 33 university partners, offer 195 courses and claim to have 1,502,351 students as of the writing of this letter. As noted in The Chronicle of Higher Education⁸ in August, Coursera had over a million students and Udacity 739,000. In her TED⁹ talk Daphne Koller said Coursera was created to provide the best courses .. from the best instructors .. to everyone around the world .. for free.

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⁵ Udacity was founded by Sebastian Thrun, David Stavens, and Mike Sokolsky, with the stated goal of democratizing education. Its first classes were offered in Feb 2012 and there are currently 11 classes posted online.
⁶ Andrew Ng and Daphne Koller of Stanford University founded Coursera. https://www.coursera.org/
⁷ edX is a joint venture initiated by the Massachusetts Institute of Technology and Harvard University to offer courses at no charge. In March 2012 there was one course and several more in the Fall.
⁹ http://www.ted.com/talks/daphne_koller_what_we_re_learning_from_online_education.html
Teaching to large numbers of students is not restricted to universities. Another prominent example in the news is the Khan Academy. The Khan Academy was started by Salman Khan when he reached out to help his niece understand some topics in her mathematics class. This expanded to helping other relatives. He then made a few videos in November 2006 and found out that his nieces and nephews preferred him on YouTube as opposed to meeting in person or through Skype. This was because they were afraid to ask questions, did not want to admit that they did not understand particular points, and did not want to waste his time. He posted videos on YouTube and by 2010 obtained funding from the Gates Foundation and Google to expand what he was doing. As of the beginning of 2012 the Khan Academy had grown to 5 million unique students per month and 2 million exercises a day. It is experiencing a 400% growth per year as noted by Khan at the Stanford Graduate School of Business in February.

Recently they have provided software which allows students to work in the classroom at their own pace as they progress through the subject. It has been tested in a remedial classroom with interesting results, including improved student performance and freeing teachers to work more one on one with students, providing the opportunity for flipped classrooms (classrooms in which students watch short videos on a topic outside the classroom and come to class to work with their peers and the teacher answers questions, or leads discussions, on the material.). The Khan academy is now looking into materials for medical schools and life-long learning and embodies many of the features of a MOOC. Even some have learn from Khan that videos should be as short as ten minutes.

What is appealing about MOOCs? To those developing MOOCs, it is an opportunity to change the world by offering the “best courses” to those who otherwise could not get the education that MOOCs provide. To university administrations, it is possibly a new 21st century business model for cutting budgets. To businesses, it could lead to new revenue streams from affordable education. To students, it is an opportunity to get basic skills leading to certifications for obtaining jobs or to learn things that were long forgotten. For the rest of us, this might change our views of how students learn. In both Koller’s and Norvig’s TED talks, there was a clear message that data was being collected on a global scale and when the data is processed we may discover something about human learning that may just lead to a revolution in education.

Is this the end of higher education as we know it? It is a good sound bite for newspapers or technology podcasts, as heard recently on This Week in Tech (http://twit.tv/twit). It is not clear yet how such courses would be handled by current universities. Do we need one faculty member per 200 students? Should we encourage students to broaden their network and learn from different experts around the world, learning to think as a global participant? If you have not taught more than a couple hundred students before, as I suspect most of you have not, then you might wonder how one can get one hundred thousand students to learn. After all, some of us have a hard time with twenty students. What types of courses are conducive to MOOCs, What pedagogy is involved? Can MOOCs be part of accredited programs? We will explore some of these topics in upcoming letters.

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10 See the Khan Academy at http://www.khanacademy.org/ and listen to
11 Listen to Salman Khan at http://www.youtube.com/watch?v=W-vj6BhQa5w

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Strength in Numbers: A Multidisciplinary, Project-based Course in Introductory Statistics

Lisa Dierker, Emmanuel Kaparakis, Jennifer Rose, Arielle Selya, and David Beveridge
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Abstract

This paper describes a multi-disciplinary, project-based course. The course is aimed at providing greater curricular access to applied statistics for students across both divisional and departmental boundaries and includes lecture and laboratory components as well as intensive individualized instructor and peer support. Learning materials and teaching strategies were designed to be structured enough to allow students to consistently move forward with their research projects, yet broad enough to encourage them to creatively and independently explore their questions by actively driving the decisions involved in inquiry. In this way, the support each student receives is dictated by their own research question and the results at each stage of their project. We describe the course around the six recommendations of the ASA-endorsed Guidelines for Assessment and Instruction in Statistics Education (GAISE) which foster opportunities for project-based work through an emphasis on the use of real world data, active learning, conceptual understanding rather than memorization, and the use of technology.

Keywords: Project-based; Data; Introductory statistics.

The days of “silo” science have ended—collaboration and inter-disciplinarity are now viewed as essential for solving the most important problems faced in the United States and the world (National Academies, 2004). The shift away from the solitary researcher to team research with scholars collaborating with others within and across disciplines has occurred in the natural sciences, computing sciences, engineering, the social sciences and the humanities (Wuchty, Jones, & Uzzi, 2007). Curricula that impart this kind of inclusive and flexible thinking and communication will best foster the development of students who will not only be able to engage in interdisciplinary scholarship, but will also be among the most scientifically literate citizens in our society.

To achieve this inter-disciplinarity, it is believed that project-based learning will play a central role. Project-based learning is most commonly defined as an instructional approach based on authentic, real-world activities that are aimed at engaging student interest and enthusiasm (BIE, 2012). Designed to answer a question or solve a problem, this approach allows students to face challenges that lead to answers, reflect on ideas and

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Strength in Numbers

make decisions that affect project outcomes. In fact, an emerging literature shows that project-based learning in many contexts is more effective in promoting deep thinking, the ability to apply knowledge, communication and reasoning skills when compared to traditional didactic approaches (e.g. Harada & Yoshina, 2004; Hickey, Wolfe, & Kindfield, 2000; Hickey et al., 1999; Langer, 2001; Lynch, Kuiper, Pyke, & Szesze, 2005).

Given that data is one of the most salient points of intersection among diverse disciplines, we describe in this paper a project-based curriculum that teaches diverse skills through the process of project-based statistical inquiry. Notably, statistics education has generally remained at the poles of discipline-specific instruction (e.g. psychology and economics) or is delivered more generically, without clear links to the work of any particular discipline. Thus, a central challenge is the development of curricula that not only serves diverse majors, but also sparks communication, reasoning and collaboration that clearly crosses the traditional disciplinary boundaries. This goal can best be achieved through project-based curriculum that allows students to “decompose their topic, identify key components; abstract and formulate different strategies for addressing it; connect the original question to the statistical framework; choose and apply methods; reconcile the limitations of the solution; and communicate findings” (Nolan & Temple Lang, 2009).

To begin to address this challenge, we have created a multi-disciplinary, project-based course in introductory statistics that can serve students from diverse majors. Learning materials and teaching strategies were designed to be structured enough to allow students to consistently move forward with their research projects, yet broad enough to encourage them to creatively and independently explore their questions by actively driving the decisions involved in statistical inquiry. In this way, the support each student receives is dictated by their own research question and results at each stage of their project.

Course Curriculum and Logistics

This project-based course differs from standard introductory statistics courses in several ways. Where traditional statistics courses employ a building-block approach which covers relatively few statistical tools in a serial manner and in the absence of a context in which to apply them, this course entails learning statistics as students answer their own questions and choosing among many statistical tools presented in a parallel manner. This course promotes learning by creating a context in which students familiarize themselves with several possible data sets, formulate a statistical question, choose among several available statistical tools, apply an appropriate method, and communicate their findings. This process has not only given students grounding in basic statistics, but also helped them develop diverse skills related to inquiry beyond those that are exclusively statistical. The semester-long course met 3 to 4 times a week for a total of 4 hours. During the first offering of the course, substantive content was presented during lecture sessions with optional readings made available on-line (ratio of lecture to laboratory sessions was 2 to 1). For the second offering, lectures were stream-lined and the Carnegie Mellon Open Learning Initiative (OLI) was added as required online reading material and interactive support activities. The ratio of lecture to laboratory sessions was also reversed (i.e. 1 to 2). Table 1 shows a list of topics, along with project activities.
Table 1. Weekly Topics and Activities.

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<th>Week</th>
<th>Topic</th>
<th>Activities</th>
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<tr>
<td>1</td>
<td>Data, data sets and data documentation</td>
<td>Exploring data documentation</td>
</tr>
<tr>
<td>2</td>
<td>Reviewing the Literature</td>
<td>Literature review</td>
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<tr>
<td>3</td>
<td>Scientific writing and referencing</td>
<td>Draft Research Plan</td>
</tr>
<tr>
<td>4</td>
<td>Statistical software</td>
<td>Running a basic procedure and error checking data</td>
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<tr>
<td></td>
<td>Review of software specific code for data management</td>
<td>Data management</td>
</tr>
<tr>
<td>5</td>
<td>Descriptive statistics and data visualization</td>
<td>Graphing means and frequency distributions</td>
</tr>
<tr>
<td>6</td>
<td>Inference</td>
<td>Graphing with two variables</td>
</tr>
<tr>
<td>7</td>
<td>Comparing means (ANOVA) and tests of categorical independence (Chi Square)</td>
<td>Testing and interpreting bivariate associations</td>
</tr>
<tr>
<td></td>
<td>Post hoc tests</td>
<td>Testing and interpreting bivariate associations and post hoc comparisons</td>
</tr>
<tr>
<td>8</td>
<td>Correlation and Regression</td>
<td>Testing, graphing and interpreting bivariate associations</td>
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<td>9</td>
<td>Multiple Regression</td>
<td>Replicating bivariate results with multiple regression</td>
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<td>Logistic Regression</td>
<td>Replicating bivariate results with logistic regression</td>
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<td>11</td>
<td>Confounding</td>
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On-line lecture clips are designed to provide students with adequate substantive and practical background for completing exams and cumulative laboratory assignments toward the completion of their research project. Each lecture focuses on a topic that allows students to make progress on their independent project. Laboratory instructors and teaching assistants are available during smaller lab sessions (20 to 25 students) to support students in completing their research project. Attendance is mandatory. Additional individualized instructional support from peer tutors is available 13 hours a day throughout the semester to a) minimize common frustrations experienced when working with data; and b) maximize productive project-based learning.
Guidelines for Assessment and Instruction in Statistics Education

We discuss how the course described above relates to the current guidelines for statistics education approved by the American Statistical Association (see The Guidelines for Assessment and Instruction in Statistics Education – GAISE; amstat.org and (Franklin & Garfield, 2006) which foster opportunities for project-based work.

These six recommendations are:

1. Emphasize statistical literacy and develop statistical thinking;
2. Use real data;
3. Stress conceptual understanding rather than mere knowledge of procedures;
4. Foster active learning in the classroom;
5. Use technology for developing conceptual understanding and analyzing data;
6. Use assessments to improve and evaluate student learning.

Emphasize statistical literacy and develop statistical thinking

The course is designed around student research projects of their own choosing and offers intensive hands-on experience in not only using statistics, but also in some of the broader aspects of applied research, in which they can contextualize the statistical skills they are taught during class lectures. In the laboratory and in homework assignments, students develop skills in a) generating testable hypotheses; b) conducting a literature review; c) understanding the structure of large data sets; d) formatting and managing data; e) conducting descriptive and inferential analyses; and f) reporting and interpreting results. Laboratory instructors provide support by engaging students in discussions about their research topics and their experiences throughout the research process; providing statistical guidance and feedback; teaching statistical software syntax and de-bugging errors; and occasional brief lectures in support of the current statistical topics. Projects are presented at the end of the semester at a research poster session in which students have the opportunity to describe their process of inquiry, including the different decisions made along the way, their premises, conclusions and any barriers that they faced.

Use real data

In the first week of class, students choose from a number of cutting-edge data sets representing several disciplines. Specifically, we provide data and supporting resources (e.g. data documentation, previously published scientific literature, grant applications describing the research, etc.) for studies that are made accessible by faculty and data that are publically accessible through national archives. Data sets for the course, are selected based on a) the completeness and clarity of their documentation; b) size in terms of number of observations (the larger the better); c) the diversity of variables measured; and d) whether the data set adds to the variety of represented disciplines. Example data sets used in recent offerings of the course include:
The General Social Survey (http://www.norc.uchicago.edu/GSS+Website/): The General Social Survey (GSS) conducts basic scientific research on the structure of American society. Research questions based on this data set have included: Are individuals with Christian beliefs more likely to report high levels of patriotism? Are there gender differences in attitudes toward censorship?

Forest Caterpillar Ecology Study: This study conducted by Michael Singer, Ph.D. (Singer, Mace, & Bernays, 2009) is aimed at understanding food web structure in a forest ecosystem. Research questions based on this data set have included: Do different tree species in the forest host different numbers of caterpillar species? Do different caterpillar species suffer different frequencies of parasitism (i.e. species of wasps or flies that lay eggs in or on a caterpillar)?

The National Longitudinal Study of Adolescent Health (Add Health), http://www.nichd.nih.gov/health/topics/add_health_study.cfm is a nationally representative study that explores the causes of health-related behaviors of adolescents in grades 7 through 12 and their outcomes in young adulthood. The public access version of the baseline assessment was made available to students in the course. Research questions have included: Do adolescents whose parents are divorced experience higher levels of depression than those from intact families? Is religious affiliation associated with contraception use?

**Stress conceptual understanding rather than mere knowledge of procedures**

Rather than focusing on rules associated with traditional lists of statistical tools (e.g., z-test, one sample t-test, two sample t-test, paired t-test, etc.), we have organized the course according to the decisions and skills involved in statistical inquiry. Basic themes such as measurement and descriptive and graphical representation are covered, as well as more specific inferential methods needed to test hypotheses and/or explore the empirical structure of data. All, however, are introduced as the student’s scientific questions dictate their presentation. In this way, students are provided with opportunities to learn to evaluate what tools would be most appropriate for their research question(s) and to engage in decision making. While not all students utilize the entire menu of tools offered in this course, through lecture, on-line materials, and collaboration with peers, they are exposed to a wide variety of methods, and learn to choose and use them flexibly as they are needed. This approach is aimed at building student confidence and their ability to evaluate data and seek out appropriate methods for the questions at hand.

**Foster active learning in the classroom**

The examples presented to the class are based on individual student experiences, and much of the more detailed instruction takes place “after the fact”, that is in the context of the questions and needs that the students’ work generates (Kester, Kirschner, & Van Merrienboer, 2004). In this way, like professional scientists, students “decompose their topic, identify key components; abstract and formulate different strategies for addressing it; connect the original question to the statistical framework; choose and apply methods;
reconcile the limitations of the solution; and communicate findings” (Nolan & Temple Lang, 2009). Based on the student’s choice of data, each generates testable hypotheses, conducts a literature review on their topic of interest, works to refine or broaden their research questions based on information they collect, prepares data for analysis (i.e. data management), selects and conducts descriptive and inferential statistical analyses; and evaluates, interprets and presents research findings. These activities are not presented or experienced as distinct stages but rather, as a series of ongoing, interactive tasks.

Use technology for developing conceptual understanding and analyzing data

We believe that the ability to use statistical software packages is a central skill that greatly expands a student’s capacity not only for statistical application, but for engaging in deeper levels of quantitative reasoning. Thus, an important aspect of the course is exposing students to popular statistical software tools that can be used to manage and analyze data. Not surprisingly, opinions differ widely both across substantive disciplines and even within individual departments about the specific statistical software packages that should be taught. Many introductory statistics courses now cover the practical aspects of using a single statistical software package. As noted by (Nolan & Temple Lang, 2009), this exposure is most often targeted at a basic knowledge about the particular package, rather than being used as a platform for the more important goal of conceptual reasoning with data. Our approach is a more general and translatable one that is meant to provide students with flexible skills that transcend the specific software to explore data and formulate and test scientific questions. Specifically, we expose students to the use and translation of four commonly used, broad statistical software packages (SAS, Stata, SPSS and R), focusing on the commonality and patterns that will provide them with a powerful, general viewpoint and more flexible understanding of data management and statistical analysis (Nolan & Temple Lang, 2009). Our choice to introduce students to different software is motivated by the goal of developing transferable skills which in turn allow students to use the “best tool for the job” instead of “getting stuck” with particular software. Importantly, although some common statistical software packages have developed a point and click interface that allows students to bypass more formal logic syntax, we employ the logic syntax-based approaches to statistical computing in an effort to allow students to fully engage in the decision making process of scientific inquiry (e.g. the connection to the logic of data management and the choices made in statistical analysis and general model building). To accomplish this, we have developed translational resources that provide students with appropriate syntax for achieving a host of data management and analytic tasks of use in the pursuit of answers to question of the greatest interest to them.

Use assessments to improve and evaluate student learning

To evaluate students learning, we use several different assessment methods:

Laboratory assignments: Students complete 12 lab assignments during the semester with each assignment allowing the instructor to gauge progress in their project.
The Open Learning Initiative (OLI) https://oli.web.cmu.edu/openlearning/ provides pre-existing on-line course packages for introductory statistics that include on-line text and interactive activities. In addition, students are given the opportunity to take non-graded self-assessments to gauge their understanding of the course material and instructors are provided with the same timely feedback on student progress and the level of on-line support that they needed.

Research Plan: Students prepare and submit a written research plan that includes a literature review on their research topic, a description of the study methods and an evaluation of the importance of the research question. This is meant to give students and opportunity to receive concrete feedback on their formal scientific reasoning and writing.

Exams: Four quarterly in-class multiple choice exams are given in which students are asked to integrate material from lecture, lessons and laboratory experiences.

Poster/Oral Presentation: Lab assignments build to the completion of the individual project which is presented and evaluated at the end of the semester as a research poster and oral presentation.

Course Enrollment and Evaluation

This course was first offered during the fall semester of 2009, and a total of 75 undergraduates were enrolled. A second offering of the course during fall 2010 enrolled 57 undergraduates and a third, during fall 2011 enrolled 98 undergraduates. Each offering of the course enrolled students with a variety of disciplinary interests and backgrounds. Among those who had declared a major (60.0% of students), 15% were majoring in a natural science or mathematics, 64% in a social science and 21% in the humanities. Satisfaction with the course was high and did not differ significantly among students pursuing majors in each of these areas.

Students completed surveys at the beginning and end of the semester (i.e. pre and post). The pretest was completed prior to the end of the first week and the posttest during the last week of the semester. Each survey took approximately 10-15 minutes to complete. Students were informed that their participation in this study was confidential and voluntary with no impact on their course grade.

Based on the posttest, 72.4% of students rated their work in the course as rewarding or very rewarding and 83.6% felt that their effort in completing the semester long project was worth the skills that they developed. Further, more than half of the students (55.2%) rated the course as more useful than other college courses they had taken (40% felt that it was similarly useful and fewer than 5% felt that it was not as useful). At the end of the course nearly three-quarters of student believed that they were likely or very likely to use the research skills that they had been exposed to again in the future. More than 90% of students felt that they would recommend the course to others (55.5% said they would definitely recommend the course and 36.5% said they would probably recommend it).
Projects were judged to be rewarding or very rewarding by 57.6% of students and 6.8% felt it was the most rewarding project they had ever completed for a course. Less than 2% of students felt that their project was not rewarding. More than 60% of students felt that they were likely or very likely to use the research skills that they had learned in the course again; 9% felt they would definitely use them again and only 6% felt that it was not likely they would be used again. Nearly half of the students (47%) agreed that they would take another statistics course in the future and only 9.1% of students felt that they would not recommend this course to others. In summary, the course appears to be succeeding in fostering exposure, understanding and appreciation of the relevance of statistical inquiry.

A comparison of student characteristics in our project-based course vs. the traditional introductory statistics course offered through our Math department is presented in Table 2. While both courses show similarly high rates of female enrollment (>60%), our project-based course attracted significantly higher rates of ethnically under-represented students (i.e. Black and Hispanic students) compared to the math course.

Table 2. Student Characteristics for Project-Based and Traditional Introductory Statistics Sections.¹

<table>
<thead>
<tr>
<th></th>
<th>Project-Based Statistics</th>
<th>Math Statistics</th>
<th>Statistics</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n = 206</td>
<td>n = 188</td>
<td></td>
</tr>
<tr>
<td>Ethnicity</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hispanic</td>
<td>25 (12.1%)</td>
<td>8 (4.3%)</td>
<td>$\chi^2=7.9$, 1 df, $p&lt;.005$</td>
</tr>
<tr>
<td>Black</td>
<td>27 (13.1%)</td>
<td>14 (7.5%)</td>
<td>$\chi^2=3.4$, 1 df, $p&lt;.06$</td>
</tr>
<tr>
<td>Asian</td>
<td>38 (18.5%)</td>
<td>34 (18.1%)</td>
<td>n.s.</td>
</tr>
<tr>
<td>White</td>
<td>112 (54.4%)</td>
<td>123 (65.4%)</td>
<td>$\chi^2=5.0$, 1 df, $p&lt;.03$</td>
</tr>
<tr>
<td>Under-represented (Black/Hispanic)</td>
<td>51 (24.8%)</td>
<td>22 (11.7%)</td>
<td>$\chi^2=11.1$, 1 df, $p&lt;.0009$</td>
</tr>
<tr>
<td>Gender (% Female)</td>
<td>130 (63.1%)</td>
<td>122 (64.9%)</td>
<td>n.s.</td>
</tr>
</tbody>
</table>

¹Data through fall semester 2011; n.s. = non-significant

Of the numerous reasons indicated for early departure from science and engineering programs, the most often cited reason is unsuitable or uninspiring pedagogical practices (Handelsman, 2005; Seymour, Hunter, Laursen, & Deantoni, 2004). Importantly, the response to our project-based course by underrepresented students was excellent. Based on the anonymous semester end survey, 72.0% of Black students and 81.2% of Hispanic students were interested in taking a follow-up course and a large proportion of students rated the course as more useful than others they had taken in college (Black, 45.8%, Hispanic, 52.4%, Asian, 51.4% and White 58.1%). Further, many felt that they were very likely to use the skills they have learned in the future (Black, 44.0%, Hispanic, 42.9%, Asian, 46.0% and White 44.4%). A total of, 70.8% of Black students and 71.4% of His-
panic students indicated that they would definitely recommend the course to their peers (compared to 49.1% of White students and 62.2% of Asian students).

Evaluations of the semester-long research project were equally positive. When asked if the effort involved in completing the research project was worth the skills developed, 79.2% of Black students and 86.4% of Hispanic students judged that their skills were worth or very worth the effort involved, compared to 86.5% of Asian students and 83.0% of White students. Sixty-eight percent of Black students and 77.3% of Hispanic students found the project rewarding or very rewarding, compared to statistically similar rates among Asian (77.8%) and White (69.5%) students.

**Summary**

The creation of a multidisciplinary project-based curriculum and the integration of maximally supportive resources takes advantage of students' natural curiosity and provides a common language for approaching questions across numerous disciplines. Importantly, the materials and supportive training infrastructure for this course have been designed in such a way that other instructors can easily follow the framework and utilize the newly developed resources. Our goal is not to deliver a course whose success is tied to individual instructors being facile in all statistical software or methods. Instead, we are developing a strong infrastructure of resources and expertise that can be drawn on by both instructors and students. In this way, the course not only develops vital student expertise, but also develops instructor expertise in terms of their ability to mentor students, engage in the use of statistical and methodologic vocabulary across disciplines and develop expertise across leading statistical software packages.

This project-based course provokes students to encounter (and struggle with) the central concepts and principles not only within the discipline of statistics, but also with the discipline that their chosen research reflects. Although our model focuses on statistics education, the emphasis on authentic real-world activities with the goal of sparking interest and enthusiasm (BIE, 2012) can be achieved in curricular content as diverse as science (Kubiatko & Vaculov, 2011) and foreign language (Danan, 2010) instruction. In addition to the specific skills most directly emphasized, project-based courses provide students with experience in communication, organization and time management (BIE, 2012). We believe that our course can benefit other universities not only through dissemination of our model and experiences, but by making our newly developed resources widely available. We are happy to share our course materials with others and encourage faculty to consider integrating project-based course content. [http://www.wesleyan.edu/qac/curriculum/](http://www.wesleyan.edu/qac/curriculum/)

**Acknowledgements**

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low, Daniel Long, Michael Singer, Wendy Rayack, Erika Fowler, John Kirn, and Marc Eisner. We also thank Mr. Michael Whitcomb for his assistance with portions of the evaluative data, Dr. Chien-Ti Lee for her work managing data for the course and Dr. Mayumi Gianoli for her contributions as a laboratory instructor.

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Buck Institute for Education (BIE) and Boise State University, Department of Educational Technology; http://pbl-online.org/ accessed April 1, 2012.


Effect of Peer Evaluation Format on Student Engagement in a Group Project

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Abstract

Active participation in classrooms often involves group work. In order to examine the effect of using peer evaluations as part of that experience, this study measured the influence of four formats of peer evaluation on students’ perceptions of fairness of the peer evaluation method, its impact on peer engagement, and peer evaluation scores. The privately delivered peer evaluation format, where each student indicated what type of letter of recommendation they would write for each of their peers, was most effective in increasing perceptions of peer engagement and scores. These results suggest that a real-world style peer evaluation is most effective at promoting participation in groups, which should help students to become prepared for activities they will experience in the work world.

Keywords: Career preparation, group work, letter of recommendation, peer assessment, peer evaluation.

Results of education research encourage educators to employ active learning techniques in their classrooms, where students take a central role in the learning rather than simply being recipients of information (National Research Council, 1997). Active learning is effective because it promotes investigation, critical thinking, and collaboration (McNeal & D’Avanzo, 1997; National Research Council, 1997). Common forms of active learning include discussions, inquiry-based learning, problem-based learning, and presentations (Brown, Abell, Demir, & Schmidt, 2006; Downing, Kwong, Chan, Lam, & Downing, 2009; George et al., 1996; Grady, Gouldsborough, Sheader, & Speake, 2009; National Research Council, 1997; Park Rogers & Abell, 2008; Rettig & Smith, 2009; Schmidt, Cohen-Schotanus, & Arends, 2009).

These active techniques lend themselves to group work as opposed to individual work. Group work promotes a sense of community (Summers, Beretvass, Svinicki, & Gorin, 2005), improves communication and teamwork (Payne, Monk-Turner, Smith, & Sumter, 2006), and leads to higher levels of thought and learning than can be accomplished by individuals (Michaelsen, Bauman Knight, & Fink, 2004; Saleh, 2011). One of the challenges to group work, though, is minimizing the number of students who will ride on the coat-tails of the group, and not do much of the work.

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A regularly used method of minimizing this problem of social loafing is the integration of peer evaluation, whereby students in the group grade each other relative to their contributions to the group effort. Many teachers encourage peer evaluation (Elliot & Higgins, 2005; Li, 2001; Michaelsen et al., 2004) so long as it is couched in a collaborative classroom environment (Gueldenzoph & May, 2002). Students like being able to evaluate their peers (Chen & Lou, 2004; Gatfield, 1999), especially those students who have work experience (Gatfield, 1999) and know that when everyone contributes the group’s product is much better than it would be if only some of the people contribute. Further, data show that peer evaluations are effective at reducing social loafing in group work (Brooks & Ammons, 2003; Chen & Lou, 2004).

Despite the utility of peer evaluations, few studies have examined the importance of the format of the peer evaluation (but see Lejk & Wyvill, 2001, 2002). The question addressed in this study was: what format of peer evaluation will be most effective at promoting student engagement and learning? I hypothesized that peer evaluation formats that are similar to real life evaluations will resonate with students and motivate them. I predicted that perceptions of fairness, group participation, and grades would all increase with peer evaluations based on real-world scenarios.

Methods

This research was approved by the SUNY Delhi Institutional Review Board and was conducted in an environmental issues course with approximately 35 students each semester. The students were primarily non-science majors. The course is certified for natural sciences general education credit by the State University of New York, and meets three times per week for lecture with no laboratory component. I established heterogeneous groups at the beginning of the semester. Specifically, students who had previously taken one of my classes served as group leaders. Their groups were then populated as evenly as possible by environmental studies majors, students who grew up in the area (a rural county in central New York State), students who grew up in New York City, and students who had spent noteworthy time outside the United States. Groups developed a collaborative atmosphere (Gueldenzoph & May, 2002) because they worked together in class throughout the semester on case studies, discussions, and learning quizzes (which mined their knowledge of environmental topics).

Each group was required to give a presentation on a national park of their choosing. The groups had to present on the location of the park, its ecosystems, the reason it was established as a park, threats to the sustainability of the park, and solutions to those threats. Each individual in the group provided a peer evaluation of each group member after the presentation.

I employed four formats of peer evaluation over successive semesters in the course (Table 1) from the spring 2009 semester to the fall 2010 semester. The peer evaluations were all holistic (a single, combined grade for effort related to all aspects of the project) as recommended by Lejk and Wyvill (2001, 2002). The points system (Table 1) was the most academic in nature and required students to grade each other from 0 to 100. The
Table 1. Comparison of formats for peer evaluations used in an environmental issues class for non–majors.

<table>
<thead>
<tr>
<th>Format of Peer Evaluation</th>
<th>Letter of Recommendation</th>
<th>Letter and Change</th>
<th>Letter, Change, and Email</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Description</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Grade peer 0-100</td>
<td>Very good = +5</td>
<td>Very good = +5</td>
<td>Very good = +5</td>
</tr>
<tr>
<td></td>
<td>Good = 0</td>
<td>Good = 0</td>
<td>Good = 0</td>
</tr>
<tr>
<td></td>
<td>Negative = -10</td>
<td>Negative = -10</td>
<td>Negative = -10</td>
</tr>
<tr>
<td>Mean peer evaluation multiplied by group grade</td>
<td>Mean score added to/ subtracted from group grade</td>
<td>Mean score added to/ subtracted from group grade</td>
<td>Mean score added to/ subtracted from group grade</td>
</tr>
<tr>
<td></td>
<td>Groups rearranged based on peer evaluations</td>
<td>Groups rearranged based on peer evaluations</td>
<td>Groups rearranged based on peer evaluations</td>
</tr>
<tr>
<td><strong>Potential Point Change</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Up to 100 points lost</td>
<td>-10 to +5</td>
<td>-10 to +5</td>
<td>-10 to +5</td>
</tr>
<tr>
<td><strong>Delivery of Peer Evaluation</strong></td>
<td>Written and delivered in class</td>
<td>Written and delivered in class</td>
<td>Written and delivered in class</td>
</tr>
<tr>
<td></td>
<td>Emailed within 24 hours</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

A shift to a realistic model of peer evaluation started with asking students to indicate what type of letter of recommendation they would write for each peer (Table 1): very good, good, or negative. This approach mimics what happens in the work world when a person tries to move to a new job, either immediately following school or as a shift in workplace or role. The second modification was to change the groups for the second part of the course based on the peer evaluations (Table 1): the students who earned the best letters of recommendation were put together in their new groups on down to those earning the least flattering letters having to work together. In the second part of the course, a different project was assigned, and it was advantageous to work with better people. This change is similar to what happens in the work world: employees who can garner the support of their peers get promoted and move on to better jobs, and those who are not highly regarded by peers tend to stagnate or lose their jobs. The final modification was to have the peer evaluations delivered to me via email rather than in class (Table 1). This condition is more consistent with the real world, because letters of recommendation are written away from the prying eyes of peers. In none of these approaches did the students know which new groups had students receiving the most very good letters of the most negative letters.

I collected data for this study using a voluntary survey and course grades. The survey was delivered at the end of the semester and asked students to indicate if they felt the format of the peer evaluation (1) was fair and (2) encouraged their peers to participate. All data were analyzed using Mintab Statistical Software version 15 (a computer program...
that performs statistical tests on data that are entered; Minitab, Inc., State College, PA, USA) at $\alpha = 0.05$. Analysis of Variance was used to compare the four peer evaluation formats for perceived fairness, perceived encouragement of participation, group grades on the presentation, and the amount of grade change to individuals based on the peer evaluation.

**Results**

There was not a significant difference in the degree to which students felt the peer evaluation was fair among formats ($F = 0.78$, $p = 0.505$; Figure 1a). Approximately 80% of students felt the peer evaluation was fair regardless of format.

![Figure 1](image-url)

**Figure 1.** Comparison of a. perceptions of fairness, b. perceptions of encouragement for participation, c. group grades, and d. change in individual grade based on the peer evaluation for four peer evaluation formats in an environmental issues class. Means within a frame with different letters are significantly different at $\alpha = 0.05$. Error bars represent one standard error above the mean. F is the statistic generated by the Analysis of Variance (ANOVA) test. The higher the F statistic, the greater the differences among the treatments. The p-value is the probability of randomly seeing a result as extreme as the F statistic from an ANOVA. The $\alpha$ value is the probability of finding a significant difference among treatments when there is not one (Type I error).
Significantly more students felt that the peer evaluation promoted engagement by peers with the emailed letter of recommendation with change in group than in any other format ($F = 2.70, p = 0.047$; Figure 1b). In the other formats, approximately 70% of students felt that the peer evaluation encouraged engagement, but that number swelled to around 95% with the most real-life format of peer evaluation.

Group grades were significantly different between the letter of recommendation with group change format compared to the emailed letter of recommendation with group change format ($F = 7.28, p < 0.0001$; Figure 1c), but there was no significant difference among any of the other formats. The average letter grade from these formats was an A-, making the statistically significant difference a meaningless functional difference.

The change in individual grade based on the peer evaluation was different for the points format compared to the other formats ($F = 7.79, p < 0.0001$; Figure 1d), which were not significantly different from each other. The average student lost 1 point with the points format and typically gained 2 points with each of the letter of recommendation formats.

**Discussion**

The results of this research collectively suggest that the real-world format of the privately provided letter of recommendation encouraged student engagement in the group activity and led to positive interactions among peers. Regardless of format, students felt that the peer evaluations were fair (Figure 1a). Students tend to like peer evaluations (Chen & Lou, 2004; Gatfield, 1999), so it is not surprising that the format of the peer evaluation did not have a significant impact on students’ perceptions of fairness of the peer evaluation. More than 80% of students viewed the peer evaluations as fair, which speaks to their importance in group activities regardless of format (Elliot & Higgins, 2005; Li, 2001; Michaelsen et al., 2004).

Students felt that the privately written letter of recommendation was the peer evaluation format that most encouraged their peers to contribute (Figure 1b). This encouragement may be the most important facet of the peer evaluation. We would hope, as teachers, that peer evaluations are not simply a means for contributing students to punish the group members who do not contribute (Saavedra & Kwun, 1993), but as a means of motivating students throughout the process to take an active part in their education and the group activity collectively. The capacity to deliver the recommendation in private seems to have made students feel that the peer evaluation would be truthful, and that they must contribute in order to earn a positive recommendation.

Data from the students’ grades also indicate that the letter of recommendation formats generally encouraged participation by peers. While there was not an important effect of the format of the peer evaluation on student grades (Figure 1c), the letter of recommendation formats resulted in positive changes in students’ grades (Figure 1d). Certainly, the points format permitted the lowest peer evaluation scores by far, but students experiencing the letter of recommendation formats had the opportunity to rate peers negatively yet consistently rated peers in the positive range. This repeated scoring of peers in the posi-
tive to very positive range indicates that groups were experiencing laudatory interactions with peers (Brooks & Ammons, 2003; Chen & Lou, 2004) that were encouraged by the format of the peer evaluation, which corroborates the students’ views that the private letter of recommendation format encouraged peer participation (Figure 1b).

While I did not collect data regarding peer evaluations in other courses, I have employed the letter of recommendation with group change based on an email in other science courses that did include science majors. The behaviors of the students in those courses were not evidently different from those in the non-majors course, and I am confident that this format for peer evaluation can be used in any course and discipline. Regardless of discipline, students will seek employment in the work world and will be dependent on letters of recommendation from peers. Further, while students were not informed as to which group was made up of those receiving the worst letters of recommendation, they seemed to understand who they were. Anecdotally, these students seemed to realize the error of their ways and worked harder after the new groups were formed. Inevitably, there have been a few students who also performed poorly with their new group. The new groups filled with the highest rated students have always done very well after the new groups were formed.

Along with providing a well-rounded education for students, our efforts as teachers should help students prepare for their future in the work world (Danielson & Berntsson, 2007; Spowart, 2006). While some students do not like working in groups (Felder, Felder, & Dietz 2002; Gardner & Korth, 1998), most will be required to work in groups in their professional careers (Ezzamel & Willmott, 1998; Stevens & Campion, 1994). The model of a realistic format for peer evaluation supported by the data in this study serves the need of preparing students for their future in evaluating colleagues, encouraging participation, and enhancing the group work experience.

The results of this study lead to new questions related to improving the experience of students working in groups. First, does the original composition of the group affect peer evaluations? Students often rate their friends highly regardless of their contributions. Peer evaluations may be less meaningful in situations where students choose their own group members. Second, how would the results differ if students had to actually write the letter of recommendation rather than simply indicating what type of letter it would be? Students may participate less in the peer evaluation process if more work was required, but they may also take the task even more seriously if there was a higher level of input expected. Third, is the letter of recommendation the most real-world format in today’s society? With the increasing use of Web 2.0 features, other venues may become the standard means of determining how a person is viewed by their peers.

In conclusion, the realistic format of peer evaluation that included private delivery of the type of letter of recommendation that a student would write for her/his peers was the most effective format in encouraging participation in group work and led to the highest peer evaluation scores. Real-world experiences, such as these, should help to prepare students for their experiences in the work world following their formal education.
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References


Challenges to Teaching Mixed Research Courses

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Abstract

Across the United States, many faculty members are developing new mixed research courses. However, before embarking on teaching these courses, it would be helpful for instructors to be aware of the challenges faced by instructors and students in mixed research courses. Thus, the purpose of this qualitative-dominant mixed research study was to document these challenges. Participants were 11 instructors of mixed research courses from institutions around the United States who were selected purposively via critical case sampling such that they represented a diverse set of instructors. The following four themes emerged that represented dimensions of challenges: Time, Diversity, Format/Life Situations, and Preconceived Bias. Three of these themes yielded 10 subthemes. Moreover, a correspondence analysis of the four themes revealed that they each fell somewhere on a continuum that lay from internal influences that characterized an interaction between instructors and students (i.e., Diversity, Format/Life Situations) to external influences that characterized an interaction between instructors and curricula pertaining to the rapidly evolving field of mixed research—yielding the meta-themes of Internal Influence and External Influence. Implications for instructors and students undertaking mixed research courses are discussed.

Keywords: Mixed research; mixed methods research; mixed research courses; mixed research pedagogy; pedagogical challenges.

The overwhelming majority of doctoral students representing the social and behavioral sciences are required or expected to complete at least one research methodology course as part of their degree programs (Capraro & Thompson, 2008; Leech & Goodwin, 2008), and although these research methodology courses tend to represent either quantitative research courses or qualitative research courses, in recent years, an increasing number of students are being exposed to mixed research courses—wherein quantitative and qualitative research approaches are taught within the same course. For example, Leech and Goodwin (2008), who surveyed 100 schools of education across the United States, docu-

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mented that 22% of programs required students take a mixed research course and 20% of programs offered mixed research as an elective. And, bearing in mind that the data for this study were collected more than 4 years ago, it is very likely that the number of mixed research courses being taught worldwide has increased significantly, especially considering the increased visibility of this third methodological movement through such venues as journals devoted to mixed research (i.e., *Journal of Mixed Methods Research; International Journal of Multiple Research Approaches*), conferences devoted to mixed research (for example see [http://www.healthcareconferences.leeds.ac.uk/conferences/](http://www.healthcareconferences.leeds.ac.uk/conferences/)), handbooks (i.e., Tashakkori & Teddlie, 2010), books (e.g., Bergman, 2008; Collins, Onwuegbuzie, & Jiao, 2010; Creswell & Plano Clark, 2010; Greene, 2007; Hesse-Biber, 2010; Johnson & Christensen, 2010; Morse & Niehaus, 2009), and mixed research articles published in high-impact journals (e.g., Johnson & Onwuegbuzie, 2004).

As surmised by Creswell, Tashakkori, Jensen, and Shapley (2003), “very few courses are currently available specifically on mixed methods research” (p. 620). Indeed, most of the existing mixed research courses have emerged in the last 6 years. As a result, the vast majority of instructors of mixed research courses never took a mixed research course themselves—unlike the vast majority of instructors of quantitative-based (e.g., statistics courses) and qualitative-based research courses. Thus, instructors of mixed research courses represent what Creswell et al. (2003) referred to as a “first generation of faculty” (p. 620). Unfortunately, as noted by Earley (2007), instructors of mixed research courses “find ourselves in the same situation: we were not officially trained in the mixed-methods research process and have to create these courses without the benefit of prior coursework to guide us” (p. 146).

As declared by Onwuegbuzie, Frels, Leech, and Collins (2011), the greatest challenge faced by the first generation of mixed research course instructors concerns the lack of works published in the area of mixed research pedagogy. Interestingly, Frels, Onwuegbuzie, Leech, and Collins (2012) found only 19 published works that were devoted predominantly or exclusively to the topic of teaching mixed research-based courses, which represented less than 2% of the mixed research works published between 2000 and 2009 that were identified by Ivankova and Kawamura (2010). Of these 19 works, only two of them (Creswell et al., 2003; Ivankova, 2010) provided substantive information about the challenges faced by instructors of mixed research courses.

Creswell et al. (2003) discussed pedagogical challenges that they labeled as: textbooks, mentoring/support, inconsistent terminology, personal bias, anxieties/misconceptions, and design and data analysis. With regard to textbooks, Creswell et al. discussed the possibility that finding an appropriate mixed research textbook might be challenging. However, with more than a dozen mixed research textbooks currently in existence, it is much less likely that this challenge still prevails. Mentoring/support refers to the lack of “well-established support systems of colleagues from which to draw” (p. 630). However, with the emergence of online mixed research discussion groups (e.g., [http://www.linkedin.com/groups/Mixed-Methods-Research-3794214;](http://www.linkedin.com/groups/Mixed-Methods-Research-3794214;) [http://www.methodspace.com/group/mixedmethodsresearchers](http://www.methodspace.com/group/mixedmethodsresearchers)) and special interest groups (e.g., American Educational Research Association Mixed Methods Special Inter-
Further, the use of inconsistent terminology in mixed research represents another challenge to mixed research course instructors that was discussed by Creswell et al. (2003). Personal bias, another challenge, involves the learning of multiple philosophical assumption and stances. Anxieties/misconceptions refer to all of the challenges and frustrations associated with quantitative and qualitative methods that students bring to mixed research courses. Finally, with respect to design and data analysis, Creswell et al. (2003) stated that “perhaps the biggest challenge instructors face when teaching mixed methods research is teaching students which design to use and how to analyze the data once they have been collected” (p. 632).

Similar to Creswell et al. (2003), Ivankova (2010) provided some evidence-based pedagogical challenges faced by one instructor of an online mixed research course. In particular, she discussed the challenge stemming from the teacher having to “rely on her own experience and student feedback in designing and teaching this online mixed methods course due to the lack of practical advice and related discussion in the literature” (p. 59). Another challenge represented finding the appropriate balance between reading and writing assignments. A third challenge stemmed from the goal of including a large amount of material into one mixed research course. Other pedagogical challenges discussed by Ivankova stemmed from the lack of resources that would serve as foundational readings for the online mixed research course, lack of a comprehensive mixed research textbook, having to rely on multiple reading sources, the diverse perspectives on mixed research, the varied terminology, and scarcity of published empirical mixed research studies in different disciplines that can be used as examples to guide students in their research proposals.

Although both the Creswell et al. (2003) and Ivankova (2010) works contain excellent information about pedagogical challenges, to date, no evidence-based challenges have been documented for face-to-face mixed research courses across various settings. To this end, the purpose of the present mixed research investigation was to examine the challenges faced by instructors who taught a variety of mixed research course formats, and to examine the extent to which these challenges are related to instructors’ mixed research-based philosophical assumptions and stances.

**Research Questions**

**Qualitative research questions.** The following qualitative research questions were addressed in this study:

1. What are the pedagogical challenges in mixed research courses faced by selected U.S.-based leading mixed methodologists?
2. What are similarities and pedagogical differences in mixed research courses in challenges faced by selected U.S.-based leading mixed methodologists?
Mixed research question. The following mixed research question was addressed in this study:

What are the pedagogical challenges in mixed research courses faced by selected U.S.-based leading mixed methodologists as a function of conceptual stance?

Theoretical Framework

According to Teddlie and Tashakkori (2010), there are six contemporary conceptual stances associated with mixed research: a-paradigmatic stance, substantive theory stance, complementary strengths stance, multiple paradigms stance, dialectic stance, and alternative paradigm stance (formerly called single paradigm stance). Each of these stances is summarized in Table 1. As stated by Teddlie and Tashakkori (2010), these six conceptual stances have “been used (explicitly or implicitly) by groups of scholars who are practicing MMR [mixed methods research]” (p. 14). Interestingly, Onwuegbuzie et al. (2011) documented a relationship between the conceptual stance of mixed research course instructors and their pedagogical approaches. Thus, we hypothesized in this study that the instructor’s conceptual stance (i.e., mixed research lens) would play an important role in the types of pedagogical challenges. As such, we believed that conceptual stance of mixed researchers provided an appropriate theoretical framework for this inquiry.

Method

Participants and Setting

Data collection for this mixed research study, part of a larger study investigating the experiences of instructors and students in mixed research courses, took place either face-to-face at various national and international conferences or remotely (e.g., via phone or Internet). The participants were 11 leading mixed methodologists, five men and six women, from various institutions in the United States who were instructors of mixed research courses. They were selected via a criterion sampling scheme (Bernard, 2000; Miles & Huberman, 1994; Onwuegbuzie & Leech, 2007). As noted by Guest, Bunce, and Johnson (2006), 12 interviews are sufficient to understand experiences and perceptions among a common group and as posited by Johnson and Christensen (2010), “when greater resources are available, collective case studies of around 10 cases are common” (p. 397). Therefore, we deemed the sample size of 11 instructors adequate for obtaining data saturation. The 11 participants taught a variety of mixed research course formats—specifically, (a) in a site-based 16-week semester format, (b) in a site-based condensed 3-weekend format, or (c) in an on-line 16-week semester format. Using the Carnegie Classification (The Carnegie Foundation for the Advancement of Teaching, n.d.), the instructors’ affiliations were as follows: institutions with very high research, institutions with high research, institutions with doctoral-level research, or institutions wherein research is not classified.
Table 1. Tashakkori and Teddlie’s (2010) Six Conceptual Stances Associated with Mixed Research.

<table>
<thead>
<tr>
<th>Conceptual Stance</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>A-paradigmatic</td>
<td>Paradigms or conceptual stances are not important to real-world practice</td>
</tr>
<tr>
<td>Substantive theory</td>
<td>Theoretical orientations (e.g., critical race theory) are more pertinent to</td>
</tr>
<tr>
<td></td>
<td>the underlying research study than are philosophical paradigms</td>
</tr>
<tr>
<td>Complementary strengths</td>
<td>Mixed research is possible but the different approaches must be kept as</td>
</tr>
<tr>
<td></td>
<td>separate as possible in order for the strength of each paradigm to come</td>
</tr>
<tr>
<td></td>
<td>to the fore</td>
</tr>
<tr>
<td>Multiple paradigms</td>
<td>A single paradigm is not appropriate for all mixed research designs; rather,</td>
</tr>
<tr>
<td></td>
<td>different paradigms are relevant for different mixed research designs</td>
</tr>
<tr>
<td>Dialectic</td>
<td>Use of multiple paradigms in a single mixed research study yields greater</td>
</tr>
<tr>
<td></td>
<td>understanding of the underlying phenomenon</td>
</tr>
<tr>
<td>Alternative paradigm</td>
<td>Single paradigm (e.g., pragmatism-of-the-middle; transformative emancipa-</td>
</tr>
<tr>
<td></td>
<td>tor) is used to support the use of mixed research</td>
</tr>
</tbody>
</table>

Per Teddlie and Tashakkori’s (2010) framework, the mixed research conceptual stances of the 11 participants were as follows: five participants were classified as endorsing a dialectic stance, four participants were classified as supporting the alternative paradigm stance, one participant was classified as promoting the multiple paradigms stance, and one participant was classified as advancing the complementary strengths stance. Consequently, four of Teddlie and Tashakkori’s (2010) six conceptual stances were represented by the 11 participants. Table 2 presents each participant’s associated conceptual stance.

**Instruments and Procedures**

After Institutional Review Board approval was obtained, two researchers conducted the series of interviews as the means to obtain data. These interviews were audio-taped using two separate hand-held digital recorders to insure clarity of recordings. The interviews were semi-structured in nature, consisted of open-ended questions, and included probing
Table 2. The 11 Participants and Associated Conceptual Stance.

<table>
<thead>
<tr>
<th>Conceptual Stance</th>
<th>Number of Participants Identified in Stance</th>
<th>Identifying Name for Each Participant</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alternative paradigm</td>
<td>4</td>
<td>Participant AP1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Participant AP2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Participant AP3</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Participant AP4</td>
</tr>
<tr>
<td>Dialectic</td>
<td>5</td>
<td>Participant D1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Participant D2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Participant D3</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Participant D4</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Participant D5</td>
</tr>
<tr>
<td>Complementary strengths</td>
<td>1</td>
<td>Participant CS1</td>
</tr>
<tr>
<td>Multiple paradigms</td>
<td>1</td>
<td>Participant MP1</td>
</tr>
<tr>
<td>A-paradigmatic</td>
<td>0</td>
<td>Substantive theory</td>
</tr>
<tr>
<td>Substantive theory</td>
<td>0</td>
<td></td>
</tr>
</tbody>
</table>

questions to obtain rich data (Geertz, 1973). Samples of interview questions are as follows:

1. What are the particular issues that students face in learning about mixed methods?
2. What are the issues for teachers in designing and delivering courses that aim to develop researchers’ abilities to carry out mixed methods?

After interviews were transcribed, the participants were asked to complete member checking (Lincoln & Guba, 1985) in order to maximize descriptive validity (Maxwell, 1992). Further, the two researchers who were involved in interviewing the participants underwent debriefing interviews themselves (Frels, Onwuegbuzie, & Frels, 2010) because they served as primary research instruments (Poggenpoel & Myburgh, 2003). Debriefing interviews, as conceptualized by Onwuegbuzie, Leech, and Collins (2008), are designed to promote reflexivity; to identify biases in interpretation of data; and to obtain rich insights as to ways that the study impacted participants, stakeholders (i.e., instructors and students of mixed research courses), and the researchers themselves.
Mixed Research Design

In the current study, we utilized a qualitative-dominant mixed research design (Johnson, Onwuegbuzie, & Turner, 2007), wherein we adopted a qualitative, constructivist-poststructuralist-critical stance with respect to the research process, while, at the same time, deeming the inclusion of quantitative analyses to yield value-added inferences.

The embedded design utilized in this inquiry was a multiple case study (Yin, 2009)—also known as a collective case study (Stake, 2005). According to Stake (2005), a multiple case study represents an instrumental case study with multiple cases/participants who are instrumental to the study because the information they yield provides insight into the underlying phenomenon—in this case, the phenomenon of challenges in teaching mixed research courses. Specifically, an embedded design was utilized, wherein the results of each case were understood through cross-case analyses (Yin, 2009). The cases were bound together by the fact that participants were leading mixed methodologists who taught mixed research courses.

Data Analysis

In this study, we adopted a dialectical pluralist stance with respect to the research process, wherein we incorporated multiple epistemological perspectives within the same inquiry (Johnson, 2011). With respect to our data analysis phase, we utilized constant comparison analysis (Glaser & Strauss, 1967), classical content analysis (Berelson, 1952), word count (Leech & Onwuegbuzie, 2007, 2008), and keywords-in-context (KWIC; Fielding & Lee, 1998) via the software QDA Miner Version 4.0 (Provalis Research, 2011). The sources for naming codes and locus of typology (i.e., theme) development were investigative (i.e., stemming from the intellectual constructions of the researchers [Constas, 1992]) in an iterative process involving a posteriori coding. Also, the verification component was technical (e.g., use of intercoder agreement). Specifically, two of the researchers independently coded 20% of the interview data and after establishing 100% interrater reliability, using Cohen’s Kappa measure (Siegel & Castellan, 1988), one researcher coded the remaining interview data. After naming codes, we conducted a Jaccard’s coefficient to determine the co-occurrence of codes across and within each of the 11 cases. Also, a case-oriented analysis was utilized, with the focus on the high frequency themes and subthemes.

According to Sandelowski (2001), a narrative description can be enhanced via a word count. The word count list was condensed by eliminating words not specific to mixed research and challenges of teaching. In addition, KWIC was used to supplement the word count analysis. According to Leech and Onwuegbuzie (2007, 2008), the purpose of KWIC is to indicate how words are used in context with other words. As noted by Fielding and Lee (1998), KWIC represents an analysis of the culture of the use of the word. Moreover, “the assumption underlying KWIC is that people use words differently and, thus, by examining how words are used in context of their speech, the meaning of the word will be understood” (Leech & Onwuegbuzie, 2008, p. 594).
These analytical procedures relied heavily on the discretion of the researchers, as a participative element of the process (Constas, 1992) and served as a means for maintaining analytic integrity (Miles & Huberman, 1994). First, the coding procedure considered three components outlined by Constas (1992): (a) origination, which is the programmatic language, the investigation, review of literature, or interpretations of the data; (b) verification, which is the evidence that the categories have a logical connection and can be verifiable in existing research; and (c) nomination, which is the process of naming the categories and resulting in logical connections. Categories that emerged were investigative and codes were named based on the analysis, conducted a posteriori (Constas, 1992), using the language of the participants (i.e., folk terms; Spradley, 1979).

As part of the cross-case analysis, the subthemes extracted from the interviews were subjected to a correspondence analysis. Broadly speaking, a correspondence analysis is an exploratory multivariate technique involving factoring categorical (i.e., nominal level) variables and mapping them in a property space that displays their associations in two or more dimensions (Michailidis, 2007).

**Results**

The constant comparison analysis identified 10 emergent subthemes that clustered into the following four themes: (a) Time, (b) Diversity, (c) Preconceived Bias, and (d) Format/Life Situations. It should be noted that the third theme (i.e., Preconceived Bias) stood alone yet co-occurred indirectly to the other three themes. Therefore, we present this theme as a stand-alone theme. Figure 1 presents the four themes as they relate to each other. Table 3 presents the themes and subthemes from the constant comparison analysis, descriptions, and significant statements.

![Figure 1. Four themes that emerged as dimensions of challenges pertaining to teaching mixed research courses.](image-url)
### Table 3: Meta-Themes, Themes, and Definitions of Challenges of Teaching Mixed Research.

<table>
<thead>
<tr>
<th>Theme</th>
<th>Subtheme</th>
<th>Definition of Challenge</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Time</strong></td>
<td>Application of Knowledge</td>
<td>Teaching students methodology specific to mixing quantitative and qualitative research (e.g., sampling, data analysis, integration of quantitative and qualitative approaches)</td>
</tr>
<tr>
<td></td>
<td>Time Restraints</td>
<td>Covering methodological concepts of quantitative and qualitative as well as mixed approaches in one course</td>
</tr>
<tr>
<td></td>
<td>Changing Field</td>
<td>Using current literature specific to strong mixed method design in a newly evolving research tradition</td>
</tr>
<tr>
<td><strong>Diversity</strong></td>
<td>Diverse Levels of Students</td>
<td>Addressing in one course students who are stronger in one research approach (e.g., qualitative) versus the other approach (e.g., quantitative)</td>
</tr>
<tr>
<td></td>
<td>Language and Vocabulary</td>
<td>Teaching research language pertaining to research in general and terms specific to mixed methods (e.g., convergent parallel design, pragmatism)</td>
</tr>
<tr>
<td></td>
<td>Different Fields of Study</td>
<td>Developing a course that meets the needs of students from various departments within the university</td>
</tr>
<tr>
<td><strong>Preconceived Bias</strong></td>
<td></td>
<td>Helping students overcome predetermined misperceptions pertaining to one approach (e.g., qualitative) versus the other approach (e.g., quantitative)</td>
</tr>
<tr>
<td><strong>Format/Life Situations</strong></td>
<td>Attending to Feedback</td>
<td>Changing each course presentation from semester to semester to increase students’ understanding and application of mixing approaches</td>
</tr>
<tr>
<td></td>
<td>Personal Life Situations</td>
<td>Addressing the typical students issues that arise but that are more intense due to the complexity of course content</td>
</tr>
<tr>
<td></td>
<td>Online</td>
<td>Adapting multifaceted concepts so that self-directed online learning is successful</td>
</tr>
</tbody>
</table>
As can be seen in the occurrence of subthemes in Figure 1, when participants mentioned the application of knowledge, often they discussed closely the time restraints relating to the amount of material to present and to apply. These two subthemes also connected to the idea that the field of mixed research is changing quickly as it evolves, comprising the theme of Diversity. In the theme of Time, the subtheme of Diverse Levels of Students was linked to the subtheme Language and Vocabulary, as well as the subtheme of Different Fields of Study. In the theme Format/Life Situations, subthemes of Attending to Feedback, Personal Life Situations, and Online were clustered as they related to the human considerations pertaining to the challenges of teaching mixed research. Finally, as shown in Figure 1, the theme of Preconceived Bias has a dotted line linking it to each of the other three themes. The following sections present the four themes representing the four dimensions of challenges, which are presented in order of dominance (i.e., prevalence rates among the participants’ voices), starting with the most dominant theme and its respective subthemes.

**Diversity**

The theme of Diversity comprised the subthemes of (a) Diverse Levels of Students, (b) Language and Vocabulary, and (c) Different Fields of Study. Diverse Levels of Students emerged as the most dominant subtheme when considering frequency \( n = 31 \) and occurrence (i.e., 8 of 11 participants). One instructor stated,

> My philosophy is that I am going to modify materials and lectures as necessary for the group of students and I often modify my expectations of what the students need based on what they're coming in with. I've got some students that come into introductory research that have no research background, and I have others that are coming into the advanced mixed methods class that have quite a bit of research background, but often in one strand.

In addition, instructors often discussed philosophical challenges that related to Diverse Levels of Students and mixing research paradigms. For example, one instructor explained,

> Exposure to research, it's not uncommon, where I am anyway, for students to come into the class, maybe they've taken two research courses and so they're kind of ill prepared to take a mixed research course and hit the ground running. Another issue that they face--again at my institution and several others where I've taught before--is lack of exposure to philosophy of research. It's very rare for me to find a student who is really aware, who has an identity in terms of research philosophy; that they know, for example, if they are a constructivist, or a pragmatist, or what have you, prior to the course.

The subtheme of Language and Vocabulary was the second overall dominant subtheme with six of the 11 participants discussing it and an overall frequency count of 11. In addition, most often when instructors mentioned the challenge of teaching diverse levels of students, they closely related this challenge to the diverse levels of vocabulary. Consider-
ing the language that is specific to research, it is not surprising that mixed research utilizes language from both quantitative and qualitative research traditions; subsequently, the vocabulary in mixed research courses would be quite extensive. One instructor explained,

They just have to learn not only the content but also they have to learn the language, the terminology, and actually, the concepts you know. Content is more methodological, how you do things differently in mixed methods research, quantitatively or qualitatively, but concepts you know new things that are unique to mixed methods research for example like how you integrate.

Pertaining to the subtheme Different Fields of Study \((n = 4)\) within the theme of diversity, four participants noted how often they found themselves challenged when working with students from different colleges within their universities. One participant noted,

I think the biggest thing is that students come with varied backgrounds. My students come from multiple schools within the university. So I'll have nursing students, I'll have school of education students, I'll have school of public affairs students and, health and behavioral science students.

**Time**

The theme of Time was the second most dominant theme and comprised three subthemes: (a) Application of Knowledge, (b) Time Restraints, and (c) Changing Field. Of these subthemes, Application of Knowledge \((n = 18;\) across 8 of 11 cases) was most dominant. One participant explained,

[Students] also struggle with separate topics, you know, specifically integration or mixing, legitimation issues, and that depends on the individual level and it depends on the coursework these students have or had in their research experiences.

In addition, it was apparent that the majority of teaching challenges pertained to methodological concepts of mixed research—as another participant suggested,

And I think, one of the things that I found is that students tend to not always flounder in the same area. So even though I can usually expect students to really struggle with the data analysis portion or the data integration portion, some students really have a hard time entering qualitative data and making numbers out of it. You know that they struggle with that.

Finally, a third instructor explained the specific content that is unique to mixed research and, therefore, is a challenge:

Well, if you're doing QUAL-QUAN when doing the QUAN component, there is an inadequate QUAL sample—there's not enough people, and not a randomly selected sample, to do the QUAN component. And if it's QUAN-QUAL, you have too many people from the QUAN component for the QUAL strategy, and you
have to really decide how you're going to select them. In a sequential design, it's even more problematic, because you can't find the subjects—they've gone away.

These sampling problems are only the beginning. There are problems in the analysis, in the way you incorporate the results…

A second subtheme of Time, specifically Time Restraints ($n = 10$), was discussed by four of 11 participants. Due to its complexity, mixed research was explained by participants as requiring much time. One participant described this challenge as follows:

So I think that's like a big problem from the beginning. In terms of a second issue [students] have a hard time understanding how to conceptualize mixed methods, particularly in terms of writing the research questions, mixed methods research questions. There seems to be some problems there. Just in terms of trying to come up with an overarching problem that you're interested in and then coming up with complementary sets of quantitative or qualitative questions. So that usually takes a lot of time.

In addition, the same participant explained,

I also think that there's just not enough time in a typical semester to get the students to plan any well-designed individual (solo conducted) mixed methods research project in that period of time. So, the teacher has to decide whether they're going to have the students do a proposal, whether they're going to have them work in groups to try to actually gather some qualitative and/or quantitative data and do an actual study.

The subtheme Changing Field ($n = 9$) was discussed by six participants. These instructors, as leading authors in the field, were cognizant that current literature was critical to understanding the quickly evolving field of mixed research. One participant contended,

I think there's a lot that is emerging now in mixed methods. And it is a field that we need to, be ready—quick on our feet I guess—to learn about what's emerging. It's not a field where you can take the old trusty textbook and say 'okay I got it out here.' And so the question really is 'how do we keep fresh with what's developing?' And of course there are avenues, there are avenues. The Journal of Mixed Methods Research is great.

In addition, finding credible articles was important to one instructor as he/she explained, “Are you asking me what I think is needed to better understand strategies for teaching missed methods? First, it is hard to find good examples—published, yes.”

**Preconceived Bias**

The theme of Preconceived Bias ($n = 6$ across four of 11 cases) refers to the way instructors explained the mindset of students and the challenges associated to the preference of
one research paradigm over another (i.e., quantitative, qualitative). As explained by one instructor,

So I do think there are still people who think either—we don't need mixed methods because it's so simple, you know you just do this and you just do that and what do you have to learn about. Or, because they really truly believe they are situated within one particular approach and that's sufficient, you know, you shouldn't force or expect people to be competent across boundaries...sometimes people are very entrenched in the beliefs that their method is the one that's right. And, that, they can't really be an expert in everything so it's ridiculous to try.

Another instructor noted how students might have been influenced by preconceived bias of former instructors:

Attitudes—they [students] unfortunately come to mixed research classes with negative attitudes either from other instructors, professors, or from their peers with a negative attitude, and have a lack of appreciation of how powerful research can be in their fields.

A third instructor reflected further on the challenge of teaching mixed research and preconceived bias and remarked,

I think where professors of mixed methods research are the most vulnerable would be from criticism by qualitative researchers who say “How do you expect students to really understand the qualitative side of it if they haven't spent a significant amount of time out in the field actually experiencing, what it is that they're studying?” And I think that's a really good criticism. And so what I hope students would get is some sort of feeling of what that's about—that is what the qualitative end of mixed methods is about.

As noted previously, the theme Preconceived Bias was not clustered with one specific theme, yet related to all three themes in some way (See Figure 1). One instructor addressed the challenge of bias in the following manner:

Definitely a lot is needed in teaching strategies because it's a new area. How do you teach mixed research? One of the problems we have in courses, in general mixed research courses, is that the instructor himself or herself may not be strong in both approaches, he or she may not be adequately strong in both quantitative and qualitative techniques so then there's a struggle; you know, what do you do? Well, obviously for me, one solution is to have people team-teach the course. So, you have two or more people team-teaching the course; so, maybe you have one or more that is quantitative oriented, other qualitative oriented and together students will get the best of both worlds.
**Format/Life Situations**

In Format/Life Situations, subthemes of (a) Attending to Feedback, (b) Personal Life Situations, and (b) Online referred to the personal challenges of students with respect to learning mixed research and challenges. The subtheme Attending to Feedback ($n = 4$; across four of 11 cases) referred to the challenge of providing feedback to various levels of students and various levels of groups of students as a whole. One instructor explained that because he/she used current readings due to the quickly changing field, preparation time can be extensive and attending to individual student feedback can be challenging:

> Every semester has different sets of readings. And I've actually found that one of the challenges that I faced the last semester was too orientated towards philosophy. I need to back out of that. Those are decisions that I make on a continual basis. A lot of the modifications end up happening through a combination of asking students for feedback, and looking at the work they are doing.

For another instructor, one challenge involved how best to amend the many concepts of mixed research after reflecting on one course cycle before moving to the next. He/she remarked,

> There's so much to cover in one course. You know it's sort of build from the knowledge that we have in QUAN and QUAL but there's still so much issues with mixed methods today. Students cannot get everything in one course that is needed for developing the proposal is too much. That is one issue that I always have— is to think at the beginning when each course began every year. I think, I sit down and look at my syllabus and think what would be the best logical way to present the topics? What should I change? And I change it every time, I change something.

Another subtheme, Personal Life Situations ($n = 3$; three of 11 cases) related the idea that due to the extensive nature of mixed research, coursework might take more of a personal toll on students. As explained by one instructor,

> Generally an issue I have is my high expectations and the rapid pace of the courses. It is a challenge for those that are working full time. It is very difficult. In the introductory class, it's [working students] generally is over 50%. At the doctorate level, I would say it's probably, 30 to 40% or something like that but I can't be sure.

Closely related in Theme 3 to Personal Life Situations is the subtheme of Online ($n = 2$ in two cases overall). One participant who taught mixed research solely in an online format emphasized that time constraints due to personal lives are magnified and stated, “I also use a Tegrity program because some cases there are students who don't want to interact because of time constraints or because they can't all come together at that one moment.” He/she also noted with respect to understanding new concepts and online content that,
When considering the framework relative to use of terminology, and relative to recognition of different philosophical stances, influences, how one approaches mixing. I teach online so that I think that there's an added level of concern on the part of the students because they can't necessarily see me [in a face-to-face context].

Interestingly, Theme 3: Format/Life Situations overall appeared to be challenges that many traditional research courses might include. In short, research methodology courses can be challenging to students, and these challenges increase in mixed research courses due to the fact that mixed research coursework includes multiple aspects of both quantitative and qualitative traditions as well as the new content and terminology specific to mixing.

**Relationship of Themes**

Figure 2 presents the subthemes pertaining to challenges of teaching mixed research in summation, regardless of cluster, and overall frequency.

![Figure 2. Overall frequencies of themes pertaining to challenges of teaching mixed research courses.](image-url)
Figure 3. Correspondence analysis of 11 participants and relationship with each other and with respective themes. Also, the quadrants are numbered 1-4.

Figure 3 displays the correspondence plot that emerged when the 10 subthemes were mapped onto a two-dimensional representation. As can be seen from this figure, the Preconceived Bias theme resided by itself on the upper right quadrant (i.e., Quadrant 2), indicating the uniqueness of this theme. Further, all the subthemes pertaining to the Diversity theme and all the subthemes pertaining to the Format/Life Situations theme were positioned on the left side of the continuum of the horizontal axis (i.e., Quadrant 1 and Quadrant 3), whereas two of the three subthemes pertaining to the Time theme (i.e., Changing Field and Time Restraints) were positioned on the right side of the continuum of the horizontal axis (i.e., Quadrant 2 and Quadrant 4). Thus, the left side of the continuum of the horizontal axis almost exclusively was characterized by the Diversity and the...
Format/Life Situations themes, whereas the right side of the continuum of the horizontal axis almost exclusively was characterized by the Time and Preconceived Bias themes. As such, the correspondence analysis maximally separated Diversity and the Format/Life Situations themes from the Time and Preconceived Bias themes. Moreover, this distinction means that the four themes each fell somewhere on a continuum that lay from *internal* influences that characterized an interaction between instructors and students (i.e., Diversity, Format/Life Situations) to *external* influences that characterized an interaction between instructors and curricula pertaining to the rapidly evolving field of mixed research yielding the meta-themes of internal influence and external influence. Interestingly, the subtheme that was clustered closest to the origin (i.e., intersecting axes) as a central subtheme among instructors was Changing Field.

In Figure 3, participants are identified as they are positioned in the four quadrants and with respect to the 10 challenge themes. Specifically, one instructor is positioned in Quadrant 1, three instructors are located in Quadrant 2, five instructors are positioned in Quadrant 3, and two instructors are located in Quadrant 4. Upon closer examination of Figure 3, it can be seen that the one instructor who held the Multiple Paradigms conceptual stance (i.e., MP1) is situated in Quadrant 3. In contrast, the one instructor with the Complementary Strengths stance (CS1) is situated in Quadrant 4. However, the two sets of conceptual stances that best illustrated the role that conceptual stances played in the formation of challenges were represented by the Dialectic stance and the Alternative Paradigm stance. Specifically, four of the five instructors who were classified as representing a Dialectic stance (i.e., D1, D3, D4, D5) were clustered together in Quadrant 3. In contrast, three of the four instructors who were classified as representing an Alternative Paradigm stance (i.e., AP1, AP2, AP3, AP4) are scattered farthest away from each other on the correspondence plot, appearing in three of the four quadrants (i.e., Quadrant 1, Quadrant 2, Quadrant 4). However, three of these four Alternative Paradigm stance instructors were situated on the external influence side of the continuum.

Finally, Table 4 presents keywords, overall frequencies, and frequency of dominant keywords specific to teaching mixed research and challenges among cases. Not surprisingly, the words *qualitative* and *quantitative* were used highly across the majority of cases. Interestingly, instructors were invested highly in helping students overcome challenges associated with a research proposal or dissertation. Also, philosophy was important to instructors. Other words pertaining to the challenges of teaching mixed methods research courses were associated with methodology, such as *mixing*, *designs*, *sampling*, and *philosophy*. Also, instructors mentioned specific textbooks or articles associated with authors such as Tashakkori and Teddlie’s (2010) *Sage Handbook of Mixed Methods in Social and Behavioral Research*, Teddlie and Tashakkori’s (2009) *Foundations of Mixed Methods Research*, Creswell and Plano Clark’s (2010) *Designing and Conducting Mixed Methods Research*, and Johnson et al.’s (2007) definition of mixed research.
Table 4. Keywords and Frequencies Across 12 Cases Pertaining to Challenges of Teaching Mixed Research.

<table>
<thead>
<tr>
<th>Term</th>
<th>Frequency</th>
<th>No. Cases</th>
</tr>
</thead>
<tbody>
<tr>
<td>QUALITATIVE/QUAL</td>
<td>171</td>
<td>12</td>
</tr>
<tr>
<td>QUANTITATIVE/QUAN</td>
<td>130</td>
<td>12</td>
</tr>
<tr>
<td>DESIGN</td>
<td>61</td>
<td>10</td>
</tr>
<tr>
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Discussion

The four themes that emerged pertaining to pedagogical challenges comprised 10 subthemes, which suggests that pedagogical challenges represent a multidimensional construct of both internal and external influences. Moreover, the finding that these challenges all lie on a external-internal influence continuum is particularly noteworthy because it implies that instructors might consider addressing their challenges by dividing their strategies into short-term strategies (i.e., pertinent to the most current course) and long-term strategies (i.e., pertinent to future course).
Another important finding is that, for the most part, these challenges appear to arise as a function of the instructor’s philosophical stance. Indeed, this finding has intuitive appeal because it addresses the importance of each instructor being aware of their philosophical assumptions and stances prior to designing their mixed research courses. In particular, the finding that the instructors subscribing to the Alternative Paradigm stance were located far away from each other in general also has logical appeal because what members of this stance have in common is the belief that philosophical assumptions and stances underlying mixed research should be different from those assumptions and stances underlying quantitative (e.g., post positivism) and qualitative research (e.g., radical constructivism, critical theory) traditions. As such, for example, researchers who consider themselves as subscribing to the transformative-emancipatory stance (cf. Mertens, 2003) and those who consider themselves to be critical realists (cf. McEvoy & Richards, 2006) would be classified under Teddlie and Tashakkori’s (2010) Alternative Paradigm stance even though these two stances are substantively different—likely explaining why these participants did not all cluster together on our correspondence analysis plot. However, the fact that these Alternative Paradigm instructors tended to identify challenges that represented external influences suggests that these instructors are more likely to view long-term challenges as problematic. Another interesting finding is that the participants who held beliefs associated with the Dialectic stance, with the exception of one participant, tended to be clustered together in Quadrant 3 near the origin of the plot and especially around the Diverse Levels of Students and Applications of Knowledge subthemes, which indicates that these instructors identified challenges that turned out to be the two most common challenges (cf. Figure 2).

An important implication for practice is that, based on the current findings, new instructors of mixed research courses potentially have numerous challenges that they should attempt to address when designing their mixed research courses. Interestingly, most of these challenges are unique to the field of mixed research. For example, although the fields of quantitative research and qualitative research have a long tradition, the field of mixed research is relatively new and thus represents a rapidly changing field (i.e., a component of the Time theme). By reflecting on their philosophical assumptions and stances as well as preparing examples of important keywords and concepts outlined in our study, new instructors might be able to predict what their most important challenges will be and make plans to address them to the fullest extent possible. As such, we hope that, at the very least, our findings at least will bring to light some of the major challenges that new mixed research instructors might face, as well as validate some of the challenges experienced by instructors who have already taught mixed research courses.

In closing, the present study was unique in at least four ways. First, the present study appears to represent only the third study—the other studies being Creswell et al. (2003) and Ivankova (2010)—wherein the challenges faced by instructors of mixed research courses have been documented. Second, this appears to be the only formal study in which the challenges faced by several instructors of mixed research courses were compared and contrasted within the same framework. Third, this study appears to represent one of only a few studies in which formal interviews were used to examine the experiences of mixed
research courses. Fourth, this is the first study, to date, to use mixed research techniques extensively to examine this phenomenon. We hope that through our research of challenges of teaching mixed research courses, the future of mixed research might be influenced through detailed planning, proactive strategies for addressing diversity, and careful attention to the many facets important for instructors to consider toward student success.

References


The Ticket To Retention: A Classroom Assessment Technique Designed To Improve Student Learning

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University of Houston, Clear Lake, Houston, TX, 77058

Abstract

Classroom assessment techniques (CATs) or other closure activities are widely promoted for use in college classrooms. However, research on whether CATs improve student learning are mixed. The authors posit that the results are mixed because CATs were designed to “help teachers find out what students are learning in the classroom and how well students are learning it” (Anglo & Cross, 1993, p.4) rather than to help students learn the material. Thus, in order for CATs to be effective for helping students learn, they should be redesigned to focus on student retention of concepts. The Ticket to Retention 2 (TtR2) is designed to do just that.

Keywords: Classroom assessment techniques, student learning, concept retention.

The Ticket to Retention (TtR) was designed to increase student retention of concepts. The TtR is similar to classroom assessment techniques (CATs) because it involves students in writing about information covered during a class session, can be used to assess student understanding of concepts, and helps to determine if the professor’s teaching methodology was successful in conveying information to the students (Angelo & Cross, 1993; Cross & Angelo, 1988; Barkley, Cross, & Major, 2005; Weaver & Cotrell, 1985). CATs or other closure activities are widely promoted for use in college classrooms (Angelo & Cross, 1993; Barkley, 2010; Blumberg, 2009; Cross, 1998; Cross & Angelo, 1988; McGlynn, 2001; Nilson, 2010; Richlin, 1998; Richlin, 2006; Steadman & Svinicki, 1998; Weaver & Cotrell, 1985; Wlodkowski, 2008). Anglo and Cross (1993) state that “Classroom Assessment is an approach designed to help teachers find out what students are learning in the classroom and how well students are learning it” (p. 4).

However, the TtR was designed to do more. The original TtR combined “the benefits of the ticket to leave, the one minute paper, half-sheet response, the post-write strategy, and think-pair-share strategies” (Divoll & Browning, 2010). Although the TtR and other CATs are similar, the TtR differs because it is designed to use three to five focused questions and peer interaction to increase students’ retention. Research on CATs found increased student satisfaction when such strategies are used (Cottell, 1991; Anglo & Cross, 1993; Olmstead, 1991; Walker, 1991); however, the effect of CATs on student learning has interpreted as mixed (Anglo & Cross, 1993) and lacking evidence (Simpson-Beck,

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2011). For example, Shelton (1991) and Walker (1991) found that student learning is increased with the use of classroom assessment, but Cottell and Hardwood (1998), Kelly (1991), Olmstead (1991), Simpson-Beck (2011), and Stetson (1991) found no evidence of increased learning. In addition, much of the research on CATs effect on learning comes from student survey data (i.e., Byon, 2005; Goldstein, 2007; Fabry, Eisenbach, Curry, & Golich, 1997; Kelly, 1991; Rouseff-Baker & Holm, 2004; Soetaert, 1998; Steadman, 1998). The goal of designing the TtR and the Ticket to Retention 2 (TtR2) was to create a CAT that could result in the same benefits for professors (i.e. evaluating teaching, determining student’s understanding of concepts, and increased students’ satisfaction with a course) (Cottell, 1991; Anglo & Cross, 1993; Olmstead, 1991; Walker, 1991), but also increase student learning.

In earlier research, the TtR was used to reinforce concepts, and students retained approximately 88% of the information that that was reviewed with the TtR (Divoll & Browning, 2010; Divoll, Browning, & Vesey, 2012). Despite these benefits, students who used the TtR seemed to score about the same on multiple choice questions as their peers who did not use the TtR, whereas students who used the TtR scored much higher on short answer questions at the midpoint of the semester than their peers (Divoll & Browning, 2010; Divoll, Browning, & Vesey, 2012).

The original TtR was basically rote rehearsal since students were simply reviewing the information multiple times in a short amount of time, therefore the rote rehearsal strategy may not lead to increased retention (Sousa, 2001). Considering the literature on learning theory, recommendations from students who used the TtR, and in an attempt to improve student retention from results of the original TtR, the ticket to retention was redesigned into the TtR2. The TtR2 has students taking notes on the TtR2 sheets during class rather than only writing their answer at the end of class. Since highlighting key points during class helps students understand what is important and helps students learn (Bransford, Brown, & Cockering, 2000; Davis, 2009), the TtR2 includes the professor alerting the students to the key points during instruction and encourages students to write the answer to the questions on the TtR2 sheet when the information is discussed.

After being alerted to the important points and writing the answers during class, social interaction occurs when students discuss their answers with two other students (one at a time). Situating learning in a social context has been shown to result in increased learning (Kafai & Resnick, 1996) and is recommended when teaching adults (Blumberg, 2009; Bransford, et. al., 2000; Davis, 2009; Donovan. Bransford, & Pellegrino, 1999; Johnson, Johnson, & Smith 1998; Richlin, 2006; Lawler, 1991). The TtR2 also added an aspect of higher level thinking into the original TtR, i.e., comparing and contrasting, which is absent in the original version. In the TtR2, the students compare and contract their answers to the questions with that of their peers and include ideas that were discussed during the peer interaction if the peer’s answer added to their answer. The assumption is that by including aspects of higher level thinking, which is at the analysis level of Bloom’s taxonomy (Bloom, Engelhart, Furst, Hill, & Krathwohl, 1956) and one of McKeachie’s (2002) categories for challenging questions, the TtR2 would further increase student retention.
Students conclude their discussion of the topics by writing the best possible answer, which is also something that is unique to the TtR2.

The TtR2 is designed to improve students’ retention of concepts. Learning and retention are not the same (Sousa, 2001). Retention is defined as “the process whereby long-term memory preserves a learning in such a way that it can locate, identify, and retrieve it accurately in the future” (Sousa, 2001, p. 85). Barkley (2010) states, “Retention is influenced by many factors, but a critical one is adequate time to process and reprocess information so that it can be transferred from short-term to long-term memory” (p. 23). The TtR2 attempts to create adequate time using the strategy throughout the entire class session and reprocessing by using multiple-sense and multiple-method instruction, which results in students learning “better and more” (Nilson, 2010, p.237).

Having students listen, write, say, and compare/ contrast the concepts results in students interacting with the ideas “multiple times and in different ways” (Nilson, 2010, p.237). Diversification in learning activities improves learning by involving multiple parts of the brain (Kress, Jewitt, Ogborn, & Charalampos, 2006; Verkiri, 2002). The TtR2 also provides students with the feedback, practice, and review needed for students to retain information (Bransford et al., 2000; Davis, 2009; Donovan et al., 1999), and allows students to reexamine concepts (Cross, 1981).

As is learner-centered teaching, the focus of the TtR2 is to shift the role of professors from provider of knowledge to facilitators of learning (Barr & Tagg, 1995; Blumberg, 2009; Wlodkowski, 2008) and to concentrate more on student learning (Blumberg, 2009; DeZure, 2000; Fink, 2003; Gardiner, 1994; Weimer, 2002). Although this shift seems logical to many, it is not the norm in the lecture-dominated college classroom (Bligh, 2000; Lammers & Murphy, 2002). However, the shift in teaching strategies should occur since millennial students “want to know we care about them” (Nilson, 2010, p.12). The TtR2 also includes active learning in the classroom, which can result in improved student learning and is recommended at the college level (Flint, Zakos, & Frey, 2002; Ginsberg, 2010; Ginsberg & Wlodkowski, 2009; Grubb,1999; Grubb & Byrd, 1999; Hackathorn, Solomon, Blankmeyer, Tennial, & Garczynski, 2011; Kuh, Kinzie, Schuh, Whitt, & Associates, 2005; McGlynn, 2001; Meyers & Jones,1993; Sorcinelli, 1991; Wlodkowski, 2008; Woolfolk, 2011).

Research on the TtR was based on using an assessment at the midpoint of the semester and at the end of the semester to determine if using the TtR resulted in higher scores (Divoll & Browning, 2010; Divoll, Browning, & Vesey, 2012). However, a limitation to the earlier research was that students were not given a pretest at the beginning of the semester to determine what the students knew going into the semester. This study adds to the growing body of literature on the TtR and TtR2 by using a pretest to determine how much students knew at the beginning of the semester and the impact of the TtR2 on students’ retention of concepts. In addition, this study provides further evidence that CATs can be enhanced to improve student retention.
Methodology

Seventy undergraduate students in three sections of an education course participated in this mixed methods study. The setting included two four-week summer courses and one 15-week fall undergraduate college level classroom management course at a southern university. Professor A taught one section of the course in the summer (section one) and one in the fall summer (section three). Professor B taught one course in the summer (section two). The professors, who are the authors of this paper, created the TtR2. The two four-week summer semester included 15 two-hour 50 minute sessions Monday through Thursday and the 15-week fall semester included meeting weekly for two hours and 50 minutes.

In each course, the students were divided into two groups, a group of students who received the TtR2 the first half of the semester (group A) and a group of students who received the TtR2 the second half of the semester (group B). Students were assigned to the groups randomly. The group not using the TtR2 for the week left class 10 minutes early, while the TtR2 group stayed to complete the TtR2. Group A participated in the TtR2 in classes 2-6. Both groups A and B participated in the TtR2 in class seven due to an odd number of classes in which the TtR2 was implemented. During class seven, a midpoint retention assessment (MRA), which consisted of short answer questions, was administered to determine the information retained by group A and group B. The TtR2 for class seven was conducted the same week as the MRA, but after the assessment for the first part of the semester was administered. In addition to week seven, group B participated in the TtR2 in classes 8, 9, 11, 12, and 13. Therefore, when the MRA was administered, group A was tested on the material that was reinforced using the TtR2, while group B was tested on the same material, but had not been given the TtR2 to reinforce the concepts.

A comprehensive retention assessment (CRA) was administered during class 15 and included 49 multiple choice questions testing students’ recall of the information from the entire semester. Questions 1-22 were from classes 2-6, questions 23-27 were from class 7, and questions 28-49 were from classes 8, 9, 11, 12, and 13. Thus, questions 1-27 represented times when group A used the TtR2 and questions 23-49 represented times when group B used the TtR2.

Data Collection and Analysis

Data collection methods included: (a) a pretest, (b) the MRA, (c) the CRA, and (d) a student questionnaire about the TtR2. The pretest, which was administered the first class, was comprised of 49 multiple choice questions and assessed the students’ knowledge of the major concepts for the semester. The MRA and the CRA assessed only concepts that were included on the TtR2. The MRA was administered on the seventh week, while the CRA and student questionnaire were conducted during the final class (the fifteenth class). Each of the assessments was used to determine students’ retention of concepts taught and did not count as a grade. Thus, students were not given advanced notice of the MRA and CRA.
The pretest and assessment data were analyzed by assessment types and sections. The pretest results were compared to the MRA and CRA when the TtR2 was implemented and when it was not. These comparisons resulted in the creation of a change score (i.e., MRA minus the pretest or CRA minus the pretest) with the intervention and one without (the difference between the pretest and an assessment). The mean and standard deviation were generated for each data set. Overall, the average of all of the sections were generated for the pretest, MRA, CRA, and change score. In addition, an overall average for each of the aforementioned data was generated when the intervention was implemented and again when it was not. Each calculation was rounded to the nearest tenth.

The Mann-Whitney U statistic and the Wilcoxon statistic were used to determine if the distribution of scores for the individual sections significantly differed. However, these tests could not be run for the averages of all three sections because of the different variables (professor and semester length). These tests could not be run to determine if the CRA and pretest with and without the TtR2 significantly differed because the students from groups A and B used the TtR2 with different questions (i.e., 1-27 for group A and 23-49 for group B).

In addition to the students’ retention assessments, the students were asked their views about the TtR2. The students were asked three open ended questions about the TtR2 (68 out of the 70 students complete the questionnaire; a 97% response rate): (a) did you learn more as a result of the TtR2, (b) would you use the TtR2 in your future classroom, and (c) general comments about the TtR2. The questionnaire data was analyzed by question topic using open coding to create categories and patterns. In accordance with qualitative methodology, after the categories and patterns were generated, a constant comparative approach resulted in discovering evidence for the categories and patterns across the questions and axial coding was applied to each data source to make connections between the categories and patterns (Creswell, 1998; Rossman & Rallis, 2003). Rather than share each students’ comments for each pattern, the students’ comments are either summarized or only a few examples are given.

Results

Quantitative data were organized by assessment (MRA, CRA, and pretest), change score, section, and finally a summary of the assessments across the sections was discussed. The qualitative data were organized by themes that emerged across all of the sections. The questions on the MRA corresponded to questions 1-22 on the pretest and CRA. Questions one through 22 were the concepts for which only group A used the TtR2 on the CRA, questions 28-49 were concepts that only group B used the TtR2, and questions 23 through 27 were concepts for which the TtR2 was used by both groups. The aforementioned questions on the CRA correspond to the same questions on the pretest.

Pretest Scores

Sections one, two, and three averaged 68 (n = 27), 60 (n = 26), and 64 (n = 17), respectively, on the pretest (see Table 1). The pretest average across all sections was 64 (see
Table 2) with group A scoring 64 and group B averaging 64.1. Scores for groups A and B on the information that they were to use the TtR2 was 62.2 with the TtR2 and 66.2 without. The pretest average for questions one through 22 was 61.5, questions 23 through 27 averaged 44, and questions 28-49 averaged 71.6. The Mann-Whitney U was conducted for each class to determine if the distribution of scores on the Pretest for questions 1-22 and questions 28-49 significantly differed between groups (group A and B). The results of the Mann-Whitney U for sections one, two, and three indicated no significant difference between groups for questions 1-22 and 28-49 (see Tables 3, 4, and 5). Thus, students in group A performed about the same on the pretest for questions 1-22 and 28-49.

The data for questions 23-27 was not run for any of the sections because both groups used the TtR2 for these questions.

**MRA Results**

Sections one, two, and three averaged 84.6 ($n = 14$), 84.3 ($n = 13$), and 81.6 ($n = 8$), respectively (see Table 1), on the MRA with the TtR2 and 67.87 ($n=13$), 69.3 ($n = 13$), 66.4 ($n = 9$) without the TtR2. The MRA average for all three sections when the TtR2 was used was 83.8 and 68 when it was not (15.8 point difference) (see Table 1). The Mann-Whitney U was conducted for each class to determine if the distribution of scores

### Table 1. Section Averages.

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<th>SD</th>
<th>3</th>
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<td>Pretest</td>
<td></td>
<td>68.0%</td>
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<td>60.0%</td>
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<td>64.0%</td>
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Table 2. Overall Averages: Sections.

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<td>X</td>
<td>X</td>
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<td>Pretest Group B</td>
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<td>X</td>
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<tr>
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<td>83.8%</td>
<td>68.0%</td>
<td>15.8%</td>
</tr>
<tr>
<td>MRA Change Score</td>
<td>17.0%</td>
<td>25.4%</td>
<td>8.5%</td>
<td>17.0%</td>
</tr>
<tr>
<td>CRA</td>
<td>84.4%</td>
<td>85.7%</td>
<td>82.8%</td>
<td>2.9%</td>
</tr>
<tr>
<td>CRA Change Score</td>
<td>20.5%</td>
<td>23.4%</td>
<td>16.6%</td>
<td>6.8%</td>
</tr>
</tbody>
</table>

on the MRA significantly differed between groups (i.e., with TtR2 vs. without TtR2) (see Tables 3, 4, and 5). The results for students in group A, the group who received TtR2 during weeks 2 – 6, scored significantly higher on the MRA than students who did not receive the TtR2 in sections one and two. Despite the 15.1 point difference between groups A and B, the results of the Mann-Whitney U for section three indicated no significant difference between groups.

**CRA Results**

Students across the sections averaged an 84.4 on the CRA (see Table 2). The CRA average for all three sections when the TtR2 was used was 85.7 and 82.8 without the TtR2. Sections one, two, and three averaged 88.3, 85.5, and 81.7, respectively, on the CRA with the TtR2 and 87.2, 79.6, and 80.8 without the TtR2 (see Table 1).

**Change Scores**

The pretest was compared to the MRA and CRA to determine what the students retained during the course. The difference between the pretest and the two assessments show what the students knew at the beginning of the semester and what knowledge they retained at the middle of the semester (MRA change score) and at the end of the semester from the course (CRA change score). We refer to the difference between the pretest and the MRA and CRA as a change score.

**MRA change score.** Across all three sections students who used the TtR2 on the MRA had a change score of 25.4 points, while students who did not use the TtR2 had a change score of 8.5 points (see Table 2). This resulted in the students who used the TtR2 having a change score that was 17 points higher than their peers. The MRA change scores for sections one, two, and three averaged 25.6 points, 26.1 points, and 24.2 points, respectively, with the TtR2 and 8.7 points, 7.6 points, and 9.4 points without the TtR2. The Mann-Whitney U was conducted for each class to determine if the distribution of MRA change scores significantly differed between groups (i.e., with TtR2 vs. without TtR2)
Table 3. Statistical Analysis.

<table>
<thead>
<tr>
<th>Comparison</th>
<th>Results</th>
<th>Statistics</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pretest Q1-Q22 (TtR2 vs. no TtR2)</td>
<td>NS</td>
<td>Mann Whitney U</td>
<td>$z = -.418, p = .676$</td>
</tr>
<tr>
<td>Pretest Q28-Q49 (TtR2 vs. no TtR2)</td>
<td>NS</td>
<td>Mann Whitney U</td>
<td>$z = -.984, p = .325$</td>
</tr>
<tr>
<td>MRA (TtR2 vs. no TtR2)</td>
<td>S</td>
<td>Mann Whitney U</td>
<td>$z = -3.283, p = .001$</td>
</tr>
<tr>
<td>MRA CS (TtR2 vs. no TtR2)</td>
<td>S</td>
<td>Mann Whitney U</td>
<td>$z = -3.786, p &lt; .001$</td>
</tr>
<tr>
<td>CRA CS (TtR2 vs. no TtR2)</td>
<td>NS</td>
<td>Wilcoxon</td>
<td>$z = -1.057, p = .290$</td>
</tr>
</tbody>
</table>

*Note.* “NS” indicates that the results are non-significant, while “S” indicates significant.

Table 4. Section 2 Statistical Analysis.

<table>
<thead>
<tr>
<th>Comparison</th>
<th>Results</th>
<th>Statistics</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pretest Q1-Q22 (TtR2 vs. no TtR2)</td>
<td>NS</td>
<td>Mann Whitney U</td>
<td>$z = -1.722, p = .085$</td>
</tr>
<tr>
<td>Pretest Q28-Q49 (TtR2 vs. no TtR2)</td>
<td>NS</td>
<td>Mann Whitney U</td>
<td>$z = -1.142, p = .253$</td>
</tr>
<tr>
<td>MRA (TtR2 vs. no TtR2)</td>
<td>S</td>
<td>Mann Whitney U</td>
<td>$z = -3.214, p = .001$</td>
</tr>
<tr>
<td>MRA CS (TtR2 vs. no TtR2)</td>
<td>S</td>
<td>Mann Whitney U</td>
<td>$z = -3.181, p = .001$</td>
</tr>
<tr>
<td>CRA CS (TtR2 vs. no TtR2)</td>
<td>S</td>
<td>Wilcoxon</td>
<td>$z = -3.645, p &lt; .001$</td>
</tr>
</tbody>
</table>

*Note.* “NS” indicates that the results are non-significant, while “S” indicates significant.

(see Tables 3, 4, and 5). The results for section one and two indicated that there was a significant difference between groups. Thus, students in group A, the group who received TtR2 during weeks 2 – 6, had significantly higher MRA change scores than students who did not receive the TtR2. Despite the 14.8 point change score for section three the results of the Mann-Whitney *U* indicated that the groups scored about the same.

**CRA change score.** Across all three classes students who used the TtR2 on the CRA had a change score of 23.4 points, while students who did not use the TtR2 had a change score of 16.6 points (see Table 2). This resulted in the students who used the TtR2 having a change score that was 6.8 points higher than their peers. The CRA change scores for sections one, two, and three averaged 21.5 points, 29.10 points, and 17.9 points, respectively, with the TtR2 and 18.2 points, 14.9 points, and 16.8 points without the TtR2 (see Table 1). The Wilcoxon statistic was conducted to determine if the distribution of CRA change scores was significantly differed between groups (i.e., with TtR2 vs. without TtR2) (see Table 3, 4, 5). Students in group A, the group who received TtR2 during the first part of the semester performed about the same on their CRA change scores as students who did not receive the TtR2 in both sections one and three. The results from section two indicated that there was a significant difference between the two groups.
Table 5. Section 3 Statistical Analysis.

<table>
<thead>
<tr>
<th>Comparison</th>
<th>Results</th>
<th>Statistics</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pretest Q1-Q22 (TtR2 vs. no TtR2)</td>
<td>NS</td>
<td>Mann Whitney U</td>
<td>z = -.097, p = .923</td>
</tr>
<tr>
<td>Pretest Q28-Q49 (TtR2 vs. no TtR2)</td>
<td>NS</td>
<td>Mann Whitney U</td>
<td>z = -.537, p = .606</td>
</tr>
<tr>
<td>MRA (TtR2 vs. no TtR2)</td>
<td>NS</td>
<td>Mann Whitney U</td>
<td>z = -1.742, p = .082</td>
</tr>
<tr>
<td>MRA CS (TtR2 vs. no TtR2)</td>
<td>NS</td>
<td>Mann Whitney U</td>
<td>z = -1.78, p = .075</td>
</tr>
<tr>
<td>CRA CS (TtR2 vs. no TtR2)</td>
<td>NS</td>
<td>Wilcoxon</td>
<td>z = -.166, p = .868</td>
</tr>
</tbody>
</table>

*Note.* “NS” indicates that the results are non-significant, while “S” indicates significant.

**Student Questionnaire Data**

In addition to the students’ retention assessments, the students were asked their views about the TtR2. The students were asked three open ended questions about the TtR2.

Using the TtR2 in their future classroom. Thirty-four of the 68 students (50%) suggested that they would use the TtR2 in their future classrooms. Most of these 34 students, suggested that they would use the TtR2 in their future classroom because they believed their students would benefit from the TtR2. Examples of these responses included: (a) “It offers the students with another opportunity to hear and discuss the material and is a great closing for the lesson” (S2-10B) and (b) “Yes, if the ticket to retention worked for me and many of the other students (I heard) it will most likely work with children rather than just lecturing” (S2-17B). In addition, one of the students suggested that the TtR2 is a good strategy for non-native English speakers, “Yes, I would like to use the ticket to retention because as a second language learner, I learned a lot from the material and I think this strategy will help others students that are learning English to become success in class” (S3-15B).

Twenty-four of the students (35%) indicated they may use the TtR2 in their future classroom. Of the 24 students who suggested they may use the TtR2, ten students mentioned that their decision was dependent on the age of students that they taught. Seven of the students who suggested that they may use the TtR2 in their classroom indicated that they might make changes to the TtR2 before using the strategy. These students suggested that they would either use an aspect of the TtR2: “I might use part of it such as talking to a partner about one aspect of the lesson” (S2-22B) or diversify the TtR2: “Possibly for some topics and in some forms, but I will probably change it up a little to give some variety” (S1-5B).

Ten of the students (15%) indicated that they would not use the TtR2 in their classrooms. Of these students, four suggested that they would not use the TtR2 because they believed the TtR2 would not work for the age that they were teaching. The remaining six students mentioned that they would not use the TtR2 because they either did not see the value in it, they did not enjoy it and thus would not use the strategy in their classroom, or they would rather use other strategies.
Students’ perception of the TtR2 on their learning. Forty-three of the students (or 63.2%) stated that the TtR2 had a positive impact on their learning. For example, the students suggested that the TtR2 helped them remember difficult concepts, being more confident with the information and recalling information quicker.

Student S3-13B inferred that the TtR2 was more helpful than simply taking notes, “Yes, because even though I usually took notes it is not the same when you hear the answers twice and then rewrite them.” Another student indicated that the TtR2 resulted in learning the vocabulary better, “I do feel like I remembered more vocabulary from the parts that I did the ticket. I normally do not remember vocabulary” (S1-22B). The TtR2 seems to encourage students who might not take notes to do so, “I knew all the questions that I did with the ticket to retention and the other questions I wasn't 100% sure on because I listened in class but I didn't always take notes” (S1-10A). In addition, a student who had the ticket the second part of the semester felt lost on the MRA because they did not use the TtR2,

When I did the ticket to retention it helped me to understand better about the subject or material that the teacher was teaching. Also, doing the "final exam" I was more secure about the materials that I learn during the semester. When I took the "midterm exam" I was a little lost because I did not have something that can help me to reinforce the material that I was learning at the beginning of the semester (S3-17B).

Finally, student S1-9A posited that the TtR2 made him more aware of what the professor’s focus was, “I was in the first group of ticket to retention and it made me more aware of what the instructor was focusing on, and because I did the ticket of retention I felt comfortable in taking notes afterward.”

Twenty-three of the students (33.8%) believed that the TtR2 had little or no impact on their ability to recall the information on the CRA. A theme that emerged from the students who believed that the TtR2 resulted in little or no impact on their retention was that the use of other teaching strategies negated the potential impact of the TtR2. Students believed that the other class strategies (i.e., discussion and active learning strategies) were just as effective as the TtR2: “I’m an auditory kinesthetic learner and with the interactive environment of the class I was able to retain pretty well… It all seemed about the same to me. The actual hands on is what helped me retain most of the information” (S1-5B). Student S3-16B, in addition to feeling that other strategies help her in class also expressed that she became anxious as a result of doing the TtR2, “I feel that I learned more when we worked together with a group… I think the TtR2 gave me anxiety more than anything because I would have to rush at the end of class to get it finished.”

Five of the students who felt the TtR2 had little or no impact on their recall indicated that their own abilities as students helped them more than the TtR2. Student S2-7A mentioned that her interest in the subject was a factor in the TtR2 not resulting in improved learning, “I feel I remembered close to the same, because I was genuinely interested in the materi-
I paid attention no matter if I had the ticket or not. And when I am trying to remember something I have to go over many times - talking, hearing, and writing about it so going over it one time after the lecture doesn't really help me. (S3-6A)

Another student stated that because she was an overachiever she learned regardless of the TtR2, “Coming from the overachiever, I find that the CRA was very easy for me because I paid attention for the whole class and remembered everything, so to be honest, I am not sure if the ticket actually helped” (S1-24B). Finally, one student suggested that she can learn without the TtR2 because of the type of learner she is, “I think it was about the same. I guess because of my type of learning is why I can retain different things” (A1-8B). Three students suggested that the reason the TtR2 did not result in more recall was because they did the TtR2 during the first part of the year. For example, student S1-27B rationalized that timing of using the TtR2 was relative to their recall, “The first part of the CRA was from the MRA and I only felt unsure about a couple, but I think it was because the information was older - not because of the ticket” (S1-19B).

**Recommendations for the TtR2.** Five students suggested that the TtR2 could be improved by starting the ticket to retention earlier so that students would not have to rush. One interesting theme that emerged from the data was that the TtR2 was best suited for weaker students. One student mentioned that the TtR2 is only good for some learners, “Ticket to retention is good for some learners, but also not good for others” (S1-3A). Students S2-7B suggested that the TtR2 would help students who are not interested in the topic, “I think for those who did not have an interest in the topic it may have helped a lot for them.” Furthermore, student S3-12B indicated that the TtR2 would be assist students if they did not know how to take notes, “Ticket to retention is a great strategy for helping students learn how to take notes.”

A few students stated that they would have liked to have the TtR2 all semester. For example, student S2-15B posited, “I think it’s a good way to learn about the lessons. Maybe all students should do it all semester, instead of dividing it up. Then we can learn more for the whole semester versus just half.” Furthermore, two other students actually thanked their professor for using the TtR2 in their comments. The students stated: (a) [Professor’s name], my comment about the ticket to retention- it helped me to understand better the subject and material during the class. It was like reinforcing while I was writing, reading, and talking to my peers. Thank you…” (S3-15B) and (b) “I think it was a great tool, and the results really gave me a lot to think about. Thank you for the invaluable tool and information. I really enjoyed this class” (S3-23B).

**Discussion**

This study investigated the effectiveness of the TtR2, which is an attempt to incorporate addition aspects into CATs so that student retention of concepts results. The study represents the first time the combination of a pretest and posttest has been used to determine
the effectiveness of the TtR2. Previous research on the TtR (Divoll & Browning, 2010) tested the retention of students when they used the TtR and used a comparison group to determine if the TtR was effective (Divoll, Browning, & Vesey, 2012). Those studies indicated that students who used the TtR recalled approximately 88% of the information that was reviewed using the TtR (Divoll & Browning, 2010) and the results of the TtR seemed to be more effective for short answer questions than multiple choice questions (Divoll, Browning, & Vesey, 2012). We theorized that the TtR2 would result in higher averages than the TtR since the TtR2 was redesigned from its original version to include aspects of teaching adults that are deemed beneficial such as highlighting key points during instruction (Bransford et. al., 2000; Davis, 2009), incorporating higher level thinking skills, and providing feedback, practice, and review (Bransford et al., 2000; Davis, 2009; Donovan, et al., 1999).

Summary of MRA and CRA Results

The average for students across all three sections when tested on the information that was reinforced using the TtR2 on the MRA was 83.8%. This average was 15.8 points higher than their peers in group B. The 15.8 point difference was slightly higher than the 13 point difference between group A and group B observed in earlier research on the TtR (Divoll, Browning, & Vesey, 2012). While pleased that students in the current study in group A scored so much higher than group B, we expected more than a 2-3 point difference between results from the TtR2 and the TtR. However, not having a pretest in the previous study, students prior knowledge was not known before the semester began. The MRA scores with the TtR2 versus without the TtR2 for two of three sections were statistically significant. The third section was not statically significantly higher, meaning that the difference could have occurred by chance, but students with the TtR2 did average 15.1 points higher than group B. In addition, section three only had 8 students who used the TtR2 on the MRA and 9 who did not, thus the low numbers could have impacted the results of the Mann-Whitney U. These results indicate that the TtR2 was successful in producing higher class averages on short answer tests for students who used the TtR2. This data suggests that CATs can be adapted to improve students’ concept retention, whereas previous research on the link between classroom assessment and learning was mixed (Anglo & Cross, 1993; Kelly, 1991; Olmstead, 1991; Shelton, 1991; Stetson, 1991; Walker, 1991).

When tested using multiple choice questions (CRA), the difference between information that was reviewed using the TtR2 and the information for which the TtR2 was not used resulted in a smaller increase, just under three points (85.7 to 82.8). The same results occurred in an earlier study on the TiR. However since the numbers were low in the previous study (i.e., 21 students), the assumption was that with the redesigned TtR and the increased numbers (i.e., 70 students) the results of the current study would be higher. In this study, the difference between the TtR2 results on the MRA and the CRA could resulted from one of five possible reasons: (a) the comparison of two groups who had different lengths of time between use of the TtR2 and the CRA, (b) the types of test questions (i.e., short answer versus multiple choice), (c) the possibility that students in one group had more prior knowledge of the content that was tested on the CRA, (d) the stu-
students in groups A and B used the TtR2 for different concepts on which they were assessed on the CRA (i.e., questions 1-27 for group A and questions 23-49 for group B) and/or (e) the students in one group were better students.

One limitation of this study was that group A used the TtR2 on the first part of the semester (classes 2-7), while students in group B used the TtR2 weeks (7-9 and 11-13). Therefore, time between using the TtR2 and the CRA was longer for the students in group A than the students in group B. For example, the information for group A that was reviewed using the TtR2 was anywhere from four weeks (summer semester) to thirteen weeks (fall semester) prior to the CRA, while the information that was not reviewed using the TtR2 was anywhere from three days (summer semester) to seven weeks (fall semester). Thus, the only time the results were compared from the same time period with and without the intervention was on the MRA. The CRA compared different questions and length of time between the intervention and the assessment. This issue with the study design most likely contributed to discrepancy between the impact the TtR2 had on the CRA and MRA.

Another potential explanation for the vast difference for the result on the MRA and the CRA was the type of questions that were used on the MRA (short answer) versus the CRA (multiple choice). Students tend to score better on tests when there are answer choices from which to choose versus when they provide an answer (short answer) (Biggs, 1999; Carvalho, 2009; Dansereau, 1985; Gay, 1980; Nickerson, 1989). Some of the effects of the TtR2 could be negated on the CRA because multiple choice questions are easier to answer than short answer questions (Carvalho, 2009). If the TtR2 results in improved recall and automaticity of recalling information, as some students suggested, then having the answers provided through multiple choice items may reduce the effects. Our earlier research resulted in the TtR having a larger effect on the MRA than the CRA (Divoll, Browning, & Vesey, 2012). Thus, our current study was designed to determine what the students knew at the beginning of the semester (i.e., pretest) and to compare student scores to what they recalled on the MRA and CRA (i.e., change score) in hope that this question would be answered.

**Summary of Change Scores**

As mentioned above, the pretest helped highlight what students could recall from the beginning of the year to the MRA and CRA. Students in group A and group B across all of the sections averaged about the same going into the semester 64.2% (group A) to 64.1% (group B). The Mann-Whitney U test revealed that students in group A receiving the TtR2 during weeks 2 – 6 performed about the same on the pretest as students in group B. In addition, the pretest average for the information that was reviewed using the TtR2 was 66.2, while the information that was not reviewed using the TtR2 was 64.1. The Mann-Whitney U statistic that was run for all three classes indicated that there was no statistical difference between the students in group A and B in each class on questions 1-22 and questions 28-49 on the pretest. The possible conclusion for the discrepancy between the impact of the TtR2 on the MRA and CRA is that group A happened to be better students than group B or that they knew more coming into the semester does not seem to be plausible given the aforementioned data.
The change score from the pretest to the MRA for the group who had the TtR2 (group A) averaged 25.4 points, while students who did not use the TtR2 (group B) averaged a change score of 8.5 point (a difference of 17). The Mann-Whitney U revealed that the change scores for group A in two out of the three sections significantly differed, meaning that the intervention was most likely responsible for the difference in those classes. According to the Mann-Whitney U, the 15.1 difference between students who used the TtR2 and those who did not in section three, the class that were there was no significantly different, could have resulted by chance. These results could have been influenced because of the now numbers (eight students in group A and nine in group B). The change scores between groups A and B on the MRA suggest that the TtR2 made a difference (significant difference for two out of three classes and a numerical difference for all three), especially since the pretest yielded no significant difference between groups A and B at the beginning of the semester.

The change score from the pretest to CRA across all three sections was 23.4 points when students used the TtR2, while students who did not use the TtR2 had a change score of 16.6 points. The Wilcoxon revealed that the change scores for group A in two out of the three sections did not significantly differ, meaning that the difference for the two classes was most likely caused by chance. Across all three sections, the students who used the TtR2 had a change score that was 6.8 points higher than their peers. Once again, it seems logical that the difference between the change scores on the MRA and CRA can be attributed to the study design (i.e., attempting to compare two groups who had a different length of time between the use of the TtR2 and the CRA and the students in groups A and B used the TtR2 for different concepts on which they were assessed on the CRA) and/or the type of questions on the CRA (multiple choice) (Biggs, 1999; Carvalho, 2009; Dansereau, 1985; Gay, 1980; Nickerson, 1989).

**Student Questionnaire Data**

The student questionnaire data provided the students’ voice to the numerical data collected for the TtR2. It is interesting that 50% of the students surveyed suggested that they would use the TtR2 in their future classroom and another 35% suggested that they might use the TtR2 in their classroom. This indicates that 85% of the students recognize the value of the TtR2. Only 15% of the students suggested that they would not use the TtR2 in their future classrooms. Of that 15%, four of these 10 students suggested that they would not use the TtR2 because they were going to teach very young children. Thus, some of the students who suggested that they would not use the TtR2 in their future classroom still recognized the benefits of the TtR2, but felt young children, because of their limitations with reading and writing, would not benefit from the TtR2.

*Students’ perception of the TtR2 on their learning.* Forty-three of the students (63.2%) stated that the TtR2 had a positive impact on their learning. Some students felt that the TtR2 resulted in recall that was more automatic, helped them recall more difficult information, improved their content vocabulary, and gave them confidence with the material, which are aspects that were not measured by the assessments.
Additionally, two students thanked their professor in their response to the questionnaire because they believed that the TtR2 helped them and one suggested that the TtR2 helped her as an English language learner. The TtR2 can be considered an effect strategy for English language learners because it includes: (a) one on one social interaction, (b) reviewing and rehearsal of concepts and vocabulary, (c) using multiple senses, (d) expanding content vocabulary, (e) practicing listening, speaking, and writing in a meaningful way, (f) clarifying concepts and helps students become confident with the content, and (g) using active engagement (Colombo, 2012; Echevarria & Graves, 2011; Echevarria, Vogt, & Short, 2008; Genesee, Lindholm-Leary, Saunders, & Christian, 2006; Ginsberg & Wlodkowski, 2009; Levine & McCloskey, 2009; Peregoy & Boyle, 2005; Smiley & Salsberry, 2007; Vogt & Echevarria, 2007). The students’ comments along with the quantitative data above provide growing evidence that the TtR2 is effective and that CATs can be adapted to improve student retention. Even without the previously mentioned data that supports the TtR2, the fact that so many students believed that the TtR2 worked for them could result in a placebo effect wherein students are more confident and thus perform better.

Of the students who suggested that the TtR2 had little or no impact on their learning, five suggested that the professors’ active learning strategies helped them just as much or more than using the TtR2. These comments also highlight another limitation of this study. This course, regardless of professor or semester, included many active learning activities to help students learn the course material. Thus, some of the recall that students had on the MRA and CRA could have been due to the active learning strategies since such strategies improve learning (Flint et al., 2002; Ginsberg & Wlodkowski, 2009; Grubb, 1999; Grubb & Byrd, 1999; Kuh et al., 2005; McGlynn, 2001; Meyers & Jones, 1993; Sorcinelli, 1991; Wlodkowski, 2008; Woolfolk, 2011). Consequently, the use of active learning strategies could have been part of the reason for the discrepancy between the results with the TtR2 and without the TtR2 on the MRA and CRA. It would be interesting to see how the TtR2 impacted retention in a predominately lecture class.

Five students also suggested that the TtR2 had little or no impact on them because they understand how to study and take notes, they are over achievers, and/or they were “genuinely interested in the topic.” These students also suggested that the TtR2 should be used for students who do not have these skills or interest in the subject. The students raised an interesting point. Could part of the reason that the TtR2 was more effective for some students and not as effective for other students be a result of the students’ abilities as learners, study time outside of class, learning style, and/or interest in the topic? Students who review the material on their own, as some students suggested, and take good notes might not need the TtR2 and for these students the TtR2 might not be as effective. Another issue mentioned by students was that the TtR2 was rushed at the end of class, often went past class time, and students not involved in the TtR2 that week could leave early. These aspects, as a student indicated, resulted in some students rushing to finish the TtR2 and potentially not being as invested in the process.
Conclusion

CATs or other closure activities are widely promoted for use in college classrooms (Angelo & Cross, 1993; Barkley, 2010; Blumberg, 2009; Cross, 1998; Cross & Angelo, 1988; McGlynn, 2001; Nilson, 2010; Richlin, 1998; Richlin, 2006; Steadman & Svinicki, 1998; Weaver & Cotrell, 1985; Wlodkowski, 2008). However, research on whether CATs improve student learning are mixed (Anglo & Cross, 1993; Kelly, 1991; Olmstead, 1991; Shelton, 1991; Stetson, 1991; Walker, 1991) and therefore one can argue that the evidence that CATs improve learning is lacking (Simpson-Beck, 2011). The authors posit that the results are considered mixed or lacking because CATs were designed to “help teachers find out what students are learning in the classroom and how well students are learning it” (Anglo & Cross, 1993, p.4) rather than to help students learn the material. Thus, in order for CATs to be effective for helping students learn, they should be redesigned to focus on student retention of concepts. The TtR2 is designed to do just that.

The data reported indicate that the TtR2 is an effective method to assist students with the retention of concepts when tested using short answer questions. However, as was the case with earlier research, the results are reduced when students are retested using multiple choice questions (Divoll, Browning, & Vesey, 2012). The reduced effect of the TtR2 on multiple choice questions could have resulted because of aspects of the study design, the active learning strategies that were implemented in class, and the multiple choice questions that were used on the CRA. Despite these results, the fact that students score better on short answer questions (MRA) than multiple choice questions suggests that students who used the TtR2 are not only able to recall the answers, but are also have enough understanding to explain their answers in writing. In addition, the students’ comments show that the TtR2 resulted in: remembering difficult concepts, more confidence with the concepts, quicker recall, learning vocabulary, taking notes for some students who do not normally take notes, and being more aware of the professor’s key points. These are aspects that were not measured by the assessments.

Furthermore, when students’ prior knowledge is included in the study, the data suggest that the TtR2 had a positive effect on the short answer questions. The change scores for students (i.e., the difference between the pretest and the MRA or CRA) who used the TtR2 on the MRA were 17 points higher than their peers, while students who used the TtR2 on the CRA scored 6.8 points higher. Thus, based on what students knew at the beginning of the semester, the students with the TtR2 were able to recall more than their peers. However, the Mann-Whitney U and the Wilcoxon revealed that the change scores on the MRA for students with the TtR2 and without were only significant for two out of the three courses and one out of the three courses on the CRA.

Although this data adds to the literature on CATs and the TtR2, further research is needed. Such investigations should include addressing the following questions: (a) Are the effects of the TtR2 more pronounced for students who have weak study skills; (b) Is the TtR2 a good strategy for English language learners at the college level; (c) How would the TtR2 perform if it was implemented in a lecture only class; and (d) Is the TtR2 only effective on short answer questions?
In addition, future research is needed that has students using and not using the TtR2 during the same weeks, and tests students in multiple types of questions. Given the impressive results of the TtR2 on the MRA, the limited results on the CRA, and the fact that almost 78% of the students believed the TtR2 helped their learning, the TtR2 shows potential for adapting CATs to improve student retention of concepts.

References


http://uncw.edu/cte/et/articles/Vol11_2/Hackathorn.pdf


Ten Things Every Professor Should Know about Assessment

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Abstract

This article describes ten key assessment practices for advancing student learning that all professors should be familiar with and strategically incorporate in their classrooms and programs. Each practice or concept is explained with examples and guidance for putting it into practice. The ten are: learning outcomes, performance assessments, objective tests, essays, portfolios, rubrics, formative assessment, student self-assessment, grading, and assessment technologies. The audience is professors of all ranks, but particularly those new to the art of teaching, as well as faculty developers.

Keywords: Assessment, teaching, learning, faculty development.

“Not everything that can be counted counts, and not everything that counts can be counted.” Albert Einstein

Broadly, by the term “assessment,” we are referring to any systematic basis for making inferences about characteristics of people, usually based on several sources of evidence (McMillan, 2007). While assessment can serve many purposes, its main purpose should be to advance student learning. The most effective and frequent assessments are carried out by individual instructors who draw on their expertise to evaluate student performances and products and to give students informative feedback that advances students’ understanding, enabling students to perform at higher levels than they would have been able to do otherwise. In this article we describe ten assessment practices or concepts that professors can draw on to improve their teaching effectiveness and advance their students’ learning (see Table 1).

Assessments can take many forms and range from giving students exams or essay questions to asking them to build a model or act out a skit. Assessments can be used to determine a grade (summative) or to give feedback (formative), or both.

Assessments are best when their basis is clear to students and students are engaged in the assessment processes themselves. In this regard, assessment rubrics, in which the criteria for a performance are made explicit, are one of the most effective tools available to a faculty member.

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Assessment is not just something that is done to students. Students can best internalize the criteria for an effective performance when they apply the criteria to self-assess their own performances, and when students give each other feedback it can enlighten not only the student receiving the feedback but also the one giving it.

It is important for a number of reasons to have a variety of assessments in a course and not rely on a single exam or project to determine student grades. All forms of assessment have both strengths and weaknesses, but it is through the melding of various approaches that professors can draw on the virtues of one to offset the liabilities of another (Shulman, 1988).

Some assessments, such as multiple-choice tests, are good at assessing content knowledge. Others, such as performance assessments, are effective at assessing the application of skills. Conversely, multiple-choice tests cannot easily measure higher-order thinking, while performance assessments are less effective at assessing dispositions.

As well, since students have different learning styles and perform at different levels depending upon the type of assessment, a variety of assessment formats better enables students to perform at their best and allows a more accurate picture of student learning to unfold.

1. Learning Outcomes

In developing good assessments, where do we begin? We begin with what we want students to know and be able to do—in other words, we begin with learning outcomes (see Table 2). We can’t effectively assess student learning unless we ourselves are clear about what we want students to know and be able to do. Moreover, students themselves won’t know what we expect them to learn unless we make those learning outcomes clear and explicit to the students themselves.

<table>
<thead>
<tr>
<th>Table 1: Ten Assessment Topics.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Learning Outcomes</td>
</tr>
<tr>
<td>2. Performance Assessments</td>
</tr>
<tr>
<td>3. Objective Tests</td>
</tr>
<tr>
<td>4. Essays</td>
</tr>
<tr>
<td>5. Portfolios</td>
</tr>
<tr>
<td>6. Rubrics</td>
</tr>
<tr>
<td>7. Formative Assessment</td>
</tr>
<tr>
<td>8. Student Self-Assessment</td>
</tr>
<tr>
<td>9. Grading</td>
</tr>
<tr>
<td>10. Assessment Technologies</td>
</tr>
</tbody>
</table>
Table 2. Examples of Learning Outcomes Statements.

- Students will be able to name the planets in our solar system.
- Students will be able to type 60 words per minute at a 95% or higher accuracy rate.
- Students will be able to give three reasons why it is important in a democratic society for citizens to have a sound knowledge of science.
- Students will be able to design, carry out, and write a social science research study.
- Students will be able to compare and contrast psychoanalysis and behaviorism.
- Students will be able to build a scale model of a two-story building from their city.

It is important to create or select outcomes that are not so broad that they are difficult to measure, nor so narrow that they are trivial. Also, notice the language used to describe the outcomes. Outcomes described with “action verbs,” such as “list” or “compare” better allow the student’s behavior to be observed and measured, while more passive verbs, such as “understand” or “appreciate” can be so broad that they are a challenge to measure. For example: “Students will know the states of the union.” One might ask: “What does it mean to ‘know’ the states of the union? Does it mean to be able to list them alphabetically? To be able to fill in the states on a blank map? To be able to describe the economy of each state?” Table 3 has a list of “action verbs” that refer to overt behaviors that can be observed and measured that might be used in creating learning outcomes.

TIP: The clearer the learning target the better students will be able to hit it.

Table 3. Examples of Action Verbs for Learning Outcomes Statements.

<table>
<thead>
<tr>
<th>Compile</th>
<th>Create</th>
<th>Plan</th>
<th>Revise</th>
<th>Analyze</th>
<th>Design</th>
<th>Select</th>
<th>Utilize</th>
</tr>
</thead>
<tbody>
<tr>
<td>Apply</td>
<td>Demonstrate</td>
<td>Prepare</td>
<td>Use</td>
<td>Compute</td>
<td>Discuss</td>
<td>Explain</td>
<td></td>
</tr>
<tr>
<td>Predict</td>
<td>Compare</td>
<td>Rate</td>
<td>Critique</td>
<td>Build</td>
<td>Enact</td>
<td>Perform</td>
<td>Draw</td>
</tr>
</tbody>
</table>

2. Performance Assessments

Performance assessments are based on observation and judgment of a student product or of a student performing a skill (Stiggins, Arter, Chappuis, & Chappuis, 2004). Springboard diving, for example, is a performance that is observed and can be judged according to the five criteria of Starting Position, Take Off, Approach, Flight, and Entry (Fédération Internationale de Natation, 2006). A three-dimensional architectural model, for example,
Table 4. Examples of Performances and Products.

<table>
<thead>
<tr>
<th>Examples of Performances</th>
<th>Examples of Products</th>
</tr>
</thead>
<tbody>
<tr>
<td>Demonstrating Lab Procedures</td>
<td>Business Plan</td>
</tr>
<tr>
<td>Giving Speech</td>
<td>Curriculum Unit</td>
</tr>
<tr>
<td>Teaching Class</td>
<td>Sculpture</td>
</tr>
<tr>
<td>Changing Tire</td>
<td>Blueprint</td>
</tr>
<tr>
<td>Interviewing Client</td>
<td>Fossil Display</td>
</tr>
</tbody>
</table>

is a product that can be judged according to features such as scale, spatial relationships, and concepts. Rubrics, or detailed criteria, are often used in the assessment of these performances and products (see Table 4).

The assessment approach should fit the assignment or task. For example, a multiple choice test might be the most efficient way to measure factual learning, while evaluating a skill usually requires the student to perform it, with the judgment of its effectiveness best guided by a rubric. As well, an important feature of a high quality performance assessment is the description of the assignment or task itself, such that the task is described with enough detail and clarity that all students have a fair chance of performing at their best (see Table 5).

Issues for the instructor to consider in designing a performance task or assignment include:

- Are the instructions for the assignment clear?
- Does the assignment dependably elicit the desired performance?
- Do all students have access to the necessary materials or resources?
- Do students have sufficient time to complete the assignment?
- Are students given feedback along the way, and from peers as well as the instructor?
- Are students asked to self-assess their performance?

TIP: Clear and detailed assessment criteria are important for performance assessments.

3. Objective Tests

Tests can take a variety of forms. They can require short answers or lengthier written responses from students. They can assess knowledge as well as attitudes. In this section we are distinguishing objective tests, such as quizzes or exams, from more complex forms of
Table 5. Example of a Performance Task.

<table>
<thead>
<tr>
<th>Performance Task: Social Science Research Proposal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identify a problem worthy of investigation in your home, school, or work setting. Explain the problem and pose a researchable question. Review the literature related to the problem and present a brief summary with references. Explain who the subjects will be and how they will be chosen. Describe your data collection and analysis plans. Make sure your data collection instrument and processes allow you to address your research question(s). Your proposal will be assessed based on the criteria detailed in the rubric for the assignment.</td>
</tr>
</tbody>
</table>

assessment, such as essays, performances assessments, and portfolios (which are addressed in other sections of this article).

The most common formats for objective, short-answer tests are: a) *Multiple-choice*, b) *Fill-in-the-blank*, c) *Matching*, and d) *True-false*.

Multiple-choice tests, the most popular of the short-answer objective formats, are versatile, can be used across different academic areas, are reliable to score, and can cover a broad sample of content - though they are less effective at measuring higher-order thinking or application of a skill.

A multiple-choice question contains two basic parts: a problem and a list of suggested solutions. The problem may be in the form of either a question or an incomplete statement, and the list of suggested solutions typically contains one correct solution and a number of incorrect ones, though other formats are possible (see Table 6).

A variety of alternative test options are available as well, such as:

- *Crossword puzzles*, in which students are given a set of crossword clues to solve, with the answers for the puzzle being terms from the course content;
- *Incomplete outlines* in which the instructor prepares a partially completed outline with students required to fill in the blanks;
- *Venn diagrams*, in which students compare two items or topics, such as the French and American Revolutions, identifying how they are different from and similar to each other;
d. *Game show formats* (which may be better for test preparation rather than tests themselves) such as *Jeopardy*, *Who Wants To Be A Millionaire?* and *Are You Smarter Than a Fifth Grader?*

TIP: Fit the assessment method to the type of learning outcome and instructional purpose.

**Table 6. Examples of Multiple Choice Questions.**

<table>
<thead>
<tr>
<th>Multiple-choice questions can take which of the following formats?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Select the:</td>
</tr>
<tr>
<td>a) Best answer</td>
</tr>
<tr>
<td>b) Correct answer</td>
</tr>
<tr>
<td>c) Incorrect answer</td>
</tr>
<tr>
<td>d) All of the correct answers</td>
</tr>
<tr>
<td>e) All of the above*</td>
</tr>
</tbody>
</table>

Typical weaknesses with multiple-choice questions include:

| a) The problem is ambiguous.                                    |
| b) The suggested solutions contain clues to the correct answer(s). |
| c) The correct solution is significantly longer than the suggested solutions. |
| d) All of the above*                                           |

(*correct answer)

4. **Essays**

Essay responses can be short or extended depending upon the type of thinking or knowledge that the professor aims to promote and assess through the question. Interestingly, if students know in advance the types of questions they will be asked, it can affect their study habits. In studying for extended essay questions students pay more attention to themes and patterns but for short answer or objective questions they focus more on memorizing smaller, unrelated bits of knowledge (Svinicki & McKeachie, 2011).
Table 7. Comparison of Short and Extended Response Essay Questions.

<table>
<thead>
<tr>
<th>Short Answer Question</th>
<th>Extended Response Question</th>
</tr>
</thead>
<tbody>
<tr>
<td>What are the pros and cons of short answer objective questions?</td>
<td>What types of thinking do extended response essay questions promote? Illustrate, with examples, how those ways of thinking might apply to your future career.</td>
</tr>
<tr>
<td>What are the three steps in designing an assessment rubric?</td>
<td>How do assessment rubrics advance teaching and learning?</td>
</tr>
</tbody>
</table>

Short-answer essay formats can be effective for assessing knowledge and basic understanding, though objective items can often achieve similar purposes in an easier-to-score format. Extended response essay questions are typically best for measuring deep understanding and critical thinking (see Table 7).

When designing extended response essay questions you want to:

- Make sure the essay question is aligned with the learning target and assessment criteria, and that the question can elicit from students the desired information.
- Give enough detail in the essay question to minimize student misinterpretation. For example, rather than ask: “Were Gandhi’s methods successful in India?” instead ask more specifically, “How successfully did India put into practice Gandhi’s principles of Muslim-Hindu unity and the elimination of the ‘untouchable’ status?”
- Specify the amount of time available for working on the essay if it is an in-class test, or specify the length of essay for an out-of-class assignment.
- Develop a rubric for scoring the essay. Essays can be scored analytically with a separate score for each part or criterion (e.g., content, organization), or holistically with a single score for the overall performance.

TIP: Offering students several short essay questions—rather than fewer, longer questions—gives them the opportunity to display a broader range of their knowledge.

5. Student Portfolios

A student portfolio at its most basic is a collection of information about a student’s knowledge, skills, and dispositions. The collection could include a variety of work samples such as projects and exams, as well as assorted other information such as self-assessments and a learning autobiography, along with items such as photos and software (see Table 8). While the possibilities are nearly endless, the purpose for including each item should be clear (Wolf & Sui-Runyon, 1996).
Table 8. Possible Portfolio Products.

<table>
<thead>
<tr>
<th>Written Work</th>
<th>Photos</th>
<th>Videos</th>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td>Research studies</td>
<td>Scale models</td>
<td>Dances</td>
<td>Blueprints</td>
</tr>
<tr>
<td>Personal narratives</td>
<td>Sculptures</td>
<td>Dramatizations</td>
<td>Software</td>
</tr>
<tr>
<td>Journal entries</td>
<td>Installations</td>
<td>Speeches</td>
<td>Drawings</td>
</tr>
</tbody>
</table>

Nearly as important as the collection of information itself is how it is framed. It can be challenging at best or misleading at worst to try to interpret a student’s portfolio contents without some information about the purposes and context for the work. A portfolio is more likely to be fully realized if it includes a student’s explanation of the contents, including captions for each major work sample and the student’s reflective commentaries on the meaning of the work.

A *caption* provides context for the work sample, and typically includes a title, the date the product was created, and a brief comment about the purpose of the product (see Table 9). *Reflective commentaries* can take many forms, again depending on the purpose for the portfolio. A student might explain how the contents illustrate his or her performance against a standard or address the assignment rubric. Or the student might explain how the body of work chronicles his or her journey as a learner. Again, the possibilities are many, depending upon the purposes for the body of work presented in the portfolio.

Table 9. Caption for Portfolio Product.

<table>
<thead>
<tr>
<th>Author: Ellen Stevens</th>
<th>Date Completed: Sept. 30, 2011</th>
</tr>
</thead>
<tbody>
<tr>
<td>Product Title: CD ROM of Digital Faculty Rubric Project</td>
<td></td>
</tr>
<tr>
<td>Explanation: In this project faculty members with expertise in assessment documented their use of assessment rubrics through video interviews, classroom observations, and written commentary (<a href="http://elixr.merlot.org/assessment-evaluation/assessment-rubrics/assessment-rubrics4">http://elixr.merlot.org/assessment-evaluation/assessment-rubrics/assessment-rubrics4</a>). This portfolio entry illustrates one of the many ways that I, as a faculty developer, support faculty scholarship and promote faculty teaching skills.</td>
<td></td>
</tr>
</tbody>
</table>
Portfolios are increasingly becoming electronic, and these e-portfolios offer some significant advantages over the notebook variety. They can be stored on compact discs or on one of the many web-based applications (which make the contents available to anyone on the web, though access can be password protected). However, a caution: Too much content with unclear purposes can overwhelm the reader or reviewer and make the portfolio less coherent and not as valuable.

TIP: A portfolio’s purpose should drive the selection of its contents and the focus of its evaluation.

6. Rubrics

A rubric is a multi-purpose scoring guide for assessing student products and performances. This tool, which usually takes the form of a matrix, works in a number of different ways to advance student learning and improve teaching as well as contribute to sound assessment (see Table 10).

Table 10. (Partial) Rubric for Public Speaking.

<table>
<thead>
<tr>
<th>Delivery</th>
<th>Below Proficient</th>
<th>Proficient</th>
<th>Above Proficient</th>
</tr>
</thead>
<tbody>
<tr>
<td>-Eye contact</td>
<td>Eye contact is sporadic.</td>
<td>Eye contact is made with all members of the audience.</td>
<td>Eye contact creates rapport with audience.</td>
</tr>
<tr>
<td>-Gestures</td>
<td>Gestures do not fit the speech.</td>
<td>Gestures compliment the presentation.</td>
<td>Gestures deepen the spoken message.</td>
</tr>
<tr>
<td>-Pacing</td>
<td>Pacing is uneven.</td>
<td>Pacing is appropriate to the content and purpose of the presentation.</td>
<td>Pacing engages audience.</td>
</tr>
</tbody>
</table>

There are three basic steps in designing an effective rubric (Wolf & Stevens, 2007).

Step 1. Identify the performance criteria. What do you want students to know and be able to do? What are the most important aspects of the performance that you want to emphasize and evaluate? For public speaking it might be: Voice, Delivery, and Content. It is then helpful to operationalize each criterion with several sub-points. “Delivery,” for example, might be composed of “eye contact,” “gestures,” and “pacing.”

Step 2. Set performance levels. How good is good enough? The most common continuum is a proficiency scale (below, proficient, above) but developmental scales (emerging, developing, mastery, accomplished) are appropriate as well. The number and type of lev-
els depend upon the purpose for the assessment and the students being assessed, along with the content and context of the performance. Two levels could be appropriate if the primary purpose is to determine pass or fail but three to four levels are a better choice if the goal is to give students informative and detailed feedback about their performances.

**Step 3. Describe performances at each level.** What does an outstanding performance look like? For each criterion at each level, what description best characterizes the performance? The descriptions are most coherent if they follow a similar pattern (as in the partial rubric above). The more specific the descriptions, the more useful they are in guiding students.

Finally, when using a rubric, consider analytic versus holistic scoring. With holistic scoring a student is given a single score for the overall performance, while with analytic scoring the student receives a score for each of the key features of the performance (such as voice, delivery, and content of a speech). Holistic scoring is a good approach when the instructor wants students to focus on the integration of the performance, while analytic scoring is useful when the instructor wants to assess students on specific features of their performance (Arter & McTighe, 2001).

TIP: Give students the rubric BEFORE they begin the task to better enable them to hit the learning target.

### 7. Formative Assessment

Formative assessments, or assessments for learning, aim to understand and support teaching and learning effectiveness rather than grade the performance or product per se. There are a number of different strategies that serve this feedback purpose (Angelo & Cross, 1993).

**Knowledge Survey.** Give students a list of the main topics at the beginning of the course and have them rate their level of knowledge for each of the 5-10 topics on a Likert-style scale (see Table 11). This information can help the instructor better customize the course content as well as alert students to what they know and don’t know. This assessment can be repeated at the end of the course so that students can see how much growth they have made in their self-reported knowledge.

**Concept Map.** Give students a blank or partially completed concept map and ask them to fill it in for a selected topic. This information helps reinforce student understanding of the topic and can give the instructor an indication of whether students have understood the main concepts.

**One-Minute Paper.** Ask students to describe in writing in one minute the most important concept they learned that day. This information can give the instructor a good idea of whether students can identify and have understood the main concepts.
Pro/Con. Ask students to list the pros and cons of various approaches or topics as a way of reinforcing and extending understanding of the concepts under study. For example, students might list the pros and cons of interviewing subjects in a study versus giving the subjects a questionnaire to complete.

Categorizing. Ask students to take a list of terms and place them in two or more categories. For example, in a social science research course students might be given a list of terms (e.g., triangulation, subjects, foreshadowed problems) and be asked to identify them as qualitative or quantitative.

TIP: Formative assessment activities such as concept maps and categorizing can also serve as class activities or practice for an exam.

Table 11. Knowledge Survey.

<table>
<thead>
<tr>
<th>Knowledge Survey on Assessment Rubrics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Directions: Rate your level of knowledge or skills according to the scale below:</td>
</tr>
<tr>
<td>( H = \text{High} ) (I have a solid understanding and can teach this concept to others.)</td>
</tr>
<tr>
<td>( M = \text{Moderate} ) (I have some familiarity and experience with the concept.)</td>
</tr>
<tr>
<td>( L = \text{Low} ) (I have limited or no familiarity or experience with the concept.)</td>
</tr>
<tr>
<td>____ 1. I can explain what an assessment rubric is.</td>
</tr>
<tr>
<td>____ 2. I can design an assessment rubric.</td>
</tr>
</tbody>
</table>

8. Student Self-Assessment & Peer Feedback

Students can productively assess themselves on many different dimensions, such as academic performance, attitudes about learning, degrees of improvement, learning style, study habits, teamwork, ability to learn from feedback, and so on.

When students self-assess, they develop a deeper understanding of their own performances and what they need to do to improve. One of the hallmarks of a professional is the ability to critique one’s own work, and that skill can be developed through guided self-assessment experiences. Self-assessment is often more successful when the instructor structures the activity. For example, giving students a checklist to review or criteria to
apply to their performance reduces the likelihood that their self-assessments will be ungrounded or unfounded. This scaffolding can gradually be reduced as students become more and more experienced with self-assessment and can independently apply their own strategies and structures.

Strategies for student self-assessment include the following:

**Rubrics.** For students to self-assess their academic performance with as much accuracy and insight as possible it is important for them to have a clear understanding of the learning criteria. As discussed in a previous section, good rubrics highlight the key features of a quality performance. Students can use an assessment rubric to rate themselves on their performance along the way and at the end.

**Practice Test.** Have students take a practice test in which they provide their answer as well as rate their confidence that the answer they provided is correct or fully realized. This kind of self-assessment can alert students to areas that deserve further study.

**Study Habits.** Students can keep a journal documenting their study habits and compare those habits with their performance on tests and assignments. Keeping track of when, how, and where they study and comparing it to their results might reveal more or less productive study habits.

**Peer Feedback.** Peer feedback can be very beneficial but also unproductive or even destructive when not designed carefully. Structuring the format of the peer response can help avoid these potential problems. For example, rather than having peers offer a general critique, they might be asked to provide a compliment about the work along with a specific action that their fellow student might take to strengthen his or her performance. Or peers can provide feedback through rubrics as well, though narrative notes rather than numerical ratings from peers are often more useful and less threatening.

**Exemplars.** High quality examples (e.g., research reports, essays, models) from previous students can sometimes help students reflect on their own performance, though beware the tyranny of the single example and aim to have several available.

TIP: Students may need assistance learning how to effectively use self-assessment tools.

9. **Grading**

While grading policies and systems are in place in most institutions, grading practices can vary so widely within an institution that a student might receive an “A” grade for an assignment or course from one instructor and an “F” grade from another for the same performance (Reeves, 2004)!

Hard to believe, but true. Suppose a student has three assignments for a course and receives two B’s but does not complete the third assignment. The instructor who averages a B with a B with an F (for the missed assignment) would give the student a course grade
of “C.” However, the instructor who averages a B with a B with a ZERO (for the missed assignment) would give the student a course grade of “F.” Most measurement experts would argue that assigning zeros for missed assignments and averaging them with other grades is a misguided practice that misrepresents a student’s overall performance.

A student’s grade can also depend on the response to the following questions:

- Does the instructor grade on a curve?
- Does the instructor base the course grade more heavily on an end-of-course performance?
- Are students offered the opportunity to re-do or make up an assignment?
- Are grades based on factors other than performance?

Measurement experts recommend that instructors:

- Assign grades against a standard and not on a “curve” since a student’s relative standing in a class may not reflect what the student actually learned;
- Consider basing the final grade on the final exam or project, if cumulative, rather than averaging all the scores in a grading period since the goal is mastery whenever it occurs;
- Avoid giving zeros for missed or late assignments since a zero rarely reflects what the student has actually learned, but instead give opportunities for making up or re-doing the work; and
- Base grades on academic performance only and not on hard-to-define-and-measure factors such as attitude or effort.

TIP: “The most effective grading practices provide accurate, specific, timely feedback designed to improve student performance” (Reeves, 2008, p. 85).

10. Assessment Technologies

The fundamental principles of assessment remain the same regardless of whether the practices are technology-based or not. The underlying measurement principles of validity, reliability, and fairness, for example, still pertain as do the purposes of formative and summative assessment. What is different is that technology can improve the efficiency of assessment as well as make forms of assessment possible that weren’t possible beforehand.

Assessing Conceptual Understanding. One way to incorporate technology in support of assessment strategies is by using classroom response systems. Classroom response systems, such as iClickers, allow you to check students’ conceptual understanding during lectures and other classroom activities. Using a classroom response system, you can strategically embed multiple-choice questions throughout a presentation (using PowerPoint, for example) and students use remote control-like devices to respond to the questions, with the results displaying on a screen. This provides immediate feedback for both you and the students, allowing for elaboration or remediation as needed. Similarly, Twitter, a
freely available social networking tool, can also be used to check students’ understanding and display the results on screen for further discussion.

Similar to classroom response systems, there are easy-to-use (and often free) assessment data collection tools available via the internet, such as Zoomerang and Google Forms. With these tools you can create surveys, quizzes and tests. In addition, there are online polling tools, such as Poll Everywhere, which allow students to respond to polling questions via a web browser or mobile device. As well, more and more people are using Twitter to collect instantaneous feedback and assessment data from students. These online tools are great options because they can be used in an on-campus classroom as well as in online courses.

Throughout this article, several strategies for the assessment of conceptual understanding are recommended. The implementation of many of these strategies can be supported by technology. For example, there are many online tools for creating crossword puzzles, flash cards, concept maps, and Venn diagrams. There are also online tools for creating Jeopardy-like assessments and other assessments in popular game formats.

**Quiz and Testing Tools.** Although there are many online quiz- and test-creation tools available (as well as many preexisting quizzes and tests available online for a variety of subject areas), some of the easiest, most reliable, and most robust online quiz- and test-creation tools exist within learning management systems (LMS). If your institution is already using a LMS such as Blackboard, Pearson LearningStudio, or Desire2Learn, then you have access to a powerful online quiz- and test-creation tool that easily enables you to build true-false, multiple-choice, short-answer, and essay assessments that can provide students with instantaneous feedback and results if appropriate. In addition, the quizzes and tests created within the LMS are easily tied to the LMS’s gradebook so that results are posted automatically. The benefit of automatic posting is that students can access their results and track their course progress, and it is very efficient for faculty.

**Portfolios.** Portfolios are a great way for students to organize and share their work for assessment purposes (see the Portfolios section above). Some popular tools that support online portfolio creation to varying degrees include Posterous, PBWiki, Weebly, and Google Sites. Students can also use blogging tools such as WordPress. Encouraging students to use online tools to create, share, and maintain a showcase of their work not only supports assessment activities within specific courses and across programs, but also allows students to share their portfolios with potential employers. This is something that is very challenging if technology is not used.

**Maintaining Assessment Data.** With the advent of LMSs such as Blackboard it is easy to maintain course-based online gradebooks. Online gradebooks are easily accessible to students (typically requiring a simple log in) so they can view grades and receive feedback on various assessment activities throughout the term, allowing them to assume responsibility for tracking their progress and overall course grade.
Online gradebooks also provide a way of making your assessment strategies more explicit so that students clearly see the connection between their effort and their course grade. More elaborate systems such as LiveText (which is an all-encompassing performance-based assessment management system) extend beyond a single course to help track students’ performance across an academic program. Because these systems house student performance-based assessment data, they also ease university accreditation efforts by generating reports required by accreditation agencies.

TIP: When considering technology, to avoid feeling overwhelmed, start off slowly and only select those options that better and/or more efficiently achieve the assessment and learning goals of the course.

Conclusion

When given guided opportunities to self-assess at key intervals, for example, students will become more insightful about what they need to do to improve their performance. When instructors gather information about their students’ progress through formative assessment techniques such as one-minute papers, for example, they are better able to adjust their instruction along the way. And when instructors are clear about the criteria for assessing performances through rubrics, for example, the assessment process is richer and more valid. While not pedagogical panaceas, the ten assessment strategies described in this article, when strategically applied, can greatly enhance teaching effectiveness and advance student learning.

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Using the FotoFeedback Method to Increase Reflective Learning in the Millennial Generation

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Abstract

This current generation of students, known as the Millennial Generation, has a propensity toward multi-tasking and a history of structured and tightly filled days. Reflection may not be viewed as productive and as conducive to learning as other “tasks” and thus may be neglected. However, by employing a methodology (photography) that joins up with their multi-media oriented learning style and voracious appetite for the visual, perhaps they will view the reflective process differently. The FotoFeedback Method is a highly flexible data-gathering tool, which combines photography with narrative discourse related to a topic or experience. This process empowers students to not only experience a moment in time, but to structure their preservation of this moment through the photograph. Then they can reflect upon the meaning of the topic/experience while viewing the visual, which can lead to deeper learning.

Keywords: Photography, FotoFeedback Method, Reflective Learning, Millennial Generation.

Millennials are the new generation whose learning and communication style significantly involves multi-media (Nicholas, 2008). They come to college with a foundation for multi-tasking, not for questioning their experiences (Johnson, 2009). To promote deeper understanding of the world, educators need to facilitate critical reflection among students (Johnson, 2009). Although reflection is not a new concept, the reflective learning process is a fairly recent tool for adult learning and many case studies show that it is effective (Tebow, 2008). “Reflective learning is the process of internally examining and exploring an issue of concern, triggered by an experience, which creates and clarifies meaning in terms of self, and which results in a changed conceptual perspective” (Boyd & Fales, 1983, p. 99). To improve the reflection skills of this generation, we must provide a method that will engage them in the reflective process. Since their world is visually rich and technologically driven, incorporating a technological tool (camera) that empowers them to capture visuals, which aid them in reflection is a proactive approach to increasing reflective learning.

The FotoFeedback Method is an emerging data collection methodology, which involves participatory photography combined with narrative discourse (Vogelsang, Tornabene &

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Versnik Nowak, 2010). Photovoice, Photo Elicitation Interview (PEI), Participant Authored Audiovisual Stories (PAAS), and hermeneutic photography have been used before in the health field as well as other disciplines for many years (Hagedorn, 1994; Wang & Burris, 1997; Ramella & Olmos, 2005; Epstein, Stevens, McKeever, & Baruchel, 2006; Wang, Yi, Tao, & Carovano, 1998; Wang, 1999; Hagedorn, 1996; Banks, 2001). However, FotoFeedback as a methodology is new and born out of the need for something different than the methods previously mentioned. FotoFeedback gives more flexibility to researchers and educators than the methods historically used by others linking photography with some form of feedback about the photographs. It is a qualitative tool that can be used to get information that mere words cannot adequately express. The content of the photos and feedback can range from deep philosophical discussions of meaning to the more routine tasks of program evaluation. Photos in various media are part of our culture; FotoFeedback is a method of harnessing the power of a photo combined with the personal narrative of the photographer.

The FotoFeedback Method can be used to increase reflective learning in students as it serves as a way for them to collect data about a topic or experience through the lens of a camera. It strengthens the reflective process as they now have a visual from which to internally evaluate that data and from which to create and clarify the meaning of such data through written narrative discourse. This can lead to a changed perspective and deeper learning for Millennials since they relate to the world visually. Table 1 outlines several characteristics of Millennials and how the photographic and reflective components of FotoFeedback can promote reflective learning in that generation.

**Incorporating FotoFeedback in Classroom Activities for Millennial Students**

The options for incorporating FotoFeedback into new and existing course curricula are endless. The following are the critical features of FotoFeedback, which need to be taken into account when planning and implementing a FotoFeedback project:

1. FotoFeedback training should include instruction in basic photography and ethics of photography before a FotoFeedback project begins.
2. FotoFeedback can be used for a wide range of topics or project questions, which can be student or instructor driven.
3. Photographs are taken by the students/participants.
4. Narratives can include meaning, knowledge, story, evaluation, and many other content related to the focus or research question.
5. Photos and narratives can be in print or electronic formats.
6. Participants may or may not share their narratives about their photographs with each other.

To incorporate the FotoFeedback Method into the classroom as a tool to increase reflective learning, students will need training in the basics of photography, the ethics of photography, and the FotoFeedback Method. Faculty will need to indicate the format in
Table 1. How photography can empower reflective learning in the millennial generation.

<table>
<thead>
<tr>
<th>Needs/characteristics of millennial generation</th>
<th>Role of photography in achieving those needs</th>
<th>Role of reflective learning in meeting the needs of Millennials.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Millennials are knowledge makers (Miller, 2009).</td>
<td>Photography promotes a relationship with the world that creates knowledge (Sontag, 1977).</td>
<td>While photography is powerful in itself, reflection about the photographs is needed to promote integration of experiences into existing knowledge that results in deep learning (Barthes &amp; Howard, 1980; Boyd &amp; Fales, 1983).</td>
</tr>
<tr>
<td>Millennials are used to structured and tightly scheduled days, which can result in disconnection to spontaneity and play (Howe &amp; Strauss, 2003).</td>
<td>Camera’s are literally at student’s fingertips as part of their cell phones. Photography could increase spontaneity, as the camera is readily available when the desire to preserve a moment arrives.</td>
<td>The ability to preserve a fleeting moment with the press of a button is a natural extension of this generation’s “button-pushing” lifestyle. But because it empowers them to immortalize that moment, it also empowers them to reflect upon a minute that may have been consumed by the voracious appetite of a day where every hour is overflowing.</td>
</tr>
<tr>
<td>Millennials expect instant responses and need trial-and-error learning (Humboldt State University, n.d.).</td>
<td>Digital photography is an exemplary method in providing instant feedback and empowering self-correction.</td>
<td>What is captured in an instant, can be reflected upon for a lifetime. With the reflection component of FotoFeedback, students are engaged in the experience in new ways that promote self-reflective trial-and-error learning.</td>
</tr>
<tr>
<td>Millennials need rules &amp; structured guidelines (Humboldt State University, n.d.).</td>
<td>By providing students with a topic or questions to answer, they have the tools to gather selective information with the camera (Collier &amp; Collier, 1986).</td>
<td>Because the innate need for rules and guidelines has been met, perhaps it will open dialogue for a deep and reflective conversation with the self and others.</td>
</tr>
<tr>
<td>Millennials value parental involvement (Howe &amp; Strauss, 2003).</td>
<td>Photography can be done together as a family.</td>
<td>May aid in the reflective learning process and act as a catalyst for deeper discussion with parents, since they value parental opinion.</td>
</tr>
<tr>
<td>Millennials feel special &amp; important (Howe &amp; Strauss, 2003).</td>
<td>A photograph is highly unique in that it renders a small slice of the world as seen through the individual’s eyes. It may also illic-</td>
<td>Reflecting on a topic or experience that is born from their uniqueness may increase their desire for reflective practices and the learning that results. Praise over their rendition</td>
</tr>
</tbody>
</table>
Millennials are motivated, goal-oriented, and confident in themselves (Howe & Strauss, 2003). Millennials may intrinsically possess the motivation to use technology (camera) to achieve a goal-oriented task (take a photo) and are confident in themselves to do so or learn the technique to do so. Perhaps such motivation momentum can carry them through to the process of internally examining and exploring the topic/experience that they photographed, propelling them to the writing of narration where they can further create clarity and meaning for themselves.

They are group oriented rather than being individualists (Howe & Strauss, 2003). Photography can be a group-oriented endeavor, which can involve entire classes of students, small groups, or large groups. Viewing other’s photos may give them more insight into the topic/experience, leading to deeper reflection.

Millennials are civic-minded, politically engaged, and progressive (Leyden, Teixeira, & Greenberg, 2007). Photography can be used to convey emotionally-charged political and human rights issues that are often difficult to discuss or understand (Global Health Council, 2006; World Health Organization Global Health Workforce Alliance, 2008). Reflecting on topics of interest to students can empower them to clarify their resolve and through such clarity, take massive action toward bettering the situation.

Millennials are committed to environmental protection (LA Times, 2009). Photography can be used to further environmental and cultural conservation (International League of Conservation Photographers, 2011). Photo-based learning activities that focus on environmental values of Millennials may invite deeper reflection resulting in greater reverence for the conservation of the natural environment.

Which students will submit their photos and narratives and have a plan for synthesizing and making sense of themes that arise.

**Basic Photography Training**

Basic photography training consists of an overview of composition, exposure and impact. Photographic composition is “the pleasing arrangement of subject matter elements within the picture area.” (Photoinf.com, n.d.). Composition includes the rule of thirds, dividing and straightening the horizon, rendering a clear focal point, being aware of the background, viewing the scene from multiple angles, experimenting with leading lines, fram-
ing the subject, and depth of field use (Grimm & Grimm, 2004). Exposure is defined as
the amount and act of light falling on photosensitive material, or simply put, how much
light hits the digital media and for how long (Peterson, 2004).

Photographic impact results from a combination of composition and exposure, which
unite to evoke a strong emotional response to the photograph. To achieve greater impact,
MacKie (2003) offers the following suggestions: try a different composition, get in close,
change point of view, return to the same spot at multiple times of year and in various
weather conditions, and shoot in diverse lighting conditions. Another suggestion is to
intentionally bend compositional/exposure “rules” to maximize the rendering of an image
that creatively illustrates a topic or experience. Information about basic photography
skills can be augmented from a plethora of books as well as online sources.

**Ethics of Photography**

Ethics includes legal constructs such as autonomy, non-maleficence, beneficence, fidelity
and justice (Photoshare.org, n.d.). Autonomy refers to informed consent or the person’s
right to refuse to be photographed. Non-maleficence refers to doing no harm to the per-
son through the use of the photograph. While beneficence means to do good, in this con-
text it means promoting a good cause without harming the subject(s) of the photograph.
Fidelity is being truthful to a fair representation of the situation, location, or context in
which the picture was taken. Justice refers to the respect that one is showing to the sub-
jects of the photograph. Aspects of culture and power must also figure into the photog-
rapher’s responsibilities.

Some of these legal constructs can be addressed simply by using photo releases any time
a subject in a photo is recognizable (Figure 1). If the person cannot be recognized, a pho-
to release is not needed, but truth, fairness, etc. is still required. If the person(s) are rec-
ognizable, a photo release is needed especially in vulnerable populations such as children,
providers or clients in clinical situations, or persons identified as belonging to special b-
ehavioral groups (e.g., criminals, drug users/abusers, victims, etc.). Another category that
does not require photo release forms are people in public places such a crowds at public
events or public figures in public places such as political figures or celebrities. It is rec-
commended that educators seek additional information on journalistic photography web-
sites, such as National Press Photographers Association (2011), and within your school or
organization to sufficiently cover ethics with your students.

**Creating and Implementing a FotoFeedback Project**

FotoFeedback can be used for a wide range of topics or project questions, which can be
student or instructor driven. To date, FotoFeedback has been used to obtain student perspec-
tives on the relationship that they see between health and the arts during a study
abroad trip to Italy (Figure 2), student perceptions of a national conference (including
strengths, weaknesses/problems, and suggestions for improvement) (Vogelsang, Tornab-
ene, & Versnik Nowak, 2011), student insights on environmental health topics within an
Using the FotoFeedback Method to Increase Reflective Learning

environmental health course (Figure 3), and students participation in an outdoor stress management activity for a health/wellness course.

Student’s narrative:

“I decided to take a trip to the basement where years and years of junk has piled up collecting dust. I found some pretty cool hidden treasures that could be used in many different ways. I realized that I did not have to go to a thrift store to find my junk because it was right in front of me. I wanted to take some of this stuff and junk it, but when I came up from the basement, my grandpa was not too happy. What I saw as an opportunity to reuse old cool junk, he saw as me taking away some of his “treasures,” even though he hadn’t touched some of them for years!

Figure 1. Sample editorial photography subject consent and release form.
Sculpture

- In Italy, fountains were sculpted and erected to celebrate clean water and health. Today, these structures still stand and are a beauty to marvel at. These stood out to me because they truly are unique in every way. Each facial expression portrays a different emotion and a different story that illustrates the importance of healthy and clean water for a community.

Figure 2. Example of a student’s photo and narrative, submitted via PowerPoint, for a FotoFeedback project involving making connections between art and health during a study abroad program in Italy.

Figure 3. Example of a student’s photos and narrative, submitted via a blog, for a FotoFeedback project in an environmental health course.
So, with a little convincing and an extra big smile, I will try to persuade my grandpa into letting me use some of these hidden treasures.”

Once a topic and/or questions are provided to the students, they are asked to photograph their experience or perspective and include a narrative of some sort that reflects upon what the subjects in photos mean to them. Narratives can include meaning, knowledge, story, evaluation, and many other content related to the focus or question being addressed. Students may or may not share their photos and narratives with each other. Photos and narratives can be submitted to the instructor in whatever print or electronic format is preferable to the students and/or instructor. Options include PowerPoint, blog, Microsoft Word, private Facebook page, etc.

After the instructor collects all the photos and narratives, he/she can review them for themes that arise. Figure 4 provides an example of themes that arose when using the FotoFeedback Method to assess perceived strengths and weakness of a national convention.

Figure 4. Number of Slides per Theme

![Figure 4. Number of Slides per Theme](image)

Figure 4. Example of themes arising from FotoFeedback project involving attending a national convention (Vogelsang, Tornabene, & Versnik Nowak, 2011).

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Students reflected upon various aspects of the conference, which provided the instructors insight regarding students’ experiences at the convention.

Information derived from the FotoFeedback Method can be used as a gauge for the depth and breadth of learning that students are experiencing and any gaps in the knowledge that the instructor needs to address. As the instructor, reflecting on these findings involves setting oneself inside the students’ visual worlds. It allows for reflection on the instructor’s teaching, appropriateness of learning methods, and a deeper understanding of students’ current abilities and limitations. The instructor can use the information gained through this reflective process to improve course methods, course delivery, and learning experiences for students.

**Conclusion**

The FotoFeedback Method is an emerging data-collection tool that was created from various other methodologies (Photovoice, Photo Elicitation Interview (PEI), Participant Authored Audiovisual Stories (PAAS), and hermeneutic photography), which have all been used before in the health field as well as other disciplines for many years. The FotoFeedback Method affords flexibility that can help the Millennial generation increase their reflective learning capacities as it embraces their multi-media learning style. Furthermore, certain characteristics that are innate to the nature of photography are also innate to Millennials, making this methodology a natural fit for this generation. The tremendous flexibility of the FotoFeedback Method empowers instructors to seek feedback on various topics or experiences from their student’s viewpoints while simultaneously empowering the students toward deeper learning.

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Using the FotoFeedback Method to Increase Reflective Learning


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Meeting the Challenge: Teaching Sensitive Subject Matter

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Abstract

When teaching diversity courses that discuss sensitive issues, such as racial, gender, sexuality, religious, and ethnic discrimination, it is possible to encounter student resistance, which can subsequently prevent students from comprehending the content. While teaching an introductory course on African American history in a Black Studies Department² at a predominantly white institution of higher education in Middle America, I experienced such resistance. This article discusses how I initially taught the course, evaluated and then restructured my active learning approach to include reflective learning and Black Studies techniques to address that resistance.

Keywords: Sensitive topics, active learning, reflective learning, Black Studies.

In the late 1960’s, many African American communities, scholars, activists, and professionals demanded African American experiences be included in the American higher educational system. This led to the establishment of Black Studies programs and departments (Conyers, 1997; Karenga, 1993; McClendon, 1974, Rojas, 2007; Rooks, 2006). These additions to college and university curricular offerings demonstrated institutional commitment to the inclusion of non-European histories and perspectives. This commitment was often implemented as a social science, ethnic studies, general education, or diversity requirement. Now, most higher education institutions offer multicultural or diversity courses in their curriculums (Onyekwuluje in Vargas, 2002, p. 46). Many of these courses are embedded into the required core curriculum options.

Black Studies departments or programs are epistemologically rooted in Afrocenticity (Asante, 1998; Mazama, 2001). That is, making African culture the starting point for seeking, acknowledging, comprehending and analyzing knowledge, as well as the world. As a result, the teaching learning environment centers the curriculum within a historical and cultural framework that includes African American students’ experiences instead of excluding them.

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² The discipline of Black Studies emerged out of the 1960’s U.S. Civil Rights Movement. Dr. Nathan Hare is considered by most to be the “founder” of Black Studies. The core elements of any program or department should include the political, social, economic and cultural experiences of African Americans (Anderson, 1990).
Active and Reflective Learning

Active learning is a common theme in many classrooms of higher education (Brockbank & McGill, 2007; Meyers & Jones, 1993). Because it focuses on the teacher serving more as a guide to students on their educational quests, it places students at the forefront of their own education. As a result, students are more engaged in the content and more participatory in class (Petress, 2008). In fact, research has shown since Bonwell and Eison’s early piece popularizing the concept that students retain more information when active learning strategies, such as class discussions and visual aids are used (Bonwell & Eison, 1991). Engaging students is one way of facilitating their learning. Getting them to reflect upon their educational process, as well as what they learned is another reflective learning practice (Moon, 2004).

Reflective learning involves students pausing from their learning process to ponder what and how they are learning. The introspection can lead to self discovery, solutions to problems and critical thinking (LaBoskey, 1993). John Dewey, Paulo Freire, David Kolb, Graham Gibbs and other experiential theorists advocate for transformative learning, which is a salient component of my teaching philosophy and pedagogy. Reflective learning models illustrate how the learner reflects upon an experience and then continuously utilizes those learned outcomes in future situations, thereby creating a constant cycle of learning. In essence, active learning was the space in which I taught the first class, and reflective learning was an integral component of the restructured one.

The Initial Course: Introduction to Black Studies

My first year teaching at Midwestern University began in the fall of 2002 as the political scientist in the Black Studies department. I was also a member of the political science (the only African American) and women’s studies faculty. Although I taught courses on black women in America and the Introduction to Political Science course, my primary class was the Introduction to Black Studies class, of which I taught two sections during the fall and spring semesters, and one in the summer. In any section, there were usually fifty white students, no more than eight black students and two international students (usually representing countries in Africa and the Middle East) in a class of approximately sixty.

Geographically, the majority of undergraduate and graduate students attending the university were Caucasian from Iowa, Kansas, Nebraska, and surrounding mid United States areas, often referred to as the Heartland. The remaining students were African American, international students, Latino, Asian American, and Native American in that descending order. All these groups combined only totaled approximately fifteen per cent (15%) of the entire enrollment.

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3 Midwestern University is a replacement name and does not denote any specific institution.
4 The term “black” is used here to include any students of African ancestry.
Midwestern University’s curriculum emphasized students’ acknowledgment of the diversity in the world around them. To that end, it required each student to graduate with a social science requirement. That requirement could be met by passing a course on African Americans, Latino Americans, Native Americans, or women. The course carried three academic credits and fulfilled the university’s diversity requirement. This meant that most students were in a required course because they had to be, and not in a course they selected based on their interests.

Students were advised to meet their social science requirement in their first year. However, some students decided to complete it after their first year, creating a class mixture ranging from first-year students to seniors from various majors. This mixture of academic levels and extent of college experiences further complicated matters, especially in such large classes of approximately sixty students (Sampaio, 2006, p. 922, reference number 5).

**Resistance**

After a few weeks of class, I began to notice the uneasiness of students during discussions, videos, and presentations. Most of them were passive, but some were clearly frustrated and defensive. Initially, I thought it was simple student apathy and lack of preparation and seriousness towards the class that students will exhibit. After all, students are more apprehensive about participating in large classes, (Gleason, 1986), as well as speaking in front of their peers (Weaver & Qi, 2005). However, after teaching political science and international relations courses to predominantly white students, at Midwestern and other colleges and universities, I realized the negative responses were not results of student unpreparedness for class, but something more challenging.

In the previous classes, I did not encounter questions and comments on the accuracy and validity of the readings, videos, textbook, or me as the professor. For example, one student actually asked, “Are you really our teacher?” I also did not receive personal attacks on my student evaluations like the ones from the Introduction to Black Studies class. For instance, one student wrote “Dr. Brown [my maiden name] is a bitter black woman, and I would not recommend this class to anyone.” Or, “I felt that this class was an excuse for her to rant & rave and mention as many times as she could that African Americans were oppressed and that whites are bad.”

Student resistance to classes on race and racism has been chronicled. Tactics range from withdrawing from the course, not participating in class discussions (Whitten, 1993) to physical and verbal assault and harassment (Pope & Joseph in Benjamin, 1997). Students often find it difficult to discuss racial matters (Tatum 2007), due to their lack of a clear understanding of racial inequalities and prejudices in American history. Indeed, those of the dominant culture did seem to harbor resistance because Black Studies addresses privilege and power relations (Hedley & Markowitz, 2001). Discovering unpleasant facts about America’s founders such as, George Washington owning slaves, and Thomas Jef-
ferson owning and fathering slave children\(^5\) challenged dominate beliefs that formed their understanding of history and what they had been socialized to believe. White students were confronted with viewing the United States from perspectives, structures, and laws that enforced exclusion and inequality, not the democratic values of inclusion and equality they were taught. Thus, they experienced cognitive dissonance, which resulted in resisting the class and me.

Cognitive dissonance is a social psychology theory put forth by Leon Festinger (1957). Its premise rests on the idea that when students encounter new information that is incongruent with their established understandings, they experience psychological distress (McFalls & Cobb-Roberts, 2001). This internal struggle triggers numerous responses, such as negative student evaluations.

In sum, students’ preconceived notions about the course and the instructor, coupled with the fact that the course was required and focused on sensitive content, generated student resistance (Perry, Moore, Edwards, Acosta, & Frey, 2009). Even though the class was multi-cultural, white student opposition was prominent, and went beyond regular student lethargy and unpreparedness. The possibility of resistance hindering students’ progress troubled me (Tatum, 1992). I knew I had to engage all of the students in order for them to learn, but I had additional obstacles to overcome in order to reach resisting white students. So, I began to analyze my teaching materials and approach.

The New Approach: Engaging Students through Connecting and Reflecting

It was my intent to re-create the course to encourage student engagement. I wanted students to view themselves as active participants in their learning to empower them (Harvey & Knight, 1996). Because Black Studies calls for Afro centered pedagogies, Manning Marable provided the best paradigm for the restructuring. He called it ‘living history’. This is a multidisciplinary approach to teaching millennial students\(^6\) African American history. Oral histories, technology, photography, film and multimedia digital technology are tools used to connect millennial students to the past, present and future (Marable, 2006). But, my approach, Engaging Students through Connecting and Reflecting (ESTCR), is applicable to any course focusing on sensitive topics and will be explained in detail later. For now, I want to describe and explain the restructured Introduction to Black Studies course.

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\(^5\) Thomas Jefferson is widely thought to have fathered at least one, if not all of the children of Sally Hemings, his slave. Strong debate for and against this union and children has existed for two centuries (Gordon-Reed, 1997). Contradictory interpretations of DNA results and research has only added to the debate. The children remained enslaved due to the Virginia legal doctrine of children inheriting the status of their mother (Kolchin, 1993, p. 17). This meant that children of slave women remained enslaved regardless of the father being a free black or white male. Both Thomas Jefferson’s and Sally Hemings’ descendants continue to grapple with acceptance of the various reports.

The revamped class was first taught in the fall of 2004. Restructuring the class involved augmenting my active learning approach by utilizing Marable’s ‘living history’ concept, along with a reflective learning assignment. The reflective assignment was also an oral history project because it involved personal interviews. To help students connect with the history and current issues of African Americans, historical artifacts were incorporated into class discussions (Gould in Cree, 2000). A new anti-racist text was also an element of the restructuring.

The book White Privilege: Essential Readings on the Other Side of Racism edited by Paula S. Rothenberg was added as the second required book after teaching the class for two years (Rothenberg, 2005). It was used to introduce students to white scholars’ analyses on, and solutions to white privilege. By reading and discussing white scholars’ perspectives on the social advantages of being white and disadvantages of being black, students examined the legal, social and psychological impacts of white privilege on their everyday existence (Jensen, 2005; McIntosh, 1988). But what was most enlightening and encouraging was how it gave white students the freedom to express their feelings of guilt, anger, sorrow, and regret at manipulated or eliminated elements of American history as they had been socialized to understand it (Burrell & Walsh, 2001). The book also allowed discussions on why some white students felt resentment, but not blame for the actions, prejudices, and legislation of previous generations.

It was important for students to first understand African American history in order to comprehend current African American issues. It was also important to encourage them to critically think and act outside their comfort zone when discussing racism and American history. This required the establishment of a supportive classroom environment based on trust, positive feedback and thoughtful handling of the content by me (Gilbert & Eby, 2001; Hyde & Ruth, 2002). To foster a comfortable environment, students were allowed to become acquainted with each other and me on the first day of scheduled classes through an ice breaker.

This first day of class introductions prepared students to become comfortable with encountering, new, different and perhaps unsettling content and class discussions. Since my teaching style is based in Socratic dialogue (Saran & Neisser, 2004), class discussions are intermingled with lecture. Emphasis is placed on the opportunity for every student to express their opinion without physical or extreme verbal responses. Students are encouraged to listen to other opinions, and if they disagree, they must logically and respectfully articulate why they disagree (Birnbacher & Krohn in Saran & Neisser, 2004).

Following introductions, the class was made aware that sensitive issues would be presented and discussed throughout the semester and that those issues may raise certain questions and comments about the world as they knew it. An explanation and description of class content was not included in the first year. But implementation of the new approach in the second year, seemed to diffuse most of the tension and relieve some anxiety.

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7 The first was African Americans: A Concise History, Combined Volume because it captured African American history from life in Africa prior to European contact, to life in the United States (Hine, Hine, & Harrold, 2004).
about what the class would entail. I noticed white students were more relaxed and less
defensive, while black students became more serious about the class. In an effort to allow
students to learn more from their classmates’ opinions, and maintain healthy dialogues,
an environment of respect had to be created and maintained. Therefore, it was also
emphasized that the instructor would moderate the class and its discussions at all times,
thereby providing set parameters for dialogues that promoted critical thinking (Birnbach
ner & Krohn in Saran & Neisser, 2004).

During the third year, original artifacts obtained through Ebay from the nineteenth and
twentieth century were used. My husband, a former educator, suggested bringing authen-
tic (as possible) historical relics into the classroom for visual support of the texts. For
example, when students were shown freedom medallions, “colored only” signs, and chil-
dren’s marbles with packaging showing the morphing of a black man into a watermelon,
they were shocked.

When viewing old fashioned hand held fans depicting a man of dark complexion with
enlarged white eyes and protruding red lips advertising everything from “Darkie tooth-
paste,” to a “Coon-Chicken Inn” to cigarettes and restaurant menus, they were equally as
shocked. We also discussed the “Aunt Jemima” relics picturing an overweight black
woman in her fifties with a head scarf and very black face to help them understand why
some people take issue with the original “Aunt Jemima” pancake box image. They were
also shown a metal yard fence sign that read “No dogs, Negros, or Mexicans” to remind
them that it was not that long ago in U.S. history that the derogatory relics were accepta-
ble and commonly used in the U.S.

Together, the provocative text written from the perspective of white scholars’ analyses of
race and racism within society combined with visual aids and peer discussions drew stu-
dents into the class content. To touch objects that were identical to, or represented the
past was invaluable towards their understanding of what they read, saw, or discussed
(Dagbovie, 2006).

**Personal Interviews: New Reflective Learning Teaching Tool**

Exposure to discrimination and prejudice through conversation and follow up class dis-
ussions was the focal point of the Personal Interviews assignment. Although this type of
pedagogical tool was later outlined by Dagbovie in 2006 as a means for millennial Afri-
can American students to engage and learn from elders in the African American commu-
nity, my assignment was used to connect millennial students from various cultures with
preferably African Americans in the local community. However, it was a deliberate at-
tempt to engage white students who had previously exhibited resistance (Tatum, 1992).
But, in order for them to appreciate the assignment and its outcomes, students were al-
lowed to select and interview any relative, neighbor, or friend who was at least an adole-

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8 As a certified former elementary school teacher, my husband recalled how successful visual aids had been
in getting his 5th grade class to connect to historical facts. Since my objective was to get students to
acknowledge and accept new ideas, particularly those related to African American history, I thought histori-
cal relics would be perfect accompaniments to the texts.

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cent during the 1950’s and 1960’s in the United States. They were instructed on interview protocol, as well as provided three questions to which they could add as many as they wished, after my approval. The assignment was due at the end of the semester and included a reflective essay. This portion was particularly revealing in terms of the impact the assignment had on the individual.

Personal Interviews were successful because students were able to hear history. They experienced African American history through their relatives and friends who conveyed real emotions and thoughts about real events about which the students had previously only heard of, or read. The outcome was particularly enlightening and moving for white students interviewing their relatives. Many family stories were revealed, which made the experience and assignment extremely personal. This convergence of awareness and life experience created the bridge between African American history and contemporary African American issues. For instance, after conducting the interviews, some students understood the arguments for Affirmative Action after comprehending the extent of the historical exclusion of African Americans from the educational system.

The critical thinking, and in some instances, the change of mind-set resulting from the out of classroom interviews diffused the class tension and resistance, as well as provided a base for viewing American history from various perspectives. Reflection sections of the Personal Interview assignment revealed how much students acknowledged class content “coming to life” and becoming more real. Students said they “learned something new” about African Americans, racism, and America. Other comments made included, “This interview shed some light on racism,” and “As I am absorbing all of this information from this interview and learning new things in class that I never knew before about the history of African Americans, it’s very hard to grasp the idea that blacks were treated in such a horrible manner. It makes me feel anger and heartbroken to actually realize that such things did occur.”

In the end, acknowledging and accepting new perspectives through the newly structured class stimulated student’s critical thinking because they became comfortable with entertaining uncomfortable thoughts. While apparent tensions still existed when discussing various topics and perspectives, it was acknowledged that some tensions are healthy within class discussions. Intense dialogue is a valuable component of the learning process.

Student evaluations reflected the positive responses to the Personal Interviews, as well as the historical relics, and both texts. One evaluation in particular captured the transformations some students experienced. The student writes, “This class was required by my program. I was not really excited to take it because it is a very sore subject. Dr. Crosby did a fabulous job in teaching this subject. She made you think.”

**Conclusion and Best Practices for Teaching Other Challenging Courses**

Literature on teaching controversial issues that provide steps for instructors, follow a similar prescription. Most commonly are the importance of establishing a comfortable and
safe, yet respectful and structured environment for open discussions, or as Cherrin (1993) terms it, “freedom with structure.” Early established ground rules for discussion are suggested (Lampert & Eastman, 2008; Pace, 2003) as are methods to generate discussion (Payne & Gainey, 2003; Welty, 1989). Also, teacher sensitivity to the subject and student responses, diffusing conflict and confronting biased, offensive remarks are mentioned as important when teaching sensitive topics (Cherrin, 1993). Not so common was introspection by the instructor on her/his approach and attitude towards the issue, or communities associated with the issue.

Many of the suggestions on teaching controversial topics are included in my approach, but I wanted to provide conceptual links to the process. Although steps and comments on implementing those steps are provided, there is not necessarily a conceptual link or framework to the steps. Thus, my approach allows instructors to utilize their own delivery, but within a process that is broad, yet defined enough to attain an outcome of addressing student resistance when teaching courses on challenging subjects.

My approach, which I’m entitling, Engaging Students through Connecting and Reflecting (ESTCR), is multidisciplinary. It can be utilized in any course centered on sensitive issues, such as mental health, Native American history, sexual orientation, HIV-AIDS, or creationism. Any course involving emotional topics, that may also be associated with public policies, as well as individual morals and beliefs, will generate passionate discussions. Although these courses tend to be situated within the social sciences, natural science courses that address medical and ethical questions, such as In-vitro Fertilization, stem cell research, euthanasia and gender selection may also benefit from this approach. In addition, ESTCR definitely takes into consideration teaching millennial students in a challenging class by also including technology and social media as an engaging, connecting, or reflecting component.

Engaging Students through Connecting and Reflecting includes the established elements of creating a safe, comfortable environment, but after the instructor has evaluated her or his personal feelings towards the subject. I also include setting ground rules for discussion, careful selection of course materials, considering student backgrounds, as well as responding positively to students, yet redirecting their remarks and behavior if necessary. The additional element that my approach offers is including an active learning assignment that involves an interview, as well as a ‘demonstration’ segment, or activity where students can manipulate items associated with the topic. Artifacts are especially useful in classes where historical evidence of the topic exist, i.e. flyers, buttons, yard signs, etc. My addition of original artifacts and the Personal Interviews are definitely active and reflective learning tools that may motivate students from any discipline in a challenging class to engage in the content. Engaging Students through Connecting and Reflecting works for new teachers, as well as seasoned instructors.
My prescribed process includes, but is not limited to:

**Evaluate Yourself and Your Class**

This is the first step towards engaging students so they may connect and reflect upon the subject matter. The teacher should begin by examining her/his perspective on the topic. Perhaps a close colleague, mentor or friend can help the teacher to introspectively evaluate her/his position on the subject, as well as a group of people associated with it. If the instructor knows, or discovers prejudice, or other difficulty speaking on the subject from a neutral viewpoint, he/she should take time to address this prior to teaching impressionable and perhaps combative students. At some point, the lecturer should take the opportunity to teach students the significance of using a critical lens on themselves. This helps facilitate moving beyond resistance to acknowledging other perspectives. Ultimately, critical self-examination, as difficult as it may be, can foster the learning process.

The age, classification, cultures, life experiences and backgrounds of students will vary. This variety may impact the composition of the class. However, each class will be different. The teacher must make an early estimate as to the character of his/her class to determine the implementation process of Engaging Students through Connecting and Reflecting.

If the lecturer is a member of, or descendant of the studied group, her/his association may increase student apprehensions that could lead to, or exacerbate resistance. This is a very delicate situation that can only be addressed by the individual instructor’s interactions with the class. The teacher must find a way to sympathize, yet teach from a neutral standpoint. This can be extremely difficult if the issue and the communities associated with it have experienced violence, discrimination, and prejudice. Instructors might seek therapeutic conversations and encouragement from trusted colleagues, religious and community leaders, or anyone with which they can share their emotions.

Outlets can provide emotional releases that help the teacher grapple with painful events, while remaining as neutral as possible when teaching. However, personal stories might reveal the actuality of the issues. Of course, disclosure is completely up to the instructor. But, by discussing their own experiences (especially if asked by students), teachers could reassure students that sensitive topics are discussable in her/his class. However, this does not remove the obligation of the teacher to correct, or redirect student comments when they are egregiously damaging and erroneous.

**Creating Safe Zones**

Instructors must set a friendly, comfortable environment. Ice breakers or games that place students in groups, or have them seek out persons with the same colored paper clip, sticky note, or other identifier encourages conversation. Conversation allows students to get to know their classmates. Once sufficient time has been allotted for the ice breaker, the instructor will need to allow every student to speak about at least one classmate with whom they have spoken. After the entire class has participated, the instructor will need
to acknowledge the differences and similarities brought up in the class, i.e. only child, favorite color, residing in the same residence hall. It is then up to the teacher to expound upon how disclosed differences and similarities open the door for greater acquaintance with their classmates.

By creating a comfortable, intimate setting, the teacher sets the tone for subsequent class discussions that may become tenuous and emotional. These types of responses require student assurance that their verbal participation will not be condemned. A classroom environment that fosters a feeling of camaraderie helps students to participate knowing that their thoughts will be acknowledged and respected. Make students aware early that they will encounter images, readings, texts, discussions and speakers that may upset their view of the world. But, remind them that they are in class to learn and that learning means being open to new ideas and thoughts, even if they disagree.

Establishing discussion ground rules on the first day is essential. Students must feel that the instructor is in charge of the class and will moderate all discussions fairly. It is important to establish an environment of respect for the teacher and all students by acknowledging students’ comments without personal interjections. Instructors should only provide opinions when students ask for their specific viewpoints. Otherwise, the discussion should be facilitated by acknowledging all students who wish to participate by respectfully raising their hands.

Some students must be shown and taught to tolerate and respect all opinions. They must be instructed on how to carry out class discussions. If they disagree, they must articulate why they disagree. This helps to inform the class of various opinions. Often, students will see the other perspective and may even change their original thoughts. Ground rules should be revisited as often as necessary. One might even wish to include them in the syllabus, or as a separate handout.

This is also an appropriate time to distribute a pre-survey to assess student knowledge, as well as perspectives on the topic. Questions may be redistributed at the end of the class to determine changes in viewpoints and presence of learning. Pre and post surveys may assist in pedagogical adjustments for subsequent classes. Prior to each implementation, the instructor should inform students that the questionnaire is strictly voluntary. They should also be assured that names are not required. Instead, students should be provided a number or alphabet letter for anonymous identification during analyses. Naturally, Institutional Review Board (IRB) approval must be obtained, if necessary.

**Reflective Learning Tool**

The introduction of an active learning assignment that provides structured encounters with a group connected with the sensitive topic gives students an opportunity to engage persons of the group in conversation. Dialogue fosters discoveries of different perspectives that hopefully lead to a better understanding of the issue, or associated group. Similarly, if a particular community is not associated with the issue, examination of personal narratives linked with the issue is appropriate for encouraging student engagement.
Student engagement is central to making students aware of how certain issues impact a particular group directly. Prior to engagement, students may only be aware of the issues from afar. They rely upon the media, family and peers for perspectives and information. But once students have an opportunity to see and hear how the issues impact members of the specific group on a daily, emotional and physical basis, they may be open up to viewing the group members differently, which could then give them a new perspective on the issue and the related group.

Connecting students to the historical and contemporary events, individuals, groups and discussions surrounding the topic is critical to their understanding and learning. Then, the class becomes a bridge between students feeling detached from the issue and those impacted by it, to consideration and perhaps concern.

Reflecting allows students to think about the engaging exercise and process. They have time to contemplate their feelings prior to, during and after the reflective exercise. Then, they document these thoughts in writing or audio. Having words to reflect upon, gives students time to reflect upon their thoughts at different intervals. Early opinions of “busy work” can give way to thoughts of inspiration, shame, or motivation to work for change.

Engaging Students through Connecting and Reflecting can be very effective. It may be applied in any discipline in a class that teaches sensitive subject matter, or anytime difficult dialogues occur because the approach is transferable to discussions on other challenging concepts, not just diversity.

When students are exposed to new experiences and ideas, they may exhibit resistance, confusion and distance, but if they are given an opportunity to connect with events and individuals associated with the new concept, and then reflect upon the entire process, they are learning because they are engaged. When students are engaged in their learning process, they feel empowered, and empowered learners are potentially in all classrooms.

References


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