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INFORMATION FOR AUTHORS

The Journal of Effective Teaching is an electronic journal devoted to the exchange of ideas and information about undergraduate and graduate teaching. Articles are solicited for publication which address excellence in teaching at colleges and universities. We invite contributors to share their insights in pedagogy, innovations in teaching and learning, and classroom experiences in the form of a scholarly communication which will be reviewed by experts in teaching scholarship. Articles should appeal to a broad campus readership. Articles which draw upon specific-discipline based research or teaching practices should elaborate on how the teaching practice, research or findings relates across the disciplines. We are particularly interested in topics addressed at this site, including empirical research on pedagogy, innovations in teaching and learning, and classroom experiences.

The Journal of Effective Teaching will be published online twice a year at the web site http://www.uncw.edu/cte/ET/. All manuscripts for publication should be submitted electronically to the Editor-in-Chief, Dr. Russell Herman, at jet@uncw.edu. Articles will be reviewed by two to three referees.

Manuscripts for publication should:

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

All articles published in The Journal of Effective Teaching will be copyrighted under the Creative Commons "Attribution-Non Commercial-No Derivs" license. The Journal of Effective Teaching will require that the author sign a copyright agreement prior to publication.

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Call for Papers

Special Issue on Teaching Evolution in the Classroom

Next year is the bicentennial of Darwin’s birth (February 12, 1809) and the 150th anniversary of the publication of On the Origin of Species (November 24, 1859). Many will be celebrating these events and there will most likely be a lot of discussion in classrooms about the impact of Darwin’s work both in the sciences and beyond. Considering the recent controversies in public schools and in the media, this topic may lead to questions as to how to effectively teach a diverse student population and the public about the science, the philosophy, and the history of evolution and Darwinism in our society.

We are planning a special issue of The Journal of Effective Teaching devoted to the teaching of evolution in a university setting. Beginning Fall 2009 we will accept articles for this issue consistent with the mission of The Journal of Effective Teaching. This issue will be in addition to two regular issues in 2009 containing regular contributions on effective teaching. The articles will be subject to peer review and we welcome submissions from university instructors in a variety of disciplines. We do emphasize that we seek articles on effective teaching at the university level.

Topics may include: Darwinism in the history and philosophy of science, politics, and religion; Evolution and the nature of science; barriers in the understanding of evolution; strategies for teaching controversial issues related to evolution and/or Darwinism; educational research in the teaching of evolution; challenging preconceptions in the classroom; and, engaging students who have strong religious views in scientific investigations as part of a liberal arts degree.

CALL FOR PAPERS

Manuscripts for the next issue will be due October 31, 2008. Articles will be accepted in any of the Content Areas supported by the journal.

Special issue on Teaching Evolution in the Classroom: We are planning a special issue of The Journal of Effective Teaching devoted to the teaching of evolution in a university setting. Articles will be accepted until May 1, 2009. Additional details are posted at the journal website.
Letter from the Editor-in-Chief:
The Open Source Movement

Russell L. Herman†
The University of North Carolina Wilmington, Wilmington, NC 28401

We are pleased to end our second volume of The Journal of Effective Teaching with interesting articles which explore critical thinking, cooperative learning, the millennial generation, using iPods, science literacy, preparing students for the marketplace, and concept mapping. We thank the contributors and reviewers for making this a successful endeavor and look forward to more contributions from our readers and invite reviewers to work with us to provide more examples of effective teaching at colleges and universities.

The Journal of Effective Teaching publishes many articles on a variety of topics from pedagogical practice to uses of technology in the classroom. However, there have not been as many recent publications on the use of technology. As university technology budgets have increased substantially over the past decade, it is important for us to occasionally discuss the high cost of computer applications as these costs are often a hardship for students and faculty. As a result, more people are joining the open source movement and are seeking ways to circumvent cost, storage and ownership. In this letter we review of the history of the open source movement and the software currently available to students and faculty under the guise of Open Source‡.

History of the Movement

In the 1950’s several organizations developed much of the software that was used and distributed by computer companies with their hardware. As hardware was their main emphasis, companies sought to keep the price of software low. Programmers at the time had grown up in an era of freely shared software, much the same as many share cooking recipes. In 1965 Applied Data Research (ADR) began to license its software at a time when IBM was giving their software away. However, by the late 60’s ADR filed an antitrust suit against IBM, forcing IBM to unbundle most of its software. This action resulted in the commercialization of computer software and operating systems (Goetz, 1998).

In 1969 Ken Thompson, Dennis Ritchie, and J.F. Ossanna at AT&T Bell Labs began development of an operating system for the PDP-7 to play a game, “Space Travel”, and which became the beginning of the Unix operating systems (Ritchie, 1980). However, when they were faced with the replacement of the PDP-7 by a newer machine, they realized that they needed an operating system which was not tied to the hardware. So, they

† Author's email: hermanr@uncw.edu
‡ This is a shorter and more general take adapted from Herman & Lugo, 2008.

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developed a portable system with the idea that operating systems should not depend on the hardware and should be portable between different computers. So, they wrote a new operating system and mailed it to other users. This action lead to the birth of a community of Unix hackers\(^8\) and several distributions of the Unix operating system evolved at places like Berkeley and MIT.

In 1984 Richard Stallman, who found himself passionately disagreeing with the new proprietary philosophy being adopted by universities, left MIT and began working on a free version of the Unix operating system, GNU, which is short for GNU in not Unix. By free, Stallman meant software that could be freely used, read, modified, and redistributed. He expressed the idea of free software, which did not mean freedom from cost, but free as in “free speech not free beer”. This view of how software should be distributed, lead Stallman to starting the GNU Project in 1983. According to Stallman (2007)

> The goal of GNU was to give users freedom, not just to be popular. So we needed to use distribution terms that would prevent GNU software from being turned into proprietary software.

In 1985 interest in the GNU Project had lead to the creation of the Free Software Foundation (FSF). The FSF wrote and maintained a number of free software programs. However, in the 1990's the FSF needed a free kernel, which managed the computer’s resources and allows applications to access the resources. In 1991 Linus Torvalds, a second year student at the University of Helsinki and a self-taught hacker, developed a free operating system and posted the news on a user’s network to the hacker community. The new system spread quickly and Linux, as it became known, has grown into a well-known operating system competing with Microsoft Windows.

In 1998 the notion of Open Source Software grew out of the free software movement. The Open Source Initiative (OSI) was started by a group including Eric S. Raymond and Bruce Perens (Tiemann, 2006). Raymond stated in his 1999 book, *The Cathedral and the Bazaar*, which was based on a 1997 talk, that the source code should be available with each software release, and the code developed between releases should be restricted to an exclusive group of software developers. In the Bazaar model, he suggests that code is developed over the Internet in public view, an idea credited to Torvalds. The central thesis is that "given enough eyeballs, all bugs are shallow"; i.e., the more widely available the source code is for public testing and scrutiny, the more rapidly the bugs will be discovered. A recent realization of this is Wikipedia, which depends on a large community of users to contribute and spot errors in the Wikipedia entries.

Partly in response to Raymond, in 1998 Netscape decided to release its source code in support of the Open Source Initiative. The Mosaic Netscape 0.9 browser first appeared on

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\(^8\) Stallman (2007) describes hackers as follows

> The use of “hacker” to mean “security breaker” is a confusion on the part of the mass media. We hackers refuse to recognize that meaning, and continue using the word to mean, “Someone who loves to program and enjoys being clever about it.”

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October 13, 1994. In 1995 Microsoft Internet Explorer was introduced in the Windows 95 Plus Pack. A competition between the two browser giants then raged for several years. As of 1998 Netscape Communicator 4.0 was provided for free under the Netscape Public License. However, later that year it was announced that Netscape was to be purchased by AOL and by November 2000 AOL released Netscape 6.0 (Moody, 2007). Things went downhill after that, leading to the end of Netscape in March 2008. In the meantime, other open source browsers have appeared and have done well, such as the Firefox browser.

Open Source Applications

In recent years the open source movement has grown and produced many alternatives to well known proprietary products. The software and its source has been located at sites such as sourceforge.net. A few prominent applications are displayed in Figure 1.

Figure 1. Sample Icons of Common Open Source Applications

In its early years, open source software had many drawbacks. It was buggy, difficult to install, incompatible with MS Windows, and took a computer hacker to get it running. However, the current generation of these programs has become more user-friendly and is getting the attention of a bigger audience. There are programs for about anything one would like to do, such as editing documents, audio files, or video files. Expensive packages like MS Office has its counterpart, Open Office. Many expensive products, like mathematics and statistics packages, have their counterparts which now are reaching the level of usability and stability expected by a computer literate population. The Linux operating system has evolved into user-friendly distributions, such as Ubuntu, which have the look and feel of MS Windows and are used to do anything from office work to running home media centers.

More recently some open source applications have been reduced in size so that they fit on USB flash drives. For example, PortableApps.com (http://portableapps.com/) provides a portable suite of applications that you can carry and use on any computer (See Figure 2.)
and uses as little as 100 MB or 350 MB, depending on one’s needs. You can even find small operating systems, like Linux distributions, which fit on a USB stick, such as the systems offered by http://www.pendrivelinux.com/. The advantage to the user is that applications do not need to be found on specific computers. Lab machines need not be configured with every imaginable application used across campus. Hard drives need not be cluttered.

Open Source and Education

The advantages of the new open source options to faculty are the costs to their departments and their students and the ease at which the software can be obtained within the confines of administrative practices. Portable applications may allow new ways to distribute applications and operating systems and make technology more accessible to students from all socioeconomic backgrounds.

The philosophy behind the open source movement is beginning to percolate into other arenas, like textbook publishing and research journals leading to easier dissemination at lower costs. As faculty, we should become knowledgeable of these trends and be ready for changes to how we develop and share our ideas. To some, there is a shared cultural philosophy between the open source movement and the mission of colleges and universities: the sharing of knowledge for the public good. How we do this is still being explored. We welcome authors to contribute to this discussion.

References


An Act of Translation:
The Need to Understand Students’ Understanding of Critical Thinking in the Undergraduate Classroom

Tiffany Gayle Chenault and Elizabeth Duclos-Orsello1
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Abstract

This article extends and expands the existing literature on critical thinking (CT) by both establishing the need for more student-centered research on the topic and reporting on the findings of a CT research project with two central, related goals: 1) To record and analyze undergraduate students’ definition of CT and 2) To create an easy-to-use instrument that can assist faculty members across many disciplines identify and understand their students’ use of the term so as to improve both teaching and learning. In this article an overview of the limits of existing CT research is followed by a discussion of the project’s three, related phases and the initial findings of each. Central to our task is improved classroom teaching.

In Phase I an open-ended two-question questionnaire was given to students enrolled in sociology and interdisciplinary courses in two departments during the 2005-2006 academic year (N = 157). In the first question, students were asked simply to “define CT”. A qualitative analysis of the data revealed not only wide variation in undergraduate students’ use and understanding of the term generally but also wide variation among students in any single classroom. Using the most common student-generated definitions of CT from the survey data, in Phase II we developed and piloted a classroom-ready instrument designed to allow faculty to quickly and simply assess their students’ understanding of the term “CT”. Faculty who piloted the instrument in Phase III generally found it to be user-friendly and pedagogically valuable. Our overall findings suggest both the need to continue student-centered research in the area of CT and the potential pedagogical value of a student-centered classroom instrument such as the one we created.

Keywords: Critical thinking, student centered, assessment tool, teaching.

The Importance of Critical Thinking in Academia and Our Search for the Missing Link

For university faculty, developing and shaping students critical thinking skills is an important goal (Browne & Litwin, 1987; Vesely & Sherlock, 2005).

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As faculty in Sociology and Interdisciplinary Studies, we teach many courses with critical thinking as a course objective. Furthermore, the mission statement of the School of Arts and Sciences at our public four-year institution highlights critical thinking as a school-wide focus, and critical thinking was recently the subject of an entire year’s worth of readings and discussion through our institution’s Council on Teaching and Learning. However, academic interest does not always translate into either pedagogical innovation or teaching success. In fact, both our classroom experiences and recent scholarship suggest that students have a difficult time applying critical thinking skills to tasks and assignments (Tsui, 2002). At the same time both classroom experience and existing scholarship suggest that there is widespread discrepancy in how the term “CT” is used (Lauer, 2005; Zygmont & Schafer, 2006), understood (Ennis, 1989), and applied (Lewis & Smith, 1993; Porta & Dhawan, 2006; Shepelak, Curry-Jackson, & Moore, 1992) by scholars and faculty. The impetus for the work in this article was a concern that the literature on CT did not adequately offer a way to bring these two lines of research (and concern) together. Nor did the existing literature attend adequately to what we believe is most critical to faculty members engaged in the CT debate: finding practical ways to improve the critical thinking abilities of our students and our teaching of the same.

Most surprising to us as we reviewed the CT literature in 2005-2006 was the relative absence of scholarship exploring how students define or understand critical thinking. Although the literature on CT broadly (and in higher education specifically) is vast, with very few exceptions it has focused on either defining “critical thinking” or exposing definitions/uses of the term from the position of faculty/scholars. What is all but absent is a thorough exploration of how students perceive, use, and understand the term “critical thinking” when they encounter it in a classroom setting. We wondered in the fall of 2005 not only what our students thought of when they heard us use the term “critical thinking” in our classrooms and course materials, but also how they defined or used the term independent of any meanings we assigned to it. We hypothesized that 1) individual students might have multiple responses to the simple request to “define critical thinking”, 2) that students in the same classroom might not understand or use the term in the same way, and 3) that students’ definitions might not mirror those of a given faculty member or discipline. We imagined that if such variations or contradictions existed so too would there exist challenges for students charged with engaging in CT activities or demonstrating CT skills. Furthermore, these discrepancies would pose a challenge for faculty members when designing assignments or assessment tools related to CT objectives. If this type of disconnect was in fact occurring in our classes then student learning might suffer, assessment data might be skewed, and frustration might result—for both faculty and students.

These potential challenges and troubling outcomes, combined with the limited (non student-centered) focus of much of the existing critical thinking research convinced us not only to continue investigating questions around student use and understanding of “critical thinking” but also to try and develop a simple tool to help faculty members gauge students’ understanding or use of the term in a real-world classroom setting. We embarked on this project believing that with this type of baseline knowledge in hand, we, as faculty members, could help our students understand and master the skills we are looking for.
when we discussed or referred to “critical thinking” and thus, achieve desired learning outcomes no matter what our discipline.

Scholars Defining Critical Thinking

There is an extensive literature about CT in higher education (and an even greater one on CT in general) spread throughout the scholarly writings of a diverse set of academic fields. Many scholars have labored to craft detailed definitions and taxonomies distinguishing the characteristics of “critical thinking” among college students from other forms of thought. Yet, without a doubt, while the term “critical thinking” has been pervasive in academic literature and discourse for more than two decades (at both the theoretical and pedagogical levels) it lacks any clear, consistent definition or usage (Petress, 2004).

Ennis’ work from the 1980s and 1990s was central to shaping the general discussion of CT in higher education. His early conceptualization (1981) limited “critical thinking” to the ability to correctly assess statements. In this work there was no reference to the formulation of hypotheses, formulating alternatives or developing plans for action/experiments. These activities Ennis claimed were part of “creative” thinking. In short, his early focus was on the process of thinking. However, by the late 1980s and early 1990s Ennis had rethought his early definition and broadened it to include the very acts of “creative” thinking that had previously been excluded. His new formulation included a range of interdependent (non-hierarchical) skills and aptitudes which together allowed a person to engage in critical thinking now defined as “reasonable reflective thinking focused on what to believe or do” (Ennis, 1991, p. 180). To gauge an individual’s competence at “reasonably reflective thinking” Ennis offered up a set of ten specific tasks thereby establishing a litmus test of sorts for identifying or assessing CT. Also writing in the 1980s and 1990s and adding to the panoply of definitions and conceptualizations of critical thinking were people like McPeck (1981) who defined CT as “reflective skepticism”, Facione (1984) who formulated a conception of CT that included not only evaluating arguments, but the active process of constructing them, and Paul and Nosich (1992) who defined CT as “disciplined, self-directed thinking which exemplifies the perfections of thinking appropriate to a particular mode or domain of thought”.

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2 Ennis’ list included the following: Judge the credibility of sources; Identify conclusions, reasons and assumptions; Judge the quality of the argument, including the acceptability of its reasons, assumptions, and evidence; Develop and defend a position on an issue; Ask appropriate clarifying questions; Plan experiments and judge experimental designs; Define terms in a way appropriate for the context; Be open-minded; Try to be well-informed; Draw conclusions when warranted, but with caution. See Ennis 1993 “Critical Thinking Assessment” Theory into Practice, vol. 32 No. 3 (Summer 1993), 179-186 for this abridged discussion on page 180.; this is also discussed and defended in Ennis 1987 and 1991.

3 Sociologist H. Reed Geersteen (2003) argued for seeing “critical thinking” and “reflective thinking” as two “different though complementary” forms of thinking.
In 1993 Lewis and Smith proposed that in the existing literature and usage there were three distinct meanings given to term “critical thinking”: “(a) critical thinking as problem solving (b) critical thinking as evaluation or judgment (c) critical thinking as a combination of evaluation and problem solving.”(p. 134). Here, “critical thinking” appears to refer to both the act of thinking (and how it is carried out) and the outcome of that thinking. The result of such a “conceptual swamp” according to Lewis and Smith was that in many cases scholars and teachers in the humanities were using “critical thinking” to refer to evaluative skills/activities, while those in the sciences were making use of it as a synonym for problem solving. While these may not be seen as dichotomous to some, Lewis and Smith protested this divide, claiming that “all disciplines need both types of thinking skills.” (Lewis & Smith, 1993).

In the early twenty-first century L. Dee Fink reversed the trend toward collapsing multiple types of thinking into the definition of CT when, he separated “critical thinking” from “creative thinking” and “practical thinking” assigning only the tasks of analysis and evaluation to the “critical” category (2003, p. 40-41).

At about the same time, when exploring the schematics and definitions for CT used by scholars in general as well as those published in discipline-specific literature, Petress (2004) found that 1) any unified usage of the term was lacking and 2) many definitions/scholars highlighted certain acts or processes at the expense of others which alternative definitions/scholars emphasized as central.

In brief, for nearly three decades scholars, academics, and instructors have made clear the academy’s difficulty in defining CT. How then can faculty expect students to have a clear, consistent definition or understanding of the term from one day to the next, from one class session to the next, or from one course of study to the next? More importantly for college instructors is the lack of student-focused research amid this sea of top-down research focused on scholars’ theories and schemas. CT scholarship has all but ignored student voices in its attempt to rein in a complex term at the center of pedagogical and policy debates alike.

**Students’ Voices and Critical Thinking**

Surprisingly, the literature about college students and CT lacks any substantial focus on the voices of those students who are being asked to “think critically”. Rather, as highlighted above, the vast majority of critical thinking research has focused on either 1) comparing and discussing the various ways in which scholars and professors define and use the term or, as we outline here below, 2) assessing students’ ability to think in a way that fits an existing scholar/faculty-created framework, matrix, or definition.

Many scholars have reported on students’ abilities in the area of CT based on results of assessments tied to pre-existing definitions and related criteria. For instance, Weast (1996) asked his students to take a pre and post test which evaluated their CT skills. His rating system was based on Browne and Keely’s (1986) model to evaluate critical thinking. Shepelak et al. (1992) developed a four page research questionnaire to assess stu-
students’ response to CT skills. Students were asked if they had adequate opportunities to communicate through speaking, writing, and to develop critical thinking and communications skills. Shepelak et al. wanted to redress some of the shortcomings in previous research that focused on the acquisition and development of student’s CT skills. To measure students’ ability to think Grauerholz and Bouma-Holtrop (2003) relied on the work of Green and Klug (1990) and Geersten (2003) to develop an eleven point item scale.

Even the use of a quantitative test such as the Watson Glaser Critical Appraisal, or the Cornell Test of Critical Thinking to measure students’ response to CT does not directly ask students how they define the term. Such an approach assumes a given definition of CT and simply assesses students based on the same. As a result of this overwhelming emphasis on existing CT schemas in 1997 R. Barnet noted that we have “no proper account of [student’s experience of critical thinking]” Yet, to date this type of account is precisely what is generally missing in the research.

Our project (in addition to correcting the general absence of student-centered research) grew from our belief that there is an imperative for instructors to be effective, responsive educators. More specifically, our project emerged from our belief that student-centered research AND responsive teaching are intimately related. In 2002 Tsui pointed out that there was an absence of critical thinking studies that explored the impact of “instructional factors.” We suggest that a first step toward redesigning of evaluating instructional practices must be a closer look at the way in which the term “critical thinking” is used among and by the students we teach.

**Students Understanding of Critical Thinking**

To date, the most significant effort at assessing students’ own definitions of CT is Phillips and Bond’s 2004 study. For the purpose of understanding how students define CT, Phillips and Bond recognized that not only was there an overwhelming literature on CT which was “both ‘confused and confusing’, but also that there was little research on university students’ “experiences” of CT. They were interested both in how students defined “critical reflection” and in understanding what students thought about when they were engaged in critical reflection. What Phillips and Bond discovered was a wide variation in both definitions of “critical reflection” among their small student sample and in the activities that students identified as employing or demonstrating the same. In fact the researchers identified four unique experiences of “critical reflection” which ranged from the “relatively simple” to “more complex and hermeneutic” such as “looking beyond what is there” (p. 289). Important to our work is that despite the fact that Phillips and Bond’s study was conducted as part of a course “in which the aim was the development of effective reasoning and where critical reflection was a predominant theme” (p. 287), they found that at the end of the semester “students’ experiences of criticality and the language they used to describe the experiences were limited.” All in all according to the researchers, “given the emphasis of the course, the way in which students in the sample constituted critical thinking was disappointing” (p. 293).
While we are buoyed by the existence of Phillips and Bond’s work, our project pushes
the discussion even further and suggests that what is most important about studying what
college students think of critical thinking may NOT have anything to do with what we, as
instructors, say it is. We believe that college and university faculty members must better
understand both their own and their students’ use of the term CT in order to engage in
effective pedagogical practices. Thus, our study differs from and extends Phillips and
Bond’s work because we looked at students’ across/from different disciplines, courses,
and years in college, and we studied students’ definitions of critical thinking with an eye
beyond simply categorizing their responses. While we did analyze their responses, our
ultimate aim was to use the data to create a practical classroom-ready instrument for in-
structors that was useful but neither invasive nor time intensive.

Scope of Project, Methods and Data

The aim of our project was twofold: 1) understand how students define CT without refer-
ence to existing schemas/definitions and 2) create a practical, classroom–ready instru-
ment for instructors to determine the same. As a result, our work was divided into three
phases which we present here. In Phase I we analyzed patterns and/or themes that
emerged when students responded in writing to two open ended questions. In Phase II we
translated our analysis into a classroom-ready instrument. In Phase III we piloted the in-
strument and analyzed faculty responses to it.

Phase I: Data Collection & Analysis

To investigate how students define and understand CT we collected data from State Col-
lege (SC) students during the 2005-2006 academic year and utilized a qualitative meth-
odological framework. 4 State College is a four year public college in New England with
a student population of 10,500 students (undergraduate and graduate, day and evening).

We obtained data from undergraduate students enrolled in five sections of Introduction to
Sociology (SOC 201), six sections of First Year Seminar (IDS 108), and one section of
Topics in American Studies (IDS 333) during the 2005-2006 academic year. In the fall
2005 semester our open-ended questionnaire was distributed to two sections of Introduc-
tion to Sociology (201) and three sections of First Year Seminar (IDS 108) for a total of
65 respondents. In spring 2006 semester we collected responses from students enrolled in
three sections of Introduction to Sociology (201), three sections of First Year Seminar
(IDS 108), and one section of Topics in American Studies (IDS 333). 92 students re-
sponded in the spring semester for a total N = 157.

The sections of each course were taught by the same professor. The students ranged from
first year students to seniors and had a wide variety of majors beyond Sociology and In-
terdisciplinary Studies. Both of our syllabi listed CT as a goal but we had not spent class
time exploring the term or offering any explicit definition prior to conducting our re-
search. During the second week of each semester students were asked to fill out the

4 We received IRB approval in 2005
an anonymous questionnaire. We asked students to answer two open-ended questions: 1) What is critical thinking? and 2) Give 2 examples of when you have used critical thinking in your daily life. For the research presented here our work in Phases II and III focused solely on responses and data from question #1.  

After collecting the data from the open-ended questionnaire we transcribed the responses to question #1 in an editable file of rich text into QSR NVIVO qualitative software. We

Figure 1. Category of Nodes.

<table>
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<th>ability</th>
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<th>pushing envelope</th>
</tr>
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<tr>
<td>abstract way</td>
<td>draw conclusions</td>
<td>questions</td>
</tr>
<tr>
<td>act upon situation</td>
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<td>rationalization</td>
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<td>answers_in depth</td>
<td>focused</td>
<td>relate it to something</td>
</tr>
<tr>
<td>apply it</td>
<td>how to think</td>
<td>researching</td>
</tr>
<tr>
<td>applying to situations</td>
<td>idea</td>
<td>scientific methods</td>
</tr>
<tr>
<td>ask questions</td>
<td>important</td>
<td>second guessing</td>
</tr>
<tr>
<td>assess_what needs to be done</td>
<td>In-depth thinking</td>
<td>sharpen skills</td>
</tr>
<tr>
<td>best answer_solution</td>
<td>information</td>
<td>situations</td>
</tr>
<tr>
<td>beyond true and false</td>
<td>interpret</td>
<td>skills_thinking</td>
</tr>
<tr>
<td>beyond whats there</td>
<td>involved_deeply</td>
<td>solution</td>
</tr>
<tr>
<td>bias_stay away</td>
<td>judgmental</td>
<td>solve a problem</td>
</tr>
<tr>
<td>brainstorming</td>
<td>learned</td>
<td>summarizing</td>
</tr>
<tr>
<td>breaking things down</td>
<td>learning on a different level</td>
<td>think_an issue</td>
</tr>
<tr>
<td>circumstances and consequences</td>
<td>look at something</td>
<td>think_deeper</td>
</tr>
<tr>
<td>common thought</td>
<td>memorized information</td>
<td>think_different level</td>
</tr>
<tr>
<td>concentrate on important parts</td>
<td>mental capacity</td>
<td>think_hard</td>
</tr>
<tr>
<td>conclusion_come up with</td>
<td>narrow something down</td>
<td>think_logically</td>
</tr>
<tr>
<td>creative</td>
<td>not accepting something</td>
<td>think_take time</td>
</tr>
<tr>
<td>critical to decisions</td>
<td>opinion</td>
<td>thinking</td>
</tr>
<tr>
<td>critically</td>
<td>overview</td>
<td>thought_lots of</td>
</tr>
<tr>
<td>criticize_other views</td>
<td>own_view</td>
<td>understand</td>
</tr>
<tr>
<td>critique</td>
<td>perspective</td>
<td>use mind</td>
</tr>
<tr>
<td>decisions_make</td>
<td>plan things out</td>
<td>using all the evidence</td>
</tr>
<tr>
<td>deeper meaning</td>
<td>point of view</td>
<td>using knowledge</td>
</tr>
<tr>
<td>details_support answer</td>
<td>problem</td>
<td>taking apart</td>
</tr>
<tr>
<td>details_using</td>
<td>problem</td>
<td>taking other things into consideration</td>
</tr>
<tr>
<td>different approaches</td>
<td>problem_faced with</td>
<td>theory</td>
</tr>
<tr>
<td>different methods</td>
<td>process</td>
<td>think outside the box</td>
</tr>
<tr>
<td>different outcomes</td>
<td>process_information</td>
<td>think_all aspects</td>
</tr>
<tr>
<td>different meanings</td>
<td>pull apart</td>
<td></td>
</tr>
</tbody>
</table>

While analyzing the raw data from both questions we noticed that responses to question #2 dealt disproportionately with non-academic subjects. We hypothesized that this resulted from the fact that we asked students to give examples of critical thinking in their "daily life" instead of asking them to give examples of critical thinking in the classroom. The non-academic focus made correlation with question #1 difficult.
used the software to identify key words and patterns, and to develop descriptive, clarifying terms (free nodes) for describing patterns of students’ definitions. Asking students how they define CT showed major variation in student generated responses and definitions. There were 108 distinct nodes that students used to define CT. The number of times the nodes were repeated in students responses (passages) ranged from 26 to 1 (See Figure 1).

We then re-examined these nodes and condensed the list from 108 to 98 (See Figure 2) by creating groups of nodes (Trees of Nodes), eliminating synonyms and clarifying some language (since in a number of instances there were only slight variations in student re-

**Figure 2. Nodes with the Most Passages.**

<table>
<thead>
<tr>
<th>Category of Nodes</th>
<th>Passages Coded</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thinking</td>
<td>26</td>
</tr>
<tr>
<td>Analyzing</td>
<td>25</td>
</tr>
<tr>
<td>Think outside the box</td>
<td>18</td>
</tr>
<tr>
<td>Think: Different Levels</td>
<td>18</td>
</tr>
<tr>
<td>In Depth Thinking</td>
<td>14</td>
</tr>
<tr>
<td>Solution</td>
<td>10</td>
</tr>
<tr>
<td>Solve a problem</td>
<td>10</td>
</tr>
<tr>
<td>Idea</td>
<td>9</td>
</tr>
<tr>
<td>Opinion</td>
<td>9</td>
</tr>
<tr>
<td>Making Decisions</td>
<td>8</td>
</tr>
<tr>
<td>Questions</td>
<td>8</td>
</tr>
<tr>
<td>Answer questions</td>
<td>7</td>
</tr>
<tr>
<td>Ask questions</td>
<td>7</td>
</tr>
<tr>
<td>Understand</td>
<td>7</td>
</tr>
<tr>
<td>Using Knowledge</td>
<td>7</td>
</tr>
<tr>
<td>Brainstorming</td>
<td>6</td>
</tr>
<tr>
<td>Information</td>
<td>6</td>
</tr>
<tr>
<td>Situations</td>
<td>6</td>
</tr>
<tr>
<td>Apply it</td>
<td>5</td>
</tr>
<tr>
<td>Thought lots of</td>
<td>5</td>
</tr>
<tr>
<td>Common thought</td>
<td>4</td>
</tr>
<tr>
<td>Deeper Meaning</td>
<td>4</td>
</tr>
<tr>
<td>Evaluate</td>
<td>4</td>
</tr>
<tr>
<td>Focused</td>
<td>4</td>
</tr>
<tr>
<td>Perspective</td>
<td>4</td>
</tr>
<tr>
<td>Asking Questions</td>
<td>4</td>
</tr>
<tr>
<td>Think deeper</td>
<td>4</td>
</tr>
<tr>
<td>Think logically</td>
<td>4</td>
</tr>
<tr>
<td>Use mind</td>
<td>4</td>
</tr>
<tr>
<td>Answer correct</td>
<td>3</td>
</tr>
<tr>
<td>Beyond true and false</td>
<td>3</td>
</tr>
<tr>
<td>Interpret</td>
<td>3</td>
</tr>
<tr>
<td>Judgmental</td>
<td>3</td>
</tr>
<tr>
<td>Process</td>
<td>3</td>
</tr>
<tr>
<td>Think an issue</td>
<td>3</td>
</tr>
<tr>
<td>Think hard</td>
<td>3</td>
</tr>
<tr>
<td>Think: take time to</td>
<td>3</td>
</tr>
<tr>
<td>Ability</td>
<td>2</td>
</tr>
</tbody>
</table>
responses). For example the Category Node “Thinking” included original responses such as “think logically”, “all aspects of thinking”, “taking time to think”, “think hard”, “think deep”, “think about an issue”. The Category Node “Answer” includes responses such as “answering questions”, “having the right answer”, “answer something in depth”, “answer correct”.

We found that within every specific class students’ definitions of CT varied (See figure 3). For example in Class A with 26 students, there were 18 different definitions of CT. Five students defined “CT” as “Thinking outside of the Box”. Other answers varied from “mental device for problem solving” to “using evidence” to “helps you to focus” to “knowledge for answers” to ” learning on different levels”. This type of variation was present in the data collected from other classes as well.

**Figure 3. Distribution of Definitions by Class.**

<table>
<thead>
<tr>
<th>Class</th>
<th># of Students</th>
<th># of Unique Definitions of CT</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>26</td>
<td>18</td>
</tr>
<tr>
<td>B</td>
<td>23</td>
<td>11</td>
</tr>
<tr>
<td>C</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>D</td>
<td>14</td>
<td>8</td>
</tr>
<tr>
<td>E</td>
<td>12</td>
<td>10</td>
</tr>
<tr>
<td>F</td>
<td>15</td>
<td>12</td>
</tr>
<tr>
<td>G</td>
<td>21</td>
<td>15</td>
</tr>
<tr>
<td>H</td>
<td>12</td>
<td>10</td>
</tr>
<tr>
<td>I</td>
<td>18</td>
<td>15</td>
</tr>
<tr>
<td>J</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>K</td>
<td>7</td>
<td>5</td>
</tr>
</tbody>
</table>

In Class B with 23 students there were 11 different understandings of “CT”. Although 5 students thought “CT” meant “thinking deeply” two students defined it as “brainstorming” and another two students stated that CT meant to “analyze what you read”. The remainder of the students stated the “CT” was defined as: “helps you draw conclusions”, “come to an opinion”, “means your [sic] open-minded”, “apply knowledge”, “deal with circumstances and consequences”, “ask questions”, and “use knowledge”.

In Class C—with only 4 students—we recorded 4 unique definitions:

1) “Critical thinking is when you question and think seriously about any given topic. Also you may look beyond actual facts and may come up with an explanation.”

2) “Critical Thinking is when you are faced with a situation/question that you need to make a decision on. It requires you to not make an emotional decision but one based on consequences and benefits of the decision.”
3) “Critical thinking is when you must think deeply about something. It is not just a quick though. You have to really put effort into what you are thinking.”

4) “Analysis of a statement or statements; ideas, etc and thinking about how they agree or disagree with your thoughts, ideas, perceptions, etc; and causing you to decide/examine the pros & cons.”

As these four students’ responses indicate, in one (small) classroom learners may under-
stand CT to be primarily about questioning, primarily about considering facts rather than emotions, primarily about putting effort into a decision, or primarily about exploring the pros and cons. In general, these four definitions point out that any one student may hold a definition of CT that combines elements of two or three “definitions” of CT as established by faculty/scholar-centered research. As instructors, we were particularly interested in the general finding that within the same classroom students’ understandings of the term “CT” varied just as much as those of scholars and researchers scattered throughout the CT scholarship.

**Phase II: Creating and Distributing Classroom Instrument**

Because the central goal of our research was to improve teaching and learning, after an-
alyzing the responses from students in phase one, we used our student-generated data from Phase I to create a student and faculty-friendly instrument for assessing students’ understand-
ning of CT in a real-world, real-time, classroom setting.

The paper and pencil instrument we developed was based on the findings of our Phase I research and was designed to allow faculty members to quickly ascertain the range of students’ definition of CT in a minimally-invasive, time-efficient manner without the need for complex equipment or data analysis software. In addition the instrument was designed to afford faculty members the opportunity to compare students’ definitions with their own.

Our diagnostic included written instructions for both faculty and students. The student portion of the instrument consisted of a list of the top 20 definitions of critical thinking as identified by frequency of response by students in our sample. Students were instructed, in writing, to 1) Read through all the words and phrases [listed] 2) Circle the ONE word or phrase that BEST matches YOUR definition of “CRITICAL THINKING”. Faculty members were instructed (also in writing) to answer the same question that the students answered on a sheet identified as the FACULTY INSTRUCTION SHEET. Faculty members were then instructed to collect the student responses and tally them on the SUMMARY KEY for FACULTY. This Summary key contained three columns: one listing the 20 definitions, one for recording the faculty response and one for tallying the number of student responses for each definition. (See Appendix A-C).
Phase III: Evaluating Instrument

We piloted this instrument in the spring of 2007. Our goal was to determine 1) how representative and transferable our clarifying terms and identified patterns were for use across a number of disciplinary boundaries and 2) how user-friendly the instrument was for both students and faculty. Five faculty members in the departments of English, Political Science, Interdisciplinary Studies and Geography volunteered for the pilot study. Each administered the survey near the end of the 2007 spring semester. The faculty received no training in administering the survey other than instructions to read and follow the directions on the survey itself. After piloting the instrument faculty participants answered a follow-up survey pertaining to the instrument’s usefulness and ease of use. (See, appendix A-C). The results of this follow-up survey offer important insights for the future of our instrument or others like it.

Usefulness of Instrument

On a scale of 1-5, 5=strongly agree and 1=strongly disagree; faculty gave the instrument a rating between 4 and 5 for being useful. All faculty respondents “agreed” or “strongly agreed” that the instrument provided them with information they could use to inform their teaching.

Ease of Use

On average faculty members stated that it took between 2-5 minutes for their classes to complete the student survey. On a scale of 1-5, 5=strongly agree and 1=strongly disagree, faculty gave the instrument a rating between 4 and 5 for being user friendly. All respondents rated the simplicity to distribute and score a 5. Asked whether the instrument was simple enough to encourage them to use it in a future course, faculty members responded with 4 and 5 ratings.

Open Response: Future Implementation of Instrument

Finally, we asked the faculty to list any ways in which they could imagine making use of this instrument to inform their teaching. While their responses varied, 4 of the 5 faculty who piloted the instrument offered specific ideas for using it in their classrooms. One suggested that the instrument “provides a solid starting point to talking with students about this important skill.” Another faculty member suggested that she might use the instrument more than once. She stated she “would use this two times, once at the beginning and once at the end of the semester.” According to a third respondent the instrument would encourage her to think about the range of student views on any number of course-related topics. She indicated that she might consider “Develop[ing] more process-orientated lesson plans particularly ones that suggest a variety of ways to approach an issue.” Finally, the fourth respondent saw this instrument as a way to understand her own students’ ideas about CT. In her words this instrument would help her “Identify the preconceptions that a particular class might have about critical thinking and working through them.”
Limitations and Areas for Further Research

There were several limitations to our study. First, when analyzing responses in Phase I we could have coded for class, rank, major, and gender (or other variables) among our student subjects in order to explore whether there were certain definitions that were particularly common among subsets of students. This type of data coding might have offered us data for developing classroom instruments more specifically geared toward faculty who are addressing a particular set of students (e.g. first year students or students in a particular major).

Second, given our need to discount the second section of our original 2-question questionnaire, we unable to address the very important issue of whether there was continuity or discrepancy between the way any single student defined “critical thinking” and the specific examples he/she offered as examples of the same. Such analysis would no doubt allow the scholarship on critical thinking to move forward even more, as it would suggest some relationship between abstract and practical understandings of the term—data that many faculty members would certainly find useful.

Finally, we would have liked a larger and more multi-disciplinary group of faculty testers to assess the usefulness of the instrument for broader dissemination. Our faculty sample size in Phase III was small and while the responses were promising with regards to creating an instrument that works for many different departments at institutions like ours, because our instrument was developed based on responses from students in only two departments, we were not surprised to hear that some faculty testers (and students in those classes) did not see “their” definition of critical thinking reflected in the choices offered. We might have added an optional “Other” free response line on the instrument. However, given that our task was to present a list of “most common” responses and use the instrument pilot as a way to test the usefulness/representative nature of our findings, restricting all pilot subjects to the list offered made most sense. In addition, and perhaps most importantly, in order to make the instrument easy to use in a classroom setting, the limited choices seemed most appropriate, a fact that our faculty pilots seemed to recognize. This is an area rich for further research.

Discussion and Conclusion

Previous research on students understanding of CT has been limited to faculty and researcher perspectives on the topic. Thus, this study moves CT research forward by explicitly focusing on the student voice and offering faculty a tool to engage their student’s authentic and useful discussions on a central topic in higher education. Similar to Phillips and Bonds’ work we agree that there is a need to understand student-centered understanding of CT. However, unlike Phillips and Bond, we were not ultimately interested in the relative success or failure of students to reach or demonstrate any particular understanding of CT. Simply put, we wanted to listen to students’ voices and use their own definitions as the basis for connecting findings about student understanding of CT with pedagogical implications. If the existing scholarship is any indication, faculty do not know how students understand CT, let alone how they apply it in the classroom. From a peda-
Pogical standpoint, knowing something about students’ existing understanding of a central course term or concept would seem to be important (if not essential) to ensuring a successful course outcome. Our project design and development as well as our research methods reflect this emphasis on pedagogical relevance.

The purpose of our research was twofold: to demonstrate the need for more research devoted expressly to students’ understanding of the term “Critical Thinking” and to create a user-friendly instrument to help faculty across disciplines evaluate their student’s definition of the same.

Our study found over 100 definitions of CT within a student sample of n=157. Students’ definitions ranged widely both within a given classroom and across the larger student population as a whole. Our findings thus confirmed our initial hypothesis that there may be multiple understandings of/use of the term among our student population in a given classroom. Given this variation, it holds that if faculty members hope to teach, increase, or assesses “critical thinking”, understanding students’ definition of the term in a specific classroom is essential. Without such baseline knowledge faculty members are faced with a potential disconnect and either they or their students may be lost in translation.

To date, the instrument we created seems to meet faculty needs according to the small pilot study we carried out. Faculty respondents indicated high ease of use and potential for practical application in their classrooms. Our initial findings suggest that whether a faculty member uses this information to align students’ understanding with his/her own, involves students in constructing a course-specific definition of CT, or simply uses the information to engage in a discussion about CT generally, there appears to be a perceived value in understanding students’ understanding of CT.

In 2004 Petress claimed that scholars need to “better understand each other’s use of the term; to better allow speakers, listeners, readers, and writers to better use this pervasive term in academic literature.” (465). Yet despite Phillips and Bond’s work and despite Petress’ clear directive for scholars to understand the complexity of the term “critical thinking” we believe that our small study is the first to explicitly listen to students as a way to “better understand” (a la Petress) an “other” heretofore silent in the literature. The result of more research like ours may be the creation of a literature that offers faculty members more and better tools for meeting their stated goals and objectives around CT. After all, only by identifying similarities and differences in the use of CT within any shared classroom space can we, as educators, clarify terms, highlight skills being taught, and effectively assess the same. Listening to the “other” (in this case students) is the first step in reflective and responsive teaching.
Appendix A: I. FACULTY INSTRUCTION SHEET

1) Read through all the words and phrases below
2) Circle the **ONE** word or phrase that BEST matches YOUR definition of “CRITICAL THINKING”

<table>
<thead>
<tr>
<th>Coming up with a solution or conclusion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Offering and in depth answer</td>
</tr>
<tr>
<td>Answering questions</td>
</tr>
<tr>
<td>Finding the correct answer</td>
</tr>
<tr>
<td>Assessing what needs to be done</td>
</tr>
<tr>
<td>Analyzing</td>
</tr>
<tr>
<td>Getting beyond what is there</td>
</tr>
<tr>
<td>Brainstorming</td>
</tr>
<tr>
<td>Applying knowledge to situations</td>
</tr>
<tr>
<td>Breaking down information</td>
</tr>
<tr>
<td>Acting upon a situation</td>
</tr>
<tr>
<td>Staying focused on what you are doing</td>
</tr>
<tr>
<td>Asking questions</td>
</tr>
<tr>
<td>In depth thinking</td>
</tr>
<tr>
<td>Making a reasonable decision</td>
</tr>
<tr>
<td>Thinking outside the box</td>
</tr>
<tr>
<td>Different approaches and ways of thinking about an issue</td>
</tr>
<tr>
<td>Staying away from biased information</td>
</tr>
<tr>
<td>Something that helps to solve problems</td>
</tr>
</tbody>
</table>

Appendix B: II. STUDENT INSTRUCTION SHEET

1) Read through all the words and phrases below
2) Circle the **ONE** word or phrase that BEST matches YOUR definition of “CRITICAL THINKING”

<table>
<thead>
<tr>
<th>Coming up with a solution or conclusion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Offering and in depth answer</td>
</tr>
<tr>
<td>Answering questions</td>
</tr>
<tr>
<td>Finding the correct answer</td>
</tr>
<tr>
<td>Assessing what needs to be done</td>
</tr>
<tr>
<td>Analyzing</td>
</tr>
<tr>
<td>Getting beyond what is there</td>
</tr>
<tr>
<td>Brainstorming</td>
</tr>
<tr>
<td>Applying knowledge to situations</td>
</tr>
<tr>
<td>Breaking down information</td>
</tr>
<tr>
<td>Acting upon a situation</td>
</tr>
<tr>
<td>Staying focused on what you are doing</td>
</tr>
<tr>
<td>Asking questions</td>
</tr>
<tr>
<td>In depth thinking</td>
</tr>
<tr>
<td>Making a reasonable decision</td>
</tr>
<tr>
<td>Thinking outside the box</td>
</tr>
<tr>
<td>Different approaches and ways of thinking about an issue</td>
</tr>
<tr>
<td>Staying away from biased information</td>
</tr>
<tr>
<td>Something that helps to solve problems</td>
</tr>
</tbody>
</table>
Appendix C: III. SUMMARY KEY FOR FACULTY

Instructions:
I. In the “MY Selection” column, put a check mark to the left of the word/phrase that YOU selected
II. As you review student selections, put a mark in the appropriate row/category for each student who circled an item in that particular category
III. Total each row (use “Final STUDENT Tally” column) to see the distribution of your class

Note: this key will help you determine the following:
• The number of students selecting each individual word/phrase & the resulting class distribution
• The similarity or disconnect between how you understand/define critical thinking and how your students understand/define it

<table>
<thead>
<tr>
<th>My Selection</th>
<th>Final STUDENT Tally</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coming up with a solution or conclusion</td>
<td></td>
</tr>
<tr>
<td>Offering and in depth answer</td>
<td></td>
</tr>
<tr>
<td>Answering questions</td>
<td></td>
</tr>
<tr>
<td>Finding the correct answer</td>
<td></td>
</tr>
<tr>
<td>Assessing what needs to be done</td>
<td></td>
</tr>
<tr>
<td>Analyzing</td>
<td></td>
</tr>
<tr>
<td>Getting beyond what is there</td>
<td></td>
</tr>
<tr>
<td>Brainstorming</td>
<td></td>
</tr>
<tr>
<td>Applying knowledge to situations</td>
<td></td>
</tr>
<tr>
<td>Breaking down information</td>
<td></td>
</tr>
<tr>
<td>Acting upon a situation</td>
<td></td>
</tr>
<tr>
<td>Staying focused on what you are doing</td>
<td></td>
</tr>
<tr>
<td>Asking questions</td>
<td></td>
</tr>
<tr>
<td>In depth thinking</td>
<td></td>
</tr>
<tr>
<td>Making a reasonable decision</td>
<td></td>
</tr>
<tr>
<td>Thinking outside the box</td>
<td></td>
</tr>
<tr>
<td>Different approaches and ways of thinking about an issue</td>
<td></td>
</tr>
<tr>
<td>Staying away from biased information</td>
<td></td>
</tr>
<tr>
<td>Something that helps to solve problems</td>
<td></td>
</tr>
<tr>
<td>Coming up with a solution or conclusion</td>
<td></td>
</tr>
</tbody>
</table>

References


Providing Faculty iPods to Explore Innovative Teaching and Learning

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Abstract

The iPod digital music player has been available since late 2001, and even in higher education, its presence has been seen, although mostly in the hands of students and rarely for outcomes-based educational purposes. In 2004, Duke University provided free iPods to all 1,650 first year students, which subsequently enabled faculty to create learning opportunities, which actively engaged students to integrate digital audio and more into their lessons. Our study takes an alternate approach in which the Center for Teaching and Learning provided a small group of faculty (n = 11) from different disciplines with a free iPod, microphone, training, support and collaboration opportunities. The faculty members were asked to create innovative instructional methods and then use the tool in their classes for the 2008 spring semester. In return, faculty agreed to share their outcomes, which would become part of a resource showcase to assist other faculty. So, instead of distributing the technology to a wide audience, where only some may participate, and our goal was to identify those who would actively engage in the project, develop specific applications, and ultimately assist faculty and subsequently students, in integrating functional instructional technology. The primary purpose of this study is to share another model for using and distributing electronic media tools in higher education and secondarily to provide the results of this model in the form of varied and successful uses of the device in teaching and learning.

Keywords: iPod, active learning, instructional technology.

Educational technology has continued to gather attention due to its increase in use and potential to assist some students with learning styles aligned to the strengths of technology enabling them to participate more easily and to learn more effectively (Palmieri, 1997). There has been an increase in the types of instructional technology as well, including laptop computers, document cameras, digital cameras, presentation software, handheld computers and now a new approach to mobile/social technology which allows the user/student to become more actively engaged as a stakeholder and contributor. Terms such as Web 2.0 and AJAX (Asynchronous JavaScript and XML) are frequently used now, which is a perceived second generation of the web or a new way to use the web in a social construct. The line between learning and socializing is becoming fuzzier as students use the same tools for capturing and attending to both environments. Examples of this approach are blogs, wikis, podcasting, virtual worlds and a host of social networking categories. Students have integrated their cellular phones (with digital cam-

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era/video and audio); as well as iPod digital recorders/players into many aspects of their lives. One particular example of the ubiquity of digital capacity is during an environmental science course, to build context and relevance during class, the class was asked to walk through campus to visit trash dumpsters. The following week, the class was to meet at the local county landfill, so the intent was to provide students with an origin for the landfill material. When arriving at the dumpster, the instructor simply asked the students to document the area, preparing detailed notes, sketches and taking photographs. Without hesitation, every one of the twenty students took out their cellular phones and began taking digital photos; two even captured digital video on their phones. That evening, students downloaded their digital media to a discussion board thread located on the course Blackboard site to begin the collaboration of sharing information for their project-based research deliverable at the end of the term.

The concept of using handheld technology such as iPods extends beyond these specific tools. A philosophy of using small external devices to significantly increase the amount of time students are engaged, physically and mentally, has been shown in numerous learning environments. In working with chemistry students, Clark (2003) used handheld computers with sensors successfully; “we have a few more hurdles to overcome but the principle has been well demonstrated that the combination of sensing and handheld devices provides a good, worthwhile lab experience for our students.” The literature correlating the advantage of authentic, meaningful learning, especially when retention is of primary concern has been linked to hands-on learning, and using objects as it focuses on the learners’ curiosity. Curiosity plays a role by acting as both a response to a stimulus and a factor for influencing further attention. As Koran and Longino (1983) found, the greater the complexity of the object, the higher degree of curiosity it will evoke. They also compared the time spent as a measure of attention to time in the vicinity of the stimulus can be a measure of curiosity. Further, Koran and Koran (1984) demonstrated that curiosity is a response to a novel stimulus, such as objects found in informal settings, which in the case of this study would be working with the iPods in arena outside of formal educational uses.

There are now many iTune universities which post audio/video material on their official iTunes for students and the general public to download and use. Other institutions which have or are using iPods in their teaching and learning include

- Stanford on iTunes U (http://itunes.stanford.edu/)
- Georgia College and State University iPod Course related projects (http://ipod.gcsu.edu/Course-related/index.html)
- Spring Arbor University research on iPods (http://www.arbor.edu/news.aspx?id=30323)
- University of Richmond mobile learning (http://learning.richmond.edu/mobile/ipod.html)

Although it seems apparent that digital tools are in the hands of students, the same uniform statement cannot be made for faculty members. There certainly are faculty members who are involved in using technology for personal and professional uses, however,
there seems to be a distinct disconnect on the crossover effect, which students have readily embraced. This philosophy allows people to carry technology equipment which can be used for multiple purposes – personal and professional. In this model, people, particularly students become very adept at manipulating the devices, initially due to intrinsic reasons – they want to take photos, download music, create video, etc. of their friends, and as such become experts at operating THEIR devices. Ownership is critical here, as the owner becomes an expert on their device and can quickly and efficiently capture and populate their digital library with their material, enabling a ready environment for which to capture scholarly material as well. Ownership typically reinforces one’s ability to regulate use and function in a technology environment. The better people are at regulating their own learning, the higher their chances of success with technology (Hargis, 2000). Therefore this project was initiated to provide the technology, training, and support to encourage ownership, subsequently developing innovative teaching and learning techniques.

Process

Eleven iPod audio devices and associated microphones were purchased by the Center of Teaching and Learning and distributed to faculty members who expressed an interest in the initiative. The faculty met on two occasions as a group, were provided the basics on how to turn on, sync, download, subscribe to RSS feeds, record and download good audio, etc. Center staff demonstrated the process and provided several internet sites, which faculty members could refer to for assistance. The sites included

The Teachers Podcast (http://www.teacherspodcast.org/podcasting-help/);
Podcasting News (http://www.podcastingnews.com/tag/educational-podcasting/);
and, Podagogy (http://blog.podagogy.com/?cat=9).

They were then asked to develop and share their ideas on how they could use the teaching tool in their teaching and learning. Continued support was provided on an as-needed, one-on-one model from the Center staff, which turned out to be a marginal effort. Some of the technical assistant provided included additional training on how the microphone works and interfaces with the iPod; downloading and syncing the iPod with a computer; saving and moving files from the computer to the podcasting section of Blackboard; sharing of best practices for recording useable audio; and reminding of the copyright issues.

Results

Amongst the faculty who received iPods, were four from the Psychology department, who decided to work together, share iPods, ideas, collaborate, etc. We met initially to develop a plan (prepare, submit, and receive IRB approval), roles, timeline, format of writing and even drafted a consistent baseline evaluation instrument, which each would distribute to all students in order to request, receive and compile attitudinal data. Faculty asked students to report the extent to which they agreed with four statements on the iPod application using a 4-point scale (1= strongly disagree, 2 = disagree, 3 = agree, 4 = strongly agree). Faculty adjusted questions slightly to fit with their specific iPod applica-
tion, but each faculty asked about whether they a) liked the application, b) found the application useful in developing skills, c) would be interested in similar applications in the current course, and d) would be interested in similar applications in other courses. Students were also asked to provide open ended comments, about what they liked most about the iPod application and how they thought it could be improved. The results from the surveys were positive for each faculty member and the data used to assist in improving the use of iPods in subsequent courses.

The four primary participating faculty members met prior to the study and developed four consistent prompts which they would use to gather data on their projects. The prompts included Challenge, which describes the scenario which they felt could be addressed with an iPod; Solution, which provided their idea of how to use the iPod to address the Challenge; Measures, or the data collected to determine the effectiveness of the iPod; and Outcomes, that summarized their evaluation of the projects.

**Faculty #1**

**Challenge 1:** Monitoring laboratories and discussion groups. Labs and small discussion groups for courses are often run by a teaching assistant (TA), and yet are an integral part of the course as a whole. Instructors may struggle how to monitor the lab activities, but cannot attend regularly, and do not want to usurp the teaching opportunity from the teaching assistant. The interactions with TA’s are potentially rich environments for both the student and the TA’s, therefore an opportunity to collect relatively unobtrusive data and act upon the data is a challenge.

**Solution:** I used the iPod with microphone to check in on a set of six discussion groups for an Introduction to Psychology course with 120 students. I sent the iPod with my graduate TA with the instructions to record several different parts of the discussion groups. During the groups, the students make presentations on the material, and engage in small group discussions.

**Measures:** From their recorded comments I noted that several were initially nervous when the iPod was turned on during their discussion, but they appeared to quickly habituate to the microphone being present.

**Outcome:** I was able to listen to parts of the discussions while working on other tasks. Since I did not have to pay full attention to the discussion, nor grade their performance in anyway, I found that I have been able to easily fit this listening into my schedule without taking very much extra time. Listening to the comments has given me a much better sense of how the groups are going and given me several ideas for feedback to share with the teaching assistant to improve the groups. Overall, I found this to be an efficient way to track the progress and goings on in the groups, without investing too much time in the process.

**Challenge 2:** Engaging students in a large lecture class. Large lecture classes often serve as a deterrent for students to ask more specific questions and to make comments. Stu-
students often indicate they are nervous to ask a question or make a comment in a large group for fear of what the other students might think.

**Solution**: To decrease the concern over asking questions in front of a large group, I used the iPod and microphone to allow students to ask questions or make comments. At the end of each lecture, I would place the iPod and microphone on a desk at the front of the class and encourage students to “Ask the Professor” on the iPod. I would later listen to these questions and address them at the beginning of the next class.

**Measures**: Over the eight lectures during which the “Ask the Professor” system was used, a total of ten questions were collected. Only one question was asked the first time it was offered and no questions during the second or fourth use.

**Outcome**: While it seemed to take a few times of announcing this and making reference to it for it to catch on, there was a small increase in use over the final four lectures. Several students commented on their end of the semester evaluations that they appreciated this avenue for asking questions and recommended continuing to use it. I forgot a few times to start the following lecture with the questions that had been asked, and this may have led to a decreased interest in asking questions. There were more questions asked on the days that I started the class with a previous question. I also found that the nature of the questions asked were somewhat different, with students asking more personal questions about the professor or their own situation. Overall, I think this may be a useful way to include more students in the lecture process and discussion, but it does require consistency.

**Faculty #2**

**Challenge 1**: Interviewing Children. Textbooks on child development can provide a common experience for students, but often lack the power and richness of observing real children and adolescents. In contrast, field observations can provide moving and interesting examples of class concepts, but are often idiosyncratic from student to student, moment to moment. The purpose of the proposed activity is to provide students with a common observational resource for studying cognitive development in childhood, which can then be used in an assessment that is authentic while still consistent across many students.

**Solution/Measures**: This activity was conducted in a child development class with 50 students. After discussing two approaches to cognitive development (Piagetian theory and Information Processing theory), students generated questions that they expected would be answered differently by children of different ages. Students were encouraged to consider relevant concepts such as abstract thinking, memory, and problem-solving. Students were then given the full list of questions that they had come up with and were asked to vote for the ones they thought would best illustrate issues of cognitive development. Based on their votes, I selected the ten most popular questions. I then arranged interviews with a small sample of children and adolescents between the ages of five and 17. The children were diverse in terms of gender, ethnicity, and generational status. I asked each child the ten questions and recorded their responses onto the iPod. The recordings were...
then edited and spliced together so that each question was followed by responses from
several children. These audio clips were placed on the course website for students to listen
to on their own time and were used as part of an extra credit assignment. Students
were asked to choose responses that best illustrated the different principles of cognitive
and language development to reason about children’s relative age based on their re-
sponses.

**Outcome:** The students generated a wide range of questions, and the final set of ques-
tions elicited interesting and informative answers from the children who participated.
Twenty-two students elected to complete the extra credit assignment. The students were
creative in applying their understanding of cognitive development to children’s re-
sponses, noting examples of egocentrism, abstract thinking, and overextension of mor-
phological rules, problem solving, and more. Twenty of these students completed a sur-
vey evaluating the audio clips assignment. Ninety-five percent of students agreed or
strongly agreed that they liked the assignment, and 100% agreed or strongly agreed that
they liked listening to children’s actual responses. Indeed, more than a third of the stu-
dents indicated that what they liked most about the assignment was hearing real re-
sponses from actual children. One student wrote, “I actually got to hear how kids would
respond to a question instead of reading about how they might respond.” Students also
indicated that the enjoyed generating their own questions, with 95% agreeing or strongly
agreeing that they liked this part of the assignment.

**Challenge 2:** Recording Student Writing Conferences. Although written and spoken lan-
guage has many functional similarities, there also exist differences in form, function, and
development (Garton & Pratt, 1998). While conferencing with students on writing as-
signments, I find that sometimes unclear writin g signals an incomplete conceptualization
of the ideas, but at other times students seem able to express ideas clearly via speech. In
these cases the ideas become less clear when they attempt to conform to the style and
conventions of written language. In this application, I used the iPod to help a student
bridge between her spoken and written language.

**Solution/Measures:** I was working with a student who was struggling to find her own
words to describe an especially complex part of her paper. By both of our estimations, the
section stood out as both unclear and jargon-laden. I asked her to put aside her paper and
the source from which she was working and to simply describe to me the ideas she
wanted to get across in this paragraph. When speaking aloud she was able to succinctly
and clearly express the ideas that were difficult for her to express in writing. I recorded
her explanation with the iPod while she spoke and then played it back for her to listen to.
I also sent her an audio file of the exchange for her to use to revise her paper.

**Outcome:** I found this process to be quick and effective. Although there were minor
grammatical issues in her spoken response, these issues were easily resolved while still
retaining the clarity of her speech. The student was also pleased with the process:
“I was having the hardest time taking an idea for my paper and putting it into my own
words. I understood the concept, but as I word processed the paper any revision from the
original source seemed to be very confusing and awkward, so that at the end, I was faced
with the possibility of just having to quote the whole section, something I really didn't want to do. My instructor suggested that I try and explain the idea in my own words out loud as we recorded my explanation with the iPod… A passage I had revised now maybe 3 or 4 times with no success and spent much time on, took me about three minutes to revise for the final time in my own coherent words. It worked out perfectly, and I ended up getting 100% on the paper! …. I think the iPod was a great way to help me to transform ideas from original sources into my own words and thoughts and also to confirm to myself that I really understood what I was writing about.”

Faculty #3

Challenge: In larger classroom settings, providing detailed and informative feedback on paper assignments can be difficult. Ideally, students would have the opportunity to meet with the instructor one-on-one and discuss the strengths and weaknesses of their writing assignments. However, individual meetings can be difficult or impossible to arrange in larger classes because of the time required and the difficulty in coordinating the schedules of the instructor and students. In such circumstances, feedback typically is limited to written comments made on the assigned paper, or perhaps added to an electronic document. This can pose at least two problems (1) providing informative written feedback can be time-consuming for the instructor; and (2) written comments might be misunderstood or not understood by the student.

Solution: One way to address these problems is for the instructor to use the voice memo feature of an iPod to dictate comments about student papers as they grade them. In so doing, the instructor can explain any concerns they have about the writing and clarify what might otherwise be vague written commentary. After some initial practice, such dictation can prove easier and less time-consuming than written comments, and even result in a more comprehensive feedback package for the students. The audio file can then be provided to the students to access at their convenience. For the current project, I first read through each paper and made very minimal marks in the margins of each page, often marking a section containing a problem (e.g., grammar errors or inaccurate content) without any additional explanation. After my initial reading and marking of the paper, I again reviewed the paper, pausing at each marked passage to record my reactions using the voice memo feature of the iPod. Upon reaching the end of the paper, I dictated a brief summary of the strengths and weaknesses of the assignment. Each voice recording lasted approximately 3-5 minutes.

Measures: Following the provision of the iPod feedback, a paper-and-pencil student feedback questionnaire was administered. The questionnaire comprised five closed-ended and two open-ended questions related to student satisfaction with the iPod feedback.

Outcome: Overall, the students reported liking the iPod feedback (90% agree/strongly agree), though fewer reported liking it more than the previous method of written feedback alone (69% agree/strongly agree). (The students had completed three papers and received written feedback prior to the paper for which iPod feedback was provided.) Moreover, students indicated that they would like the instructor to continue providing iPod feedback
(88% agree/strongly agree) and would like their other instructors to provide iPod feedback (78% agree/strongly agree). Students indicated that they preferred the audio feedback because it was more detailed, the tone of voice of the professor helped to emphasize which sections to work on the most, and there were no problems with reading the professor’s shorthand.

Qualitatively I found that recording comments in audio format allowed me to give more detailed feedback. While it initially took longer, eventually time used per paper was about equal for written or audio feedback. I enjoyed the audio feedback more because I felt like I was getting the message across better to the students. Overall I am very pleased with this use of the iPod and microphone and plan to continue to use it in future classes.

However, several limitations should be noted. First, and potentially most problematic, using the “High Quality” voice memo setting on the iPod results in large files. Even recordings as short as five minutes can require that the file be separated into two or more smaller files before being sent via e-mail. A potential solution would be to use a web-based file-hosting service such as http://www.mediafire.com/ to provide access to the feedback, or to use the “Low Quality” setting, which did not noticeably decrease the sound quality. Also, recording as the battery charge wanes can degrade the quality of the data file, sometimes resulting in corrupted files than cannot be played. Finally, recording dictated comments requires a quiet environment in which to grade papers, whereas written comments allow grading in more diverse environments.

Faculty #4

Challenge 1: Writing conferences with students (graduate and undergraduate). When meeting with students to provide feedback on their papers, students often fail to take notes on the verbal feedback provided to them, or have difficulty actively attending to the instructor’s feedback and taking notes simultaneously.

Solution: I used the iPod to record my verbal feedback to each freshman student during an individual meeting with me regarding the final paper draft. I also used the iPod to record my feedback to graduate students regarding their final paper drafts during my individual meetings with them.

Measures: Following the provision of the iPod feedback, a paper-and-pencil student feedback questionnaire was administered. The questionnaire comprised five closed-ended and two open-ended questions related to student satisfaction with the iPod feedback.

Outcome: Because the responses to the recorded meetings were quite disparate between the graduate students ($n = 3$) and the freshmen ($n = 6$), the data are presented separately. Overall, the freshmen liked having a podcast of their individual feedback meetings. All six “agreed” or “strongly agreed” that they “liked getting feedback in the form of a podcast.” Five of the six “agreed” or “strongly agreed” that they “liked getting feedback in the form of a podcast MORE than the previous method” (of meeting without recording) and that they “would like the instructor to use podcast feedback again.” All six “agreed”
or “strongly agreed: that “the podcast feedback helped me to improve on my next assignment.” These meetings were 7-10 minutes long, and many of the students’ comments suggested they liked the podcast because it allowed them to listen more carefully to the feedback without also trying to take notes, and then they were able to go back and listen to the feedback again, taking notes on the podcast. Graduate student meetings were longer – 15-25 minutes – which may be why 2 of the 3 “disagreed” or “strongly disagreed” with the above statements – and 2 of the 3 did not wish to receive podcast feedback in the future. One thought this method was useful stating “I can’t always remember verbal suggestions, but now I can go back and listen to them on the podcast” and all three commented that the sound quality needs improving and it took too long to download the file.

**Challenge 2:** Student presentations. Students rarely have a chance to hear themselves as they give a presentation, making it more difficult to learn to improve upon their public speaking skills.

**Solution:** I used the iPod to record students’ 90-second practice presentations. Students gave 90-second presentations in preparation for their final 5-minute presentations. The rest of the class brought in “noisemakers” that they used each time the presenting student used a filler word (e.g., “um”, “uh”, “like”, “you know”). Thus, students had the opportunity to practice with little grade penalty. However, students rarely have the opportunity to go back and listen to their presentations again, which would presumably improve their presentation skills.

**Measures:** Same as for Problem 1.

**Outcome:** Eleven of 20 students answered the questionnaire. Nearly all (82%) “agreed” or “strongly agreed” that: they liked getting feedback in the form of a podcast, 91% “agreed” or “strongly agreed” that the podcast feedback helped to improve their next assignment, and just over half (55%) wanted to receive podcast feedback in other classes. Comments about what students liked most about the podcast feedback included, “it gave me a chance to listen to myself so I could improve;” useful as a guide for my final presentation because I could listen to it over and over;” “I could hear what was wrong and needed improving.” Some students commented that they did not like hearing their voices, but thought it was a useful exercise nonetheless. Finally some commented on the length of time it took to upload the podcast and the poor sound quality.

After using the iPod, I discovered several limitations, although none outweighed the benefits. First, the iPod microphone is not as powerful as I had initially thought due to low volume and sound quality. Second, sending podcast files to each individual student proved to be quite time-consuming and cumbersome. The use of a website that hosts the podcasts did alleviate this difficulty to some degree (http://www.mediafire.com/), making it easier to email each student his or her podcast.
Beyond the Psychology Faculty Cohort

Additional, other faculty participated from various departments and although similar extension outcomes-base data were not gathered, we will present the faculty members department and the initiatives which they implemented their iPods in teaching and learning. The hope is that readers from many disciplines can read the details from the psychology department as well as the ideas from other disciplines and be able to generalize into their teaching.

**Economics:** Interview specialists on topics that are discussed in class and link voiceovers to PowerPoint slides for students.

**Physical Therapy:** Create audio for podcasting on each movement of the body and make available on an interactive syllabus for students to download, review and apply. Create vodcast on similar movements of the body. Record patient interviews in the community that are used as case studies.

**Theatre Arts:** Recording audio files covering the in-class warm up exercises for Acting (guided meditation/concentration exercises, stretching/muscle release exercises, vocal warm-up exercises).

**History:** Recording class lectures to assist students who panic when they hear a foreign term in a non-language class. Recording a list of new terms, so students can hear the pronunciation.

**Sport Science:** Create guided vodcast and an SPSS guide talking students through the steps of entering data and calculating the statistics.

**Education:** Students learn to administer reading, writing, spelling and math assessments, and then perform practice exercises in class using video. The exercises will be recorded as the instructor provides assessment which can be played back on the iPods.

**Discussion**

**Initial Interaction – Faculty Meets iPod**

Frequently, faculty members differ on their perspective on using instructional technology, however, when the iPods were offered, many of them expressed an interest. The iPod provided a different sense of using technology, as most people were familiar with recording audio, so this tool simply enhanced this ability, as well as increased its portability, hence usability, especially in teaching and learning. Although faculty members initially did not know how the iPod functioned, this was remedied with little effort. The main challenge, which faculty was most suited for was to create innovative ideas for using the iPod to enhance their teaching and learning. In the beginning, there was some apprehension, however once a few ideas were generated, everyone could quickly tran-
late the ideas into their own discipline. The more difficult hurdle was finding the time to implement the innovative methods.

**Time, Time, Time – There will never be enough**

The intent of the iPod was never to save time, as is the case in using most technology learning tools, but to add power and offer diverse learning environments which attend to learning styles. Although it seems we never have enough time, faculty on this initiative embraced taking the extra time to improve their teaching and learning, especially in providing additional opportunities for students to interact with the material in alternate ways. This philosophy and subsequent approach resulted in numerous student success stories, which made any additional time and sacrifice worth the investment.

**References**


Teaching for the Millennial Generation:  
Student and Teacher Perceptions of Community Building and Individual Pedagogical Techniques

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Abstract

As a new generation of learners enters higher education classrooms, effective teaching strategies must adapt to match their learning styles. This research explored student and teacher perceptions of effectiveness of teaching methods, with particular comparison between techniques emphasizing community versus individual learning. Fifteen psychology teachers and 120 undergraduate students rated how interesting and effective they found 17 pedagogical techniques ranging from lecture to simulation gaming. Results suggested that students perceived techniques that connected them to the classroom community, such as discussion and sharing stories from teachers’ and students’ lives, as more effective than did teachers. Teachers gave higher effectiveness ratings to techniques emphasizing individual learning, such as papers and quizzes. Findings suggest that teachers may want to spend more time on activities that build connections between students and linking academic material to students’ lives.

Keywords: Pedagogical techniques, student perceptions, community learning, engaged learning, millennial generation.

When we want to know how to teach well, we often turn to teachers who share knowledge about how to engage students in learning (Daniel, 2005; Lucas & Bernstein, 2005). However, as new generations of students enter college, their needs and learning styles may change at a faster rate than do the existing cohort of faculty. In particular, McGlynn (2005) describes a new generation of college students with increasingly diverse backgrounds and learning needs. A major portion of this cohort is known as Millennials, Generation M, or Echo Boomers who are traditional-aged college students born after 1982. These students were raised with technology that allows constant connection to friends and family. Text and instant messaging, cell phones, beepers, blogs and social networking are a normal part of their everyday life and allow connection anytime and anywhere. Frand (2000) suggests that to be isolated from others is unthinkable for this group, yet many of our current teaching techniques expect them to disconnect from their friends and technology and listen to lecture or work independently. In addition, this cohort may include 26-year-old Generation X students with “customer service” expectations about

1 Portions of this project were presented at the National Institute on the Teaching of Psychology in St. Petersburg Beach, FL, January 2008.  
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Teaching for the Millennial Generation

education, and 40-year-old parents juggling family, work, and coursework (both in the classroom and online). Finally, this generation includes more individuals from non-white ethnic backgrounds than in prior history at approximately 34% of students. As McGlynn describes, this new cohort of students may prefer teaching approaches that emphasize teamwork, experiential activities, and use of technology (McGlynn, 2005). The goal of the current study was to examine current student and teacher perceptions of effectiveness of teaching methods, with particular comparison between techniques emphasizing community versus individual learning.

Much of the existing teaching literature emphasizes personality traits of master teachers (Buskist, Sikorski, Buckley & Saville, 2002; Ginsberg, 2007; Moore, 2007). For example, in reviewing perceptions of what makes good teachers, Buskist et al. (2002) found that teachers and students at four-year colleges agree that good teachers have the following characteristics: They are approachable, creative and interesting, encouraging and caring, enthusiastic, flexible and open-minded, knowledgeable, hold realistic expectations and are fair, and respectful. Similar results were found for two-year institutions (Shaefer, Epting, Zinn & Buskist, 2003). In both of these studies, the focus was on what teachers are, i.e., their personality attributes, and not what they do in the classroom. Similarly, Moore (2007) found that when asked to nominate a teacher for a teaching excellence award, alumni mentioned the personality attributes of the teacher more than any specific techniques. Alumni most valued the sense of belonging and of community that excellent teachers encourage. They also nominated teachers who made them feel listened to and understood. Moore concluded that it is the teacher’s attributes, and not actions that build this sense of community and belonging.

Although personality attributes are likely important, they may be overemphasized in students’ recall of effective teaching due to gestalt processes in memory and the fundamental attribution error in social psychology (Ross, Amabile, & Steinmetz, 1977). Students who are asked to describe excellent teachers may naturally focus on the personality of such teachers and overlook the context and techniques used in the classroom. However, while it is difficult to change your personality, most teachers can adopt pedagogical techniques that lead to effective instruction. Asking students about teaching techniques directly may yield practical suggestions for techniques that help build the sense of community that students value.

Research on interactive learning and student engagement support the idea that building community is effective pedagogy (Hake, 1998). Hake found that teachers who employ interactive techniques showed pre-post test gains in introductory physics courses that were twice as large as students’ performance in non-interactive classrooms. In addition, Casteel and Bridges (2007) found that upper-division psychology students rated seminar courses with student led discussion groups more favorably than traditionally taught courses. Researchers have found that discussion increases student memory (Abowitz, 1990) and enthusiasm (Hedley, 1994). Kember and Grow’s (1994) work suggests that teachers need to pay attention to encouraging students to interact with knowledge and to motivation of student learning and problem solving, not in simply transmitting knowledge via lecture.
The current study examines the issue of teaching excellence from the pedagogical point of view rather than focusing on personality traits of good teachers. We hope to gain insight into classroom behaviors that help this generation of students feel connected and engaged in the learning process. For example, group discussion, linking material to students’ lives, sharing examples from teachers’ lives, and group work all may contribute to a student’s sense of belonging in the classroom, and may enhance memory. Although ultimately useful for assessing learning outcomes, techniques that isolate learners or induce competition for grades, such as papers, exams and quizzes may be less likely to build community that enhances initial learning motivation.

We compared responses of psychology teachers and undergraduate students about what pedagogical techniques were viewed as interesting and effective in helping students learn. Goals included measuring the agreement between students and teachers on which techniques are interesting and effective, and examining whether techniques that emphasize community were rated as more effective than those that emphasized individual learning.

**Methods**

**Participants**

Fifteen psychology teachers and 120 students voluntarily completed the primary survey on perceptions of interest and effectiveness of pedagogical techniques. The students were surveyed in psychology courses that ranged from sophomore to senior level at a public liberal arts college in southwest Colorado. The faculty participants received surveys in their college mailboxes, and were from this college as well as a state university in Kansas. An additional sample of 17 junior and senior students completed a separate survey to rate each technique on how much it builds connections or isolates learners.

**Materials**

*Ratings of level of interest and effectiveness.* In the primary survey, 17 pedagogical techniques were presented along with two rating scales. The first asked how interesting that technique was on a scale of 1 (*not at all interesting*) to 7 (*very interesting*). The second asked how effective the technique was at helping students learn on a scale of 1 (*not at all effective*) to 7 (*very effective*). The techniques were: lecture, movie clips, class discussion, student presentations, tests, homework, small group discussion, project based learning, writing papers, simulation games, in-class lab activities, out of class group projects, reading textbooks, quizzes, students share examples from their lives, teacher shares examples from their life, and journaling. The list of techniques was developed by brainstorming with colleagues about techniques that they typically used in the classroom. Definitions of the techniques were left to the interpretation of individual participants, which allowed them to base their ratings on their own experiences. We conceptualized techniques such as discussions, examples from student and teachers lives, and group projects as building community whereas techniques such as tests, lectures, movie clips, texts, papers, journaling were viewed as more individual.
Table 1. Average effectiveness ratings for pedagogical techniques.

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<td>Out of class group project</td>
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Ratings of community versus individual emphasis. To identify and confirm which techniques may be perceived as building community versus isolating learners, a separate group of students completed a questionnaire using a 7-point scale with the following endpoints: 1 = “Makes me feel isolated from other students and/or faculty;” 7 = “Makes me feel connected to other students and/or faculty.”

Results from this additional sample showed that student ratings matched our conceptualizations of which techniques emphasized community versus individual learning. A paired sample t-test showed that students indeed rated the group of community techniques (i.e., discussions, examples from student and teachers lives, group projects) as significantly higher in making them feel connected (M = Mean = 5.71, SD = .78) than did the individual techniques (i.e., tests, lectures, movie clips, texts, papers, journaling); (M = 3.62, SD = .82); t(16) = 10.02, p < .001.

Results

We used Pearson correlation coefficients in primary analyses to look for relationships between ratings of interest and effectiveness. Results suggested that students and teachers agreed on which techniques were interesting (r = .89), but there was less agreement
on what was effective ($r = .54$). Students tended to rate techniques they thought were interesting as effective ($r = .73$), whereas teachers were less likely to correlate the two ratings ($r = .16$).

We used independent samples $t$-tests, with alpha set at .05 to examine differences in student and teacher perceptions of effectiveness for each of the techniques. Means and standard deviations for ratings of each technique appear in Table 1 and Figures 1 and 2 show graphical representations of these data. Students rated class discussion, examples from students and teacher’s lives, and movies as significantly more effective than did teachers (all $p < .05$). Teachers rated labs, papers and quizzes as more effective than did students (all $p < .05$).

**Figure 1. Student ratings of pedagogical techniques.**

**Figure 2. Teacher perceptions of pedagogical techniques.**
Overall, students rated activities promoting a sense of community (i.e., discussions, examples from student and teachers lives, group projects) as more effective than those emphasizing individual learning (i.e., tests, lectures, movie clips, texts, papers, journaling) $t(118) = 3.81, p < .001$. This difference was not significant for teachers $t (14) = 0.08, p = .94$. This difference is illustrated in Figure 3.

**Figure 3. Average student and teacher ratings of community and individual teaching techniques.**

![Figure 3](image)

**Discussion**

Student results reinforced what cognitive psychologists know: to learn something, one first has to pay attention. With a rapidly changing and diverse new generation of college students, getting their attention and keeping them engaged may be vital to their success. Students in this study valued teaching techniques that were interesting and involved them personally with the material through discussion, projects, papers, and lab work. Least liked by students were techniques that tend to isolate learners: Quizzes, tests, texts, journal writing, student presentations and lecture. The high correlation between students’ ratings of interest and effectiveness is supported by memory research (Baddeley, 1999), and the lack of correlation for teachers’ ratings may be of concern. Klemm (2007) argues that students need to be taught effective memory strategies to help with learning and thinking skills. Perhaps teachers can also improve by making information memorable through effective teaching techniques. Students particularly valued discussion and personal stories as effective learning tools. Given that researchers have found that discussion increases student memory (Abowitz, 1990), teachers may want to consider increasing time for structured discussion that is relevant to academic concepts (e.g., debating competing theories or applying concepts to case examples). It may also be that discussion and inclusion of examples from both student and teacher lives helps build the sense of community and personal contact that lead students to nominate teachers for awards (Moore, 2007).
We know that personality of a teacher is an important predictor of teaching excellence. This work suggests that what we do in the classroom is also important. We may not be able to easily change who we are, but we can change what we do. Educators may benefit from the expertise and experience of students. Students who sit in the classroom daily know that it is difficult to retain information that is not presented in a format that they find interesting. Deeper levels of processing that come with personal stories and discussion are perceived by students as enhancing learning. Techniques that promote a sense of community and engagement with the material are valued by today’s students. Teachers can use these pedagogical techniques to help create an environment conducive to learning.

These results yield information about student and teacher perceptions of the effectiveness of teaching techniques. A logical next step in this line of inquiry is whether these perceptions would match actual learning outcomes. Future research is needed to investigate the effects of community versus individual learning on objective learning outcomes such as grades. Although the current study cannot definitively answer whether teachers or students are more accurate in their ideas of what constitutes effective learning, it raises questions for future empirical work in this area. Whereas teacher’s perceptions may be based on years of experience and training and thus valuable, whether these perceptions are still correct as the generations of students evolve remains an empirical question.

References


Museum Exhibits and Science Literacy: Using Technical Writing and Science to Make Connections Among Disciplines and Communities

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Abstract

This article presents a model for increasing science literacy of P-16 students as well as community members by engaging university students in the design and development of university museum exhibits. While the design of this project was in large part motivated by time and budget constraints faced by the faculty members involved, the positive outcomes of the project with respect to student learning and community involvement suggest that this kind of project is highly valuable and worth repeating.

Keywords: Museum exhibits, science literacy, technical writing.

The authors of this article teach at Southwest Minnesota State University (SMSU), a public, comprehensive liberal arts institution in rural Minnesota. The campus attracts a population of roughly of 3,000 undergraduates who come from nearby small towns, more distant urban areas, and international communities. Students come to the institution with a range of backgrounds and skill levels, and as is true of many small, inexpensive, public institutions, our campus attracts first-generation and non-traditional college students. Many of these students work long hours to pay for their own educations. This variety of students and skill levels, the limited funding at the institution, and the fact that instructors teach at least four three-credit courses a semester in addition to their service and scholarship commitments creates a challenging environment for education.

We have discovered that it is possible to meet these challenges by thinking creatively, working in small stages and steps, and collaborating across disciplines. We have learned that by honoring the unique context of our programs and their broader connections to the institution and community, we can create significant learning opportunities for our students while also meeting service commitments to the university and surrounding community.

The course English 360: Science and Technical Writing was instrumental in teaching us these lessons. Teresa Henning, one of the co-authors of this article whose background is in English, routinely teaches the course, but since the course is a required course for both science and humanities majors, Henning routinely consults with the department chair of

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science who at the time the course was offered was co-author Elizabeth Desy whose background is in biology. Desy is now Dean of the School of Arts, Letters, and Sciences (ALS) and is even more invested in serving a variety of populations as she considers how to make the best use of the limited resources in ALS. English 360’s mix of majors and disciplines created the fertile atmosphere for a cross-disciplinary class project that would ultimately work to positively impact a variety of populations including college students, P-12 students, science and humanities faculty, and local community members.

**General Learning Outcomes for English 360**

The overall goal for English 360: Scientific and Technical writing is to help students realize that both scientific writing and technical writing have the same aim: to manage “technical information in ways that allow people to take action” (Johnson-Sheehan, 2007, p. 5). While this learning goal may seem basic, students find it difficult to write in a manner that emphasizes the audience’s needs rather than the writer’s needs or the subject matter. To help ease students into audience-based thinking and writing, most technical writing experts advocate as Michael Salvo (2002) does that students participate in “repeat[ed] cycles of observing, critiquing, articulating and creating designs of information objects [i.e. texts]” and write for ‘real’ audiences in ‘real’ contexts (Johnson-Eiola, 2004). In addition to supporting these two pedagogical tenets, the course must also be accessible to both humanities and science students. The science in the course cannot be so technical that it prohibits the participation of humanities students yet it cannot be so basic that it prohibits science students from effectively applying their learning.

Given all these potentially conflicting course goals and requirements, some might argue that science and technical writing should in fact be two separate courses: one scientific writing and one technical writing. Certainly, such a separation exists at larger campuses. However, the small size of our institution does not make it possible to separate these courses. Neither group of students (science or humanity) is large enough to justify the creation of a separate course.

In the spirit of best serving the unique populations that take English 360, co-author Henning began to look for a real, on-campus project that might allow her to meet a variety of needs. When speaking to co-author Desy at an ALS retreat, Henning discovered that SMSU’s Natural Science Museum could become an ideal candidate for such a project. Desy directs the museum but does not receive any reassigned time to do so and must operate the museum on a shoe-string budget. As Semper (1990) notes, while museums at small colleges and universities are important educational and community-based resources for science learning, they are often understaffed and under funded. SMSU is no stranger to such constraints; it is often difficult for the museum to bring in quality, new exhibits that are engaging and educational. However, despite these challenges, Desy facilitates museum visits for roughly 1,200 students and teachers from P-12 schools in the area.

Besides enhancing college students’ understandings of audience and helping the museum add to its exhibits in a creative and inexpensive manner, a project for the museum provides an important out-of-classroom context that can enhance all students’ understand-
ings of science. Out-of-classroom contexts add to and improve the learning of science. The Teaching and Learning Research Programme’s “Beyond 2000” report (2006) suggests a need for “science education for citizenship,” which would help young people develop a broad appreciation of science and the natural world around them (Millar and Osborne, 1998). Informal educational venues such as museums can contribute to “science education for citizenship” (i.e., science literacy) by stimulating the curiosity of young people about science and the natural world around them (TLRP Commentary, 2006).

This project also engaged students in meeting several of the Association of American Colleges and Universities’ (AAC&U) “LEAP” initiative liberal education outcomes that all students should achieve during their undergraduate study. Outcomes especially relevant to the learning outcomes of English 360 include:

- **Outcome One:** “knowledge of human culture and the natural world” through study of such subjects as science, social science, math, humanities and art (AAC&U, 2005).
- **Outcome Two:** “intellectual and practical skills” such as “written and oral communication” skills (AAC&U, 2005).
- **Outcome Three:** “intellectual and practical skills” such as “inquiry, critical and creative thinking” (AAC&U, 2005).
- **Outcome Four:** “intellectual and practical skills” such as “teamwork” (AAC&U, 2005).
- **Outcome Five:** “individual and social responsibility” expressed through such behaviors as “civic responsibility and engagement” (AAC&U, 2005).

### English 360 Museum Exhibit Assignment Description

As an experiment, Desy and Henning agreed to let English 360 students try their hands at creating poster-size exhibits for the museum. Henning agreed to direct the project and require that students complete the assignment in a PowerPoint poster template which would allow the Science Department to print successful projects on their GIS printer rather than sending the posters out for printing, an expense that would be prohibitive. To keep the project manageable and to capitalize on the mix of majors and abilities, Henning required students to work in self-selected teams or three or four; this requirement also has the added benefit of linking this project to LEAP Outcome Four: “teamwork” (AAC&U, 2005). During the selection of teams, Henning urged students to make sure that their group consisted of at least one science major and at least one experienced PowerPoint user. Figure 1 provides the exact wording of the assignment.

The assignment in Figure 1 relates to several of the course’s learning outcomes as well as several LEAP Outcomes. First, the assignment’s focus on audience and context emphasizes writing with consideration for purpose, audience, and the conventions of the discourse community (or organization) and genre (e.g., memo, letter, report, etc.) in communicating. This emphasis on communication aligns this assignment with LEAP Outcome Two: “written and oral communication” skills (AAC&U, 2005). Successful posters need to be sensitive to the variety of audiences and purposes museum exhibits can serve.
English 360 Technical Description Poster Project: For this assignment, you will be required to work in a team of three or four to create a technical description for the SMSU field science museum. Your technical description will need to be written for a 4th grade audience and will need to be formatted as a poster. Groups will be assigned one of the following topics: butterflies vs. moths; prairie plants; Minnesota wetlands; Minnesota prairies; or fish of Minnesota. Your group will be expected to do research on your topic and cite that research in your poster (if necessary). Only credible, scientific sources may be used. Wikipedia and .com web sites MAY NOT BE USED!

In addition to creating a poster, your group will have to turn in:
A transmittal memo (about 2 single-spaced pages) addressed to me that overviews the topic/poster and discusses what document design choices the group made to meet the needs of the rhetorical situation. You should especially discuss how the document’s content and design is appropriate for 4th grade users as well as how the design will fit with the other exhibits in the museum.

✓ A revised version of the activity memo submitted to me on 3/6/07 that summarizes the group’s activity to that date, discusses the results achieved, and offers a plan for future work. Please be sure to refer to Chapter 21 for more specific guidelines.

✓ A thumbnail printing of your poster that addresses the guidelines for technical descriptions found in Chapter 17.

✓ An electronic PowerPoint copy of your poster that you email to me.

Supporting materials that represent all planning and drafting the group has done as well as the results from in-class peer review.

Grading Criteria

Folders will be evaluated for how well their documents:
✓ engage specific audiences through the use of appropriate details and stylistic choices;
✓ make use of patterns of organization appropriate for the various documents in the folder;
✓ organize information in a manner that is reader-centered;
✓ follow the design principles of balance, alignment, grouping, consistency, and contrast;
✓ make use of correct grammar and spelling (documents need to be as flawless as possible).
while also being sensitive to the design and space constraints of this unique genre (i.e., a PowerPoint poster).

Also, this assignment, like others in the course, requires that students work together to solve a communication problem (i.e., how to best convey technical, scientific information to a young, lay audience). Solving this communication problem requires that students draw on a variety of strategies including but not limited to: applying critical thinking skills to a communication task; making use of credible, reliable, and relevant source material; working with others in a manner that is congenial, civil, productive and responsible; managing documents in a variety of electronic documents (e.g., MS-Word, PowerPoint, and email); using patterns of organization in a manner that is appropriate for a specific communication situation; and varying levels of style and language use for a specific communication situation. Successfully meeting these assignment outcomes requires the use of skills related to LEAP Outcome Three: “inquiry, critical and creative thinking” and LEAP Outcome Four: “teamwork” (AAC&U, 2005).

Finally, the public and service learning aspects of the assignment (i.e., posters go on display and do not just remain in the teacher’s in box) align it in LEAP Outcome Five “civic responsibility and engagement” (AAC&U, 2005) while also making it possible that more students might meet these assignment’s learning goals with a degree of excellence.

**English 360 Museum Exhibit Assignment Classroom Outcomes**

In considering the outcomes of this project, this article will first consider outcomes that affected students taking the course and then consider broader impacts on those outside the classroom. First and foremost, the nature of this assignment did allow undergraduates to excel in technical writing in an atypical manner. As already noted, good technical writing manages information “in ways that allow people to take action” (Johnson-Sheehan, 2007, p. 5). Good technical writing is also often “interactive and adaptable, reader-oriented, produced collaboratively, and visual” (Johnson-Sheehan, 2007, p. 5). Managing information in the manner Johnson-Sheehan describes requires students to apply LEAP Outcome One: “knowledge of human culture and the natural world,” LEAP Outcome Two: “written and oral communication” skills and LEAP Outcome Three: “intellectual and practical skills” such as “inquiry, critical and creative thinking” (AAC&U, 2005).

In addition to meeting these LEAP Outcomes, it is also important to reiterate that all of the course’s museum exhibit projects strongly support LEAP Outcome Four: “teamwork” (AAC&U, 2005) as well as meeting Johnson-Sheehan’s (2007) requirement that good technical writing is collaborative as this project was completed in teams of three or four students. The students’ teamwork was further enhanced by the assignment’s link to the museum. As Semper (1990) notes, experiences in museums support peer interaction (i.e., teamwork). Peer interaction enhanced students’ learning in English 360 in two ways. First, in their class visit to the museum before designing their posters, college students worked together to complete a worksheet designed to help them analyze the existing exhibits and plan for how their own exhibit could fit into the museum (see Figure 2). Secondly, peer interaction was maintained throughout the writing of this project through
Figure 2. Natural History Museum Fact Finding Sheet.

1. Look at the example posters in the museum, and explain:
   ✓ What is the focus/topic of each?
   ✓ How are they formatted?
   ✓ How are source citations/references handled?
   ✓ In what ways do they seek to engage a fourth-grade audience?
   ✓ How do they partition their subject?

2. What material does the museum have concerning your topic? In what ways might you utilize this information? Build on this information?

3. Record any additional useful information about the museum here:

activities in and out of class. Students were given some time each class period to work on their projects together, and they made informal, one-minute, progress reports to the whole class. In addition, teams met out of class or through email to complete their project on time.

As this overview of outcome suggests, this assignment allowed students to meet requirements related to technical writing, the assignment’s grading criteria, and LEAP Outcomes. This point becomes most evident when one closely considers two examples of student work from this project that are currently on display at the museum: Moths and Butterflies of Southwest Minnesota and Prairie Plant Directory. Each example can be viewed by clicking on its respective title.

Moths and Butterflies of Southwest Minnesota was the most unique of all of the student group projects in that they were the only ones who departed from the standard poster template. In the group’s transmittal memo discussing their writing choices for the assignment, they noted that they departed from the template in the effort to give their poster a “circular feel” that mimics the life cycle of these insects. This group’s circular design choice for the poster is significant in that it allows them to integrate the technical writing principle of visual design (Johnson-Sheehan, 2007) with that of producing a “reader-oriented” (Johnson-Sheehan, 2007) document. This design choice also integrates several of the LEAP Outcomes including Outcome One: “knowledge of human culture and the natural world,” Outcome Two: “written and oral communication” skills, and LEAP Outcome Three: “intellectual and practical skills” such as “inquiry, critical and creative thinking” (AAC&U, 2005).

Apart from the overall visual design, an astute reader will also notice other reader-oriented writing choices. For instance, in order to help their audience distinguish between the types of insects, these writers use concrete, sensory details like skinny, fat, knobs, and feathery which help a young audience imagine these insects’ differences. Such reader-oriented choices allow the writers to again integrate LEAP Outcome One: “knowledge of human culture and the natural world,” with Outcome Two: “written and oral communication” skills (AAC&U, 2005). Pictures further reinforce the poster’s meaning, and the
judicious uses of primary colors help further attract a young audience and demonstrate LEAP Outcome Three: “intellectual and practical skills” such as “inquiry, critical and creative thinking” (AAC&U, 2005).

Also, this poster’s style makes attempts to interact with its audience. Even though they are writing to a young audience, the authors of this poster do not “talk down” to the audience and do not avoid using technical terms. However, when technical terms like “nocturnal” are used, they are defined simply and directly. Additionally, the writers use a series of interactive questions to help young viewers engage with the poster. Finally, the authors of this poster clearly cite their work which models good research behavior for young students, but also orients part of the poster toward a teacher audience by providing teachers with resources to which they can refer when they return to their classrooms after visiting the museum. All of these writing choices demonstrate further evidence of these students successful fulfillment of LEAP Outcome One: “knowledge of human culture and the natural world” and Outcome Two: “written and oral communication” skills (AAC&U, 2005).

The *Prairie Plant Directory* makes use of a standard poster template that is commonly used by science majors for research posters that they create in their science courses. In the team’s transmittal memo discussing their writing choices for the assignment, the authors explain that they decided to stick to the traditional template as doing so, “helped them keep the material organized.” Here, the authors echo Johnson-Sheehan’s (2007) point that good technical writing should manage information; keeping material organized is one way to do that. Keeping material organized is also a feature of good writing thus aligning these authors’ work with LEAP Outcome Two: “written and oral communication” skills (AAC&U, 2005).

However, this poster’s organization is enhanced by some customizations the authors made to the template. Readers will notice that the longer columns of the template are divided by dashed lines, and that pictures are alternatively placed on the right and left. Both of these customizations use a kind of “visual grammar” to help readers navigate the document easily. Also, the background color of each column while not a primary color is the cheerful color (purple, blue, yellow, or green) that a young audience is likely to find appealing. The flowers themselves are appealing as well, and the alternative left/right placement capitalizes on this fact quite well by continually drawing the eye to the poster. This poster’s design customizations are significant in that these customizations allow the authors to integrate the technical writing principle of visual design (Johnson-Sheehan, 2007) with that of producing a “reader-oriented” (Johnson-Sheehan, 2007) document. These customizations also allow the authors to integrate three LEAP Outcomes: Outcome One: “knowledge of human culture and the natural world,” Outcome Two: “written and oral communication” skills, and Outcome Three: “intellectual and practical skills” such as “inquiry, critical and creative thinking” (AAC&U, 2005).

Another way that the *Prairie Plant Directory* stays “reader oriented” (Johnson-Sheehan, 2007) and aligns itself with LEAP Outcome Two: “written and oral communication” skills (AAC&U, 2005) is that it takes advantage of the local context of SMSU. In addi-
tion to the Natural History Museum, SMSU is also home to a small, wilderness preserve which includes a reconstructed prairie. One of this poster’s underlying purposes is to inform the audience of these plants in the hopes that teachers and students will also make the wilderness preserve part of their visit (or a return visit if weather prohibits a visit to the preserve). The campus map helps to further reinforce this point.

As was true of “Moths and Butterflies of Southwest Minnesota,” this poster’s style makes attempts to interact with its audience. The authors of this poster do not “talk down” to the audience and do not avoid using technical terms. They also use a series of interactive questions to help young viewers engage with the poster. Here again, the authors of this poster clearly cite their work which models good research behavior for young students and orients part of the poster to a teacher audience by providing teachers with resources to which they can refer when they return to their classrooms after visiting the museum. All of these writing choices demonstrate further evidence of these students successful fulfillment of LEAP Outcome One: “knowledge of human culture and the natural world” and Outcome Two: “written and oral communication” skills (AAC&U, 2005).

**English 360 Museum Exhibit Assignment Community Outcomes**

In addition to positive learning outcomes for students in the English 360 course, this project also positively impacts the P-12 students who visit the museum. As is evident through such national initiatives such as STEM and Project Kaleidoscope (PKAL), there is growing concern about our nation’s ability to adequately prepare a scientific- and math-literate workforce for the 21st-century. One way to deal with this concern is to provide students with both formal and informal education in the area of math and science. Informal education, such as a field trip to SMSU’s Natural Science Museum, provides one way of stimulating the curiosity of young people about the natural world (TLRP, 2006; Roscoe 2006). By designing exhibits that are creative, visually appealing, and informative, English 360 students not only contribute to the museum in general, but they also contribute very specifically to the learning of these young people thus aligning the work of English 360 students with LEAP Outcome Five: “individual and social responsibility” expressed through such behaviors as “civic responsibility and engagement” (AAC&U, 2005).

On top of contributing to the learning of its visitors, students in English 360 also have a chance to impact positively the way young people respond to the museum. This fact is important because as Semper (1990) indicates experiences in museums can motivate children (and adults) to become more inquisitive. Also, since this museum is housed on campus, the work of students in English 360 has the potential to extend relationships between an institution of higher learning and the surrounding community (Rao, Shamah, & Collay, 2007). This latter point is particularly crucial for our institution as the rural nature of our environment means that the SMSU can serve as the catalyst for educational innovation by its commitment to supporting, encouraging, and providing community-based learning for its students. These connections to the community further allow students to meet LEAP Outcome Five: “individual and social responsibility” expressed through such behaviors as “civic responsibility and engagement” (AAC&U, 2005).
Project Reflections: Directions for Us and Others

On the whole, we were pleased with the outcomes of this project for a number of reasons. The mix of disciplines, the mix of writing and science, and the mix of formal (classroom) learning and informal (museum) learning yielded several positive outcomes for SMSU college students and the local community. First, the value of university students’ educational experience was enhanced through a hands-on, applied class project. Secondly, students honed their problem-solving, communication, research skills, and their small group, interpersonal, communication skills. Finally, in so doing, students performed a valuable service for both the university and local communities by enhancing the educational value of SMSU’s Natural History Museum.

Given this project’s success we are excited by the prospect of developing other projects where a mix of disciplines and contexts is possible and hope that we have excited others to pursue similar projects. However, there are a few additional directions we would like to take such projects in the future. First, if we pursue such a project again, we would build in more formative evaluation and invite the users of the museum to evaluate their experiences with the museum and the new exhibits. We would also be more deliberate in sharing with others at our own institution what we did and how we did it so that they too might be inspired to creatively problem by creating connections among various disciplines and contexts. We would also try to involve more faculty in similar projects and be more deliberate about making notes of our reflections and learning along the way. Finally, in pursuing more projects, we would try to keep in mind that this project was successful because it was relevant to local needs and conditions of our institution and surrounding community. We would be careful in the future to continue to honor the unique contexts of our institution and community.

In sum, we view what we did as a possible prototype or model for creatively addressing our institution’s limited resources with respect to time and money. We have come to realize that seeing such solutions requires creative thinking, optimism, and willingness to problem solve. One must learn to be proactive, and rather than letting constraints drive one’s work, one needs to learn to drive the constraints and use them as an opportunity for making connections. We have also learned that small steps can allow one to make big moves in creating such solutions. Making connections across disciplines and populations (e.g., college students, college faculty, P-12 students, P-12 teachers, and community members) does not require large curriculum revisions.

In our instance, this one small project had a synergy that surprised us as we were able to make multiple connections across disciplines, populations, and learning outcomes. Not only did this project help our students to successfully meet a variety of local and national learning outcomes, but it helped us reflect on our work and create connections among ourselves, our students, our institution, and local constituencies. Our openness to seeing connections and willingness to work in small steps helped us create some valuable outcomes and connections that we hope to replicate in future projects that build on this initial small but significant step.
References


It’s Hard Work Learning Soft Skills:  
Can Client Based Projects Teach the Soft Skills Students Need and Employers Want? 

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Abstract

The importance of business relevance in academia coupled with an increasingly challenging job market magnifies the importance for students to be better prepared for the marketplace. Client-based projects have been lauded for helping students gain the soft skills employers look for in entry-level employees, but little research supports this premise. This study discusses how students improved their soft skill sets, ultimately preparing them for career entry by working with business clients. This study demonstrates students benefit by not only applying the theories of marketing to a practical activity, but also by providing an opportunity to develop the skill sets needed to transition their careers.

Keywords: Client based projects, business education, assessment of learning, soft skills, career preparation, marketing education.

Employers have often stated that graduating marketing majors do not have the requisite skills to be successful, entry-level professionals. This is not a new complaint. In the mid-70s, Mintzberg (1976) described how education had to change to meet the needs of business more effectively. “Greater use should be made of the powerful new skill-development techniques which are experiential and creative in nature … Educators need to put students into situations… where they can practice managerial skills, not only interpersonal but also informational and decisional.” (p. 53) The importance of business relevance in academia (Porter & McKibbon, 1988), coupled with an increasingly challenging job market (McCorkle, Alexander, Reardon, & Kling, 2003) magnifies the importance for students of all majors – business students, liberal arts majors, etc. – to be better prepared for the marketplace. Today, college graduates, regardless of their major, must not only possess the requisite marketing-related skills but also certain supporting skills such as communications abilities and problem-solving aptitude in order to be successful as an entry-level employee (McCorkle, Alexander, Reardon, & Kling, 2003).

The competitive job market complicates this matter. In recent years, fewer companies have been visiting college campuses than in previous years (Capell, 2002). Perhaps the biggest shock for many marketing undergraduates is that “a marketing degree is not re-

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required for many entry-level [marketing] jobs, meaning that marketing majors must compete for them against college graduates from other fields” (Taylor, 2003, p. 97).

Researchers have focused on a few, key, supporting skills today’s business managers continually state are the most important to an entry-level employee’s career success which are, according to employers, missing from the educational landscape. The abilities most commonly valued among employers include: communication and interpersonal skills (Scott & Frontczak, 1996; Floyd & Gordon, 1998) and problem-solving skills or critical thinking abilities (Ray & Stallard, 1994; Floyd & Gordon, 1998). Additionally, McCorkle, et al. (1999) included computer/technology skills, presentation skills, leadership skills, job search skills, teamwork skills, multicultural skills, and creative/innovator skills.

These supporting skill sets would not typically be thought of as skills that can be enhanced by students’ marketing courses. However the literature shows that students’ skills can be enhanced through experiential learning activities, such as the culminating experience found in client-based projects (Bobbitt, Inks, Kemp, & Mayo, 2000).

Indeed the client-based project, or the live case method as some researchers call it, can be quite beneficial. Working with real clients as opposed to case studies helps students learn problem-solving skills as well as how to manage the ambiguity a young professional will inevitably experience when they begin working (Lincoln, 2006). Clients or managers may fail to provide all the information, give conflicting information or provide less direction than an entry-level employee might prefer. Further, students aren’t necessarily seeking the presumed, right answer as prescribed by an author in a textbook; in a real situation, students are acting on and reacting to information that is being gathered in bits and pieces rather than information that has been neatly and succinctly summarized in a textbook (Leclair & Stottinger, 1999). Client-based projects couple the reinforcement of textbook knowledge with real-world application: a prescription employers are specifically asking for in today’s college graduates.

Education does not have to be an either/or situation. The inclusion of a client-based project in, for example, an upper division marketing class, can meet the needs of several constituencies: first, it can assist faculty in educating students about the core marketing concepts being reviewed in class. Second, the project can help students provide evidence of the specific skill sets that employers/researchers say are critical to employment success. Lastly, employers would ultimately receive better prepared, more street-ready employees for the workforce. Such projects can be included in a variety of courses, liberal arts, sciences or business, to accomplish the improvement of these same skill sets.

This article provides evidence of the benefits a traditional-aged undergraduate marketing student derives from completing a client-based project. Students find benefit and value in completing such a project both in personal satisfaction as well as professional development of the key supporting skills employers indicate are not only needed in today’s graduates. Lastly, completing such an experiential activity not only provides practical
experience, but reinforces the key marketing concepts covered in marketing classes, thus aiding in learning.

### Literature Review

#### Client-based learning

One common experiential activity in popular practice today is the client-based project. The literature refers to this project in a number ways: as live cases and consulting projects most often. While a client-based project could in theory be done in almost any marketing course, it’s most often seen in upper level courses such as marketing research and marketing management (Maher & Hughner, 2005; Corbin, 2002; Elam & Spotts, 2004).

While there are numerous articles about these types of projects, few go into specific detail about the project: often the articles are written more as a how-to approach with little substantive analysis for what students gain from said projects. The rare exceptions do exist. However, the few studies that do measure elements are typically very limited in scope as to what they do measure. For example: Karnes’ research (1993; 2005) provides a rare glimpse of how undergraduate students not only prefer certain experiential learning activities but also how effective they are, based on challenge and connection to the real world. While this is extraordinarily valuable, it does not measure what skills or knowledge students gain. While Maher and Hughner’s study (2005) provides an excellent comparison of student preferences between client-based projects and simulations, it measured if the students felt they had learned more – but not what they learned. Corbin’s study (2002), while larger than the others, focuses predominantly on the students’ key skills of group management and teaming – certainly critical skills as per employers – but solely limited to this set of skills. Lastly, Elam and Spotts’ study (2004) does address soft skills and benefits to the student, but it does not address whether the project reinforced or aided in the understanding of marketing content.

Employers’ needs for college graduates to graduate street ready -- that is, prepared to be able to work professionally -- is perhaps the biggest reason to include such projects in coursework. The abilities most commonly valued among employers include: communication skills, interpersonal, and problem-solving skills or critical thinking abilities. These are the key, translatable skills that can be applied in a variety of situations and industries. Thus, it is advisable for faculty members to align their skills and course requirements to teach students these skills in tangible ways (Pritchard, Potter, & Saccucci, 2004).

#### Student Perceptions/Self-Efficacy

Kolb (1984) states that learning is the process of creating knowledge from experience and is based on six principles:

Learning is a process, not an outcome; derives from experience; requires an individual to resolve dialectically opposed demands; is holistic and integrative; re-
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quires interplay between a person and environment; and results in knowledge creation (p. 25-38).

Learning, however, rests on a bedrock of core self-concept, or, the perception one has of him/herself. Such perceptions are created by one’s experiences and through others’ perceptions of the individual. Not surprisingly, self-concept is correlated to achievement (Shavelson & Bolus, 1982).

Related to and part of self-concept are three characteristics:

- **self-ascribed epistemic authority**, a person’s perception of his or her knowledge in a specific topic (Ellis & Kruglanski, 1992);
- **self-efficacy**, a measure of self-perception, is the belief that one has the ability and/or skills to complete a task (Erikson, 2003), and
- **outcome expectancy**, that completing a given activity will take a person one step closer to their desired outcome (Stone & Bailey, 2007).

The three are tied in experiential learning theory.

As an example of these tied characteristics, Ellis & Kruglanski (1992) found that a person’s self-ascribed epistemic authority influences the success of experiential learning activities. The higher one’s self-ascribed authority, the better the subjects responded to the experiential learning activities. One’s mastery of certain types of tasks, observing the modeled behavior of other successful individuals (one could make a case that observing unsuccessful individuals and learning from their mistakes could be equally educational) and hearing from others, preferably persons in authority (i.e., the professor or instructor) positive affirmations and coaching all contribute to a person’s self-efficacy.

Self-efficacy is heavily influenced and developed through one’s personal experience, and is a driver of one’s determination to succeed, and colors one’s hopes for future results. For example, if a student believes he has the ability to write a marketing plan (self-ascribed authority) and has seen how others write marketing plans and has been told by a trusted professor that he has the talent to be a great marketer (self-efficacy) certainly he will perceive himself as being able to be successful in his final marketing class assignment (outcome expectancy.)

**Assessment**

Learning, historically, has been synonymous with rote memorization, the lowest level of Bloom’s taxonomy of cognitive learning (1956) which moves through a series of levels of learning from recall, to comprehension, application, analysis, synthesis before finally reaching evaluation. The classroom of yesteryear was instructor centered; the instructor passed information on to the students, the sole source of information and primary responsible individual for learning. The modern, more current paradigm proposes that learning be active and student centered. The new model shifts the responsibility for information from being solely the instructor’s responsibility to the students as well; learning then
comes from a whole host of sources, one of which is the instructor. (Hernandez, 2002)
This migration from passive to active learning environments further supports the move to a more “experientially based” classroom.
The Association to Advance Collegiate Schools of Business (AACSB) standards, guidelines and recommendations further supports this line of progression through their accreditation requirements encouraging faculty to find new ways of engaging students to be actively involved in their own learning, as opposed to seeing learning that is something that is done “to” them. Further the AACSB (2003, p. 52) states: “Faculty members should find such approaches that are suited to their subject matter and should adopt active learning methodologies.”

The movement to outcomes assessment has pressured faculty to measure if learning is taking place and what learning has been accomplished. Assessment, “defined as any regular and systematic process by which a program faculty designs, implements, and uses valid data gather techniques for determining program effectiveness and making decisions about program conduct and improvement.” (Eastman & Allen, 1999, p. 7) At the micro-level, assessment determines if a student has learned, and to what degree he or she has mastered, specific knowledge and skills. At a mid-level, assessment evaluates the faculty member and the choices he or she has made in designing the course to accomplish course objectives and goals – including their use of experiential learning. At the macro-level, assessment evaluates if a business school or marketing program is meeting the recommendations of such governing bodies as AACSB to not only reinforce program content knowledge but to find ways of actively engaging the student in his or her own learning journey/experience.

While information may be provided, true learning follows the public relations adage, “perception is reality.” While a student’s interpretation of what they have learned may be quite different from that of the instructor’s (Nicholson, Barnett & Dascher, 2005), it is no less, important and can provide insight into the student learning process. A student’s perception of not only what has been learned, but the relevance, importance and improvement in self-efficacy/outcome expectancy can drastically color his or her interpretation of whether real learning and growth has taken place.

While there are many ways to measure the accomplishment of learning outcomes (Young, Klemz & Murphy, 2003), learning performance, as defined as the “students’ self-assessment of their overall knowledge gained, their skills and abilities developed, and the effort they expended in a particular class relative to other classes” (p. 131).

Research Design

This descriptive study portrays the benefits undergraduate marketing students derive from completing experiential learning activities – specifically client-based projects – as described in the literature review. What benefits, skills and knowledge do students gain from completing a client-based marketing project? Can client-based projects prepare students for career entry?
Surveys were made available by a web-based program to 76 traditional undergraduate students of a private college in a Western state who had completed marketing management or marketing research courses which included client-based projects as their final projects. Questions were organized into basic categories: benefits, skills applied/developed, marketing content, and career preparation to gather data to either support or reject the preceding hypotheses. A Likert scale was used with anchors ranging from strongly agree (5) to strongly disagree (1). Demographic data and information regarding the student’s amount of work experience (paid, unpaid and classroom projects) were gathered. Four open-ended questions were provided to allow students to elaborate on their experiences. The questions were predominantly identical with the exception of only slightly altering the wording so as to reflect each class name or specific content area.

**Classroom Methodology**

Students were provided an outline to follow for the client-based projects. Throughout the semester, the instructor drew connections between the marketing text and the students’ final project including providing several “work days” in which students brought sectional drafts of their final project to discuss informally with the instructor. Students were required to find their own clients, form their own teams, elect a project manager, and develop their own form of team management, to include conflict resolution.

**Results and Discussion**

Cronbach’s Alpha was used to determine the internal consistency of the survey instrument. The test resulted a .964, thus indicating the survey instrument was reliable.

**Demographics**

The group was almost evenly split between males (42.7%) and females (43.9%). A little over 6% of the students chose not to answer demographic information. With regards to ethnic diversity, the surveyed group was representative of the school’s student body in terms of ethnicity. According to school records 19% of the student body is of an ethnicity other than White/Caucasian. For the study, 1.2% self-identified as African American; 12.2% as Hispanic; and 6% as “Other.” Just less than 83% of the students identified themselves as “seniors”; 3.7% as “juniors” and again, 6.1% did not answer the question. Students wrote in their majors – thus allowing for multiple answers. Not surprisingly, the largest representations were: 40% - marketing majors; 12% - communication arts majors; 12% - double majors in marketing and management.

Work experience is high in this group of students.

- 81.6% of students responded they are or have been employed.
  - While the average employment is 29.83 months, more than 27.6% reported a work history of more than 4 years.
  - The range for number of hours worked is astonishing: 5-80 hours weekly; the class average much more in line with expectations (22)
  - 35% of students reported working 30 or more hours weekly.
• 53.7% of replied the have worked in a non-paid situation such as an internship or volunteer experience.
  o The average length of tenure in non-paid employment is significantly shorter, 9.45 months. However, 9.7% of the students report having worked in such positions for more than 24 months – and 6.1% for more than 48 months.
  o The range for number of hours worked is quite wide, 1-40 hours weekly with an average of 9.45, much as one might expect in an internship situation, for instance. However, 11.8% report working more than 20 hours weekly in such unpaid situations.
• 75.6% of students reported they have completed academic projects that have contributed to their skill sets.

Hypothesis 1a stated that there would be differences between how men and women value client-based projects in the area of employer-requested skill set development. At face value, there were strong favorable responses to the project. Ninety-three percent of students stated they perceived the improved the project management skills; 89% stated they improved their critical thinking skills and leadership skills; 88% of the students stated the improved their teamwork skills. However, while females seemed to respond more favorably that they did indeed see improvement in their own skill sets. However, females rated only one skill, project management, significantly differently than the males (95% confidence interval).

A composite score was also calculated for the skills section and t-tested. However, there was no statistical significance between the men’s and women’s composite scores. Therefore, H1a was partially supported.

Hypothesis 1b stated that there would be a difference between working and non-working students and their perspectives if they improved their soft skills. As a whole, working students responded more favorably that they felt they had improved their skill sets through the client-based project (team work and managing client skills – both at the 90% confidence level). Is it feasible that it is because these students are in the workplace, and therefore have the ability to see what skills are needed and then observe those skills in themselves that they responded so favorably? However, the composite score did not demonstrate significant differences between the employed and non-working student groups. Therefore hypothesis 1b was only partially supported.

Hypothesis 1c stated that there would be a difference between volunteering and non-volunteering students and their perspectives if they improved their soft skills. Students who do not volunteer seemed to respond more strongly that they improved their skill sets – more so than volunteering students. However, none of these findings proved to be statistically significant. Further, a composite score was also created of the skills responses and then t-tested to determine if there was a statistically significant difference between the two groups; there, again, was not. Therefore hypothesis 1c was not supported.
Hypothesis 1d stated that there would be differences between students who have completed academic projects that contribute to their career skill sets, and those who have not, and how they value client-based projects in the area of employer-requested skill set development. T-tests were conducted to determine the differences between these groups. Those students who do not believe they have completed academic activities that improved their skills did seem to acknowledge the client-based projects skill enhancing opportunities more so than those who have completed such academic activities. A composite score was then also created for the skill sets then t-tested to determine if there was a statistically significant difference between the two groups; there, however, was not. However, none of these findings were statistically significant. Therefore hypothesis 1d could not be supported.

**Table 1. Skill Set Enhancement.**

<table>
<thead>
<tr>
<th>Skill Sets</th>
<th>Gender</th>
<th>Mean</th>
<th>Employed</th>
<th>Mean</th>
<th>Unpaid Work</th>
<th>Mean</th>
<th>Academic Projects</th>
<th>Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>Writing skills</td>
<td>Male</td>
<td>3.83</td>
<td>Yes</td>
<td>4.02</td>
<td>Yes</td>
<td>4.00</td>
<td>Yes</td>
<td>3.90</td>
</tr>
<tr>
<td></td>
<td>Female</td>
<td>4.17</td>
<td>No</td>
<td>3.58</td>
<td>No</td>
<td>3.82</td>
<td>No</td>
<td>4.18</td>
</tr>
<tr>
<td>Critical thinking skills</td>
<td>Male</td>
<td>4.17</td>
<td>Yes</td>
<td>4.35</td>
<td>Yes</td>
<td>4.25</td>
<td>Yes</td>
<td>4.26</td>
</tr>
<tr>
<td></td>
<td>Female</td>
<td>4.47</td>
<td>No</td>
<td>3.83</td>
<td>No</td>
<td>4.25</td>
<td>No</td>
<td>4.36</td>
</tr>
<tr>
<td>Information technology skills</td>
<td>Male</td>
<td>4.06</td>
<td>Yes</td>
<td>4.13</td>
<td>Yes</td>
<td>3.95</td>
<td>Yes</td>
<td>4.00</td>
</tr>
<tr>
<td></td>
<td>Female</td>
<td>4.11</td>
<td>No</td>
<td>3.67</td>
<td>No</td>
<td>4.14</td>
<td>No</td>
<td>4.36</td>
</tr>
<tr>
<td>Communications skills</td>
<td>Male</td>
<td>4.06</td>
<td>Yes</td>
<td>4.27</td>
<td>Yes</td>
<td>4.14</td>
<td>Yes</td>
<td>4.23</td>
</tr>
<tr>
<td></td>
<td>Female</td>
<td>4.44</td>
<td>No</td>
<td>4.00</td>
<td>No</td>
<td>4.32</td>
<td>No</td>
<td>4.27</td>
</tr>
<tr>
<td>Project Management skills</td>
<td>Male</td>
<td>4.31</td>
<td>Yes</td>
<td>4.58</td>
<td>Yes</td>
<td>4.48</td>
<td>Yes</td>
<td>4.52</td>
</tr>
<tr>
<td></td>
<td>Female</td>
<td>4.72*</td>
<td>No</td>
<td>4.08</td>
<td>No</td>
<td>4.50</td>
<td>No</td>
<td>4.45</td>
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<tr>
<td>Teamwork skills</td>
<td>Male</td>
<td>4.09</td>
<td>Yes</td>
<td>4.39</td>
<td>Yes</td>
<td>4.30</td>
<td>Yes</td>
<td>4.31</td>
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<tr>
<td></td>
<td>Female</td>
<td>4.58</td>
<td>No</td>
<td>3.92</td>
<td>No</td>
<td>4.29</td>
<td>No</td>
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<tr>
<td>Leadership skills</td>
<td>Male</td>
<td>4.17</td>
<td>Yes</td>
<td>4.40</td>
<td>Yes</td>
<td>4.32</td>
<td>Yes</td>
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<tr>
<td></td>
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<td>4.58</td>
<td>No</td>
<td>4.08</td>
<td>No</td>
<td>4.39</td>
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<td>Conflict resolution skills</td>
<td>Male</td>
<td>3.89</td>
<td>Yes</td>
<td>4.34</td>
<td>Yes</td>
<td>4.14</td>
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<td>4.26</td>
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<tr>
<td></td>
<td>Female</td>
<td>4.61</td>
<td>No</td>
<td>3.67</td>
<td>No</td>
<td>4.32</td>
<td>No</td>
<td>4.09</td>
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<tr>
<td>Presentation skills</td>
<td>Male</td>
<td>4.00</td>
<td>Yes</td>
<td>4.26</td>
<td>Yes</td>
<td>4.11</td>
<td>Yes</td>
<td>4.23</td>
</tr>
<tr>
<td></td>
<td>Female</td>
<td>4.44</td>
<td>No</td>
<td>4.08</td>
<td>No</td>
<td>4.36</td>
<td>No</td>
<td>4.27</td>
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<tr>
<td>Managing clients</td>
<td>Male</td>
<td>4.09</td>
<td>Yes</td>
<td>4.47</td>
<td>Yes</td>
<td>4.50</td>
<td>Yes</td>
<td>4.37</td>
</tr>
<tr>
<td></td>
<td>Female</td>
<td>4.67</td>
<td>No</td>
<td>3.92</td>
<td>No</td>
<td>4.18</td>
<td>No</td>
<td>4.45</td>
</tr>
</tbody>
</table>

*95% confidence level

**Conclusion/Recommendations**

Clearly, no one experiential learning activity can provide benefits to all students, nor is activity appropriate in all situations. This study hoped to uncover what undergraduate marketing students gained from one of the most popularly referenced forms of experien-
tial learning activities found in the marketing literature: the client-based project. While some research had been done about various characteristics of the client-based project, none to date has examined the soft skill development in light of independent variables such as gender, employment, volunteerism and previous academic experiential activities.

Table 2. Hypotheses Results.

<table>
<thead>
<tr>
<th>Hypothesis</th>
<th>Independent Variable</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>1a</td>
<td>Gender</td>
<td>Partially Supported</td>
</tr>
<tr>
<td>1b</td>
<td>Employment</td>
<td>Partially Supported</td>
</tr>
<tr>
<td>1c</td>
<td>Volunteerism</td>
<td>Not Supported</td>
</tr>
<tr>
<td>1d</td>
<td>Previous Experiential Learning Activities</td>
<td>Not Supported</td>
</tr>
</tbody>
</table>

The core concepts, that client based projects can teach and reinforce certain skill sets is a cross-disciplinary premise: liberal arts students as well as business students could certainly benefit from the hands on approach a client based project can provide. From the research, it appears that female undergraduate marketing students appear to derive more perceived benefits in the tested areas than do their male counterparts as a whole – particularly in the marketing research course. This is not to say that males can or don’t benefit – but certainly one area of study might be to more closely examine male participation in experiential learning to understand more about their perceptions. While there certainly are differences between male and female responses, such as in the skills section, the remaining question is why? Is it because males perceive that they are already entering the courses as seniors with “adequate” skills for the marketplace (thus implying they are blissfully ignorant of employers’ perceptions of traditional undergraduates)? Is it due to a self-efficacy difference between males and females? Is it because females are more honest in their responses where as males still find a need to maintain an image of competence –even when anonymity is evident? The existing survey does not address any of these issues, but would certainly be worth considering for future studies.

Further, is this set of experiences with experiential learning unique to marketing classes? What about liberal arts programs? What are the gender differences (if any) when one studies a similar cap-stone, client-based project in a different discipline, such as accounting or management or history? Would there be similar results? Another area of study to consider is to further explore the correlation between work experience, gender and the responses on the survey. Perhaps the males who responded lower than the females have more work experience and already feel they are “prepared?” Lastly, it would be wise to further compare the responses found here in this study to how students react to other forms of experiential learning, such as internships, self-marketing plans, simulations or community based learning.

References

It’s Hard Work Learning Soft Skills


Making Cooperative Learning Work in the College Classroom: An Application of the ‘Five Pillars’ of Cooperative Learning to Post-Secondary Instruction

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Abstract

Cooperative learning is viable yet generally underutilized method of instruction at the college level (Paulsen and Faust, 2008). This paper highlights the work of teacher educator Dr. Paul J. Vermette in his implementation of cooperative learning based practices in a graduate level Multicultural education course. In analyzing the ‘Five Pillars’ of cooperative learning as outlined by Johnson, Johnson & Smith (1991), this article will highlight Vermette’s implementation of cooperative learning structures to this theoretical framework. Through narratives of Vermette’s actual teaching, the authors will provide suggestions for implementing cooperative learning in the college classroom.

Keywords: Cooperative learning, teacher education, multicultural education.

The purpose of this study is to share a model of cooperative learning based practices at the college level. The authors studied the pedagogy of Dr. Paul J. Vermette, author of the book *Making Cooperative Learning Teams Work in K-12 Classrooms* (1998), throughout a four-week Multicultural Education course during summer 2007. The goal was to examine how he uses cooperative learning structures as his students’ primary means of knowledge acquisition. Through key learning experiences in this Multicultural Education course, the authors of this paper will examine how Vermette’s model of cooperative learning aligns with a pre-existing model, the Johnson, Johnson and Smith ‘Five Pillars’ (1991) for cooperative learning in the college setting.

Cooperative Learning in Higher Education

“It could well be that faculty members of the twenty-first century college or university will find it necessary to set aside their roles as teachers and instead become designers of learning experiences, processes, and environments” (Duderstadt, 1999). The role of the college professor is changing. While large lecture halls and bell curves have generally characterized higher education, according to Fink (2004) the past twenty years have seen an increase in active learning and cooperative learning based pedagogies in colleges across the country. Fink reports that when asked, most college professors state they have

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tried structured group learning in at least one of their classes, at least once throughout the semester (Fink, 2004). As the Constructivist educational paradigm continues to take hold, it is likely that the higher education will continue to make progress in alignment with this movement.

However, Paulsen and Faust (2008) note that there is still a resistance and hesitation in higher education to transform traditional college classes into cooperative learning environments. Despite the pedagogical interest, under the false notions that cooperative learning is an alternative to, rather than an enhancement of professorial lectures, many avoid integrating cooperative learning into their classes (Paulsen & Faust, 2008). In fact, according to Weimer (2007) when asked about the teaching methods they most commonly employ, 76% of college professors reported that lecture was their “primary approach” to teaching. Even though many may dabble into the realm of cooperative learning as indicated by Fink (2004), it is not common practice. Due to the expert nature of higher education, much evidence suggests that many college professors still cling to the notion of expounding knowledge to their students rather than engaging them in discovering such knowledge through active learning (Ediger, 2001; Murry & Murry, 1992; Felder, 1992).

There is also a general confusion as to what the term ‘cooperative learning’ means. Very often, this phrase is a blanket term, applied to any sort of group work or interaction between classmates that results in a product. Educators often operate under the false assumption that putting adults in groups automatically assumes that they are being ‘cooperative’ and that they are ‘learning.’ Neither of these assertions is necessarily true (Johnson & Johnson, 1994).

According to the Cooperative Learning Center at the University of Minnesota, Cooperative Learning is a relationship among a group of students that requires five elements:

- positive interdependence
- individual accountability
- interpersonal skills
- face-to-face promotive interaction
- processing out

(Johnson & Johnson, 1994)

These five elements form the ‘five pillars’ of cooperative learning which Johnson, Johnson, and Smith (1991) use as their basis for utilizing such practices in the college classroom. Based on Paulsen and Faust’s assertion that there is reluctance among professors to embrace cooperative learning structures, this five pillars approach seeks to provide a complete model for implementing pedagogical change. Examining Dr. Vermette’s actual implementation of this structure will help to bridge the gap between educational theory and actual college teaching.

Being that David and Roger Johnson have been at the forefront of cooperative learning theory for four decades, the five pillars model was chosen for this paper due to its solid
foundation in educational research. Johnson, Johnson and Smith (1998) have reported that between 1924 and 1997, over 168 studies have supported the notion that cooperative learning is effective for students over 18 years old. This ‘five pillars’ model for cooperative learning has been well studied and Johnson and Johnson have been at the forefront of much of this research. For the purposes of objectivity however, only cooperative learning research not conducted by Johnson, Johnson and Smith will be considered in the research portion of this piece.

The Effectiveness of Cooperative Learning in the College Setting

Cooperative learning is among the most well researched of all teaching strategies. Forty years of research has shown that when compared to other methods of instruction, cooperative learning is one of the most effective ways for students to maximize their own learning and the academic accomplishments of their classmates (New Horizons, 2008, Johnson & Johnson, 1994, Slavin, 1996, Williams, 2007). Highly structured cooperative learning allows students to develop their own understanding of key concepts all the while encouraging and assisting others. Thus, the major benefits of cooperative learning at the college level fall into two categories: academic benefits and social-emotional benefits.

Academic Benefits

Concentrating on academic achievement at the post-secondary level provides the unique opportunity to examine the effects of cooperative learning on a population of students who are largely self-motivated and self-directed learners. These students have learned to work and succeed in variety of instructional setting throughout their schooling careers. Thus, the hundreds of studies showing increased academic achievement using cooperative learning in the college classroom suggest that cooperative learning promotes significant cognitive results even for the most esteemed of student populations. One recent study of nearly 500 undergraduate engineering students from six diverse institutions indicated that cooperative learning produced “statistically significant and substantially greater gains in student learning than those associated with more traditional instructional methods.” Even with differences in pre-course characteristics and learning advantages, levels of understanding and retention still increased in the cooperative learning settings (Terenzini et al., 2001). For decades there have been hundreds of studies, which ultimately have come to the same basic conclusion, post-secondary students learn more, are better able to remember and then transfer their knowledge when taught with the cooperative learning model than other instructional methods (Cooper et al., 1990, Goodsell et al., 1992).

The reasons for this increase are simplistic. Firstly, in a lecture-based college class, estimates show that the teacher speaks about 80% of the time. Thus, in a class with 30 students (which is a relatively small number for a college class) each student has less than 30 seconds to speak every hour (Lie, 2008). Research has shown that students learn by doing, thinking critically about concepts and then applying their knowledge to diverse situations. In a cooperative learning setting, students must not only articulate their under-
standing to their teammates but also have the luxury of immediate feedback from their peers (New Horizons, 2008).

Social-Emotional Benefits

In 1991, the US Department of Labor conducted a nationwide survey to investigate what skills employers most seek in their new employees. The purpose of this survey was to get the business world’s “take” on what schools could do to better prepare American worker for highly skilled, highly profitable jobs. While technical skills and general intelligence proved important, the skills most often cited were “communication skills, interpersonal skills and initiative” (Dowd & Liedtka, 1994). In the document from the US state department entitled "What Work Requires of Schools,” among the top attributes US employers most desired were:

- Sociability- demonstrates understanding, friendliness, adaptability, empathy
- Self-Management- assesses self accurately, sets personal goals, monitors progress, and exhibits self-control
- Ability to participates as member of a team- contributes to group effort
- Ability to exercise leadership- communicates ideas to justify position, persuades and convinces others, responsibly challenges existing procedures and policies
- Ability to work with diversity- works well with men and women from diverse backgrounds

As evident from these demands, knowing content academic is not enough to make today’s college graduate competitive in the workplace. No longer can students just have sound academic standing, but they must be taught and have the opportunity to practice the social and personal competencies necessary to survive in the workplace. Research indicates that compared to other forms to instruction cooperative learning helps students become better communicators and listeners, cooperative members of a team and effective leaders (Strom & Strom, 2003; Lie 2008; Goodwin, 1999). Using cooperative learning the college setting helps break the stereotype that students working together are “cheating.” Instead, it enables students with the mindset that one must exercise their collaborative skills and work with others to achieve a common goal.

In addition to promoting social skills, cooperative learning also enhances personal competencies of self-reflection and accurate self-assessment. By working closely with others students, learners can evaluate their own strengths and weaknesses, utilizing the diversity of the group to accomplish their mutual goal. By considering how well the group worked together, the effectiveness of social skills used as well as the creation of goals for further growth, cooperative learning encourages students to become reflective practitioners and strive for continuous improvement (Williams, 2007).

These notions provide the rationale for the following case study highlighting the educational practices of Dr. Paul J. Vermette, a 22-year Teacher Educator. Cooperative Learning was the primary mode of instruction used throughout his four-week graduate level Multicultural education course. In comparing narratives of his actual teaching to John-
son, Johnson and Smith’s (1991) five pillars of cooperative learning, Vermette’s teaching will serve as a model for cooperative learning theory in practice.

A Description of the Site and Participants

The participants discussed in this study were 33 pre-service teachers, enrolled in a 39 credit-hour cohort that would lead to initial certification in Adolescence and Middle Childhood Education. These Niagara University students, ranging in age from 21 to 55 years of age were of American and Canadian citizenship. The course, Multicultural Education, was the first course of their program that took place in May 2007.

Their professor, Dr. Paul Vermette has been a professional educator since 1971 and is now in his 22nd year as a Teacher Educator at Niagara University. He has authored (or co-authored) dozens of texts including Applying Standards Based Constructivism (2004), Constructivist Strategies (2001) and Making Cooperative Learning Work: Student Teams in K-12 Classrooms (1998). He has written and presented widely on topics of Constructivist based instruction, teacher change, diversity and cooperative learning on both sides of the US-Canadian border. At Niagara University, Vermette teaches instructional methods, curriculum planning, courses in teaching for diversity (Niagara University, 2006).

Johnson, Johnson and Smith’s Five Pillars

Johnson, Johnson, and Smith (1991) define cooperative learning as “the instructional use of small groups so that students work together to maximize their own and each other's learning.” Based on their research, they have proposed five essential elements that are necessary to construct effective cooperative learning experiences: positive interdependence, promotive face-to-face interaction, individual accountability, social skills, and group processing. A visual representation of this concept is presented in figure 1 below.

Figure 1.

![Cooperative Learning](Foundation Coalition, 2008)

As shown in the above graphic, this ‘five pillars’ model provides the foundation for building successful Cooperative Learning in the college classroom. They will now become the lens through which we interpret the learning experiences of Dr. Paul Vermette’s Multicultural Education class.
Positive Interdependence

Positive Interdependence is the belief that the individual is dependent on the contributions, inclusion, and success of the others in the group in order to be successful. Those with a strong sense of positive interdependence believe that there is value in learning from the ideas and contributions of others and that “group members sink or swim together” (Johnson, Johnson & Smith, 1991). Infusing positive interdependence into group activities ensures that team members have a common goal and that there is an unwavering commitment to the success of group members. As they describe, “if there is no positive interdependence, there is no cooperation.”

With this in mind, let us examine one instance of how Dr. Vermette fostered positive interdependence in his graduate class. All of the subsequent narratives indicated in italics are the result of the authors’ field notes combined with teacher and student interviews taken over the four-week period.

The ‘Gronk’ activity was the students’ first learning experience. Used within the first hour of the first class, students were in random pairs and each assigned roles. One student, designated the role of ‘teacher’ was responsible for teaching the characteristics of a fictitious creature called the Gronk to their partner, given the role of ‘illustrator.’ The illustrator was to draw the Gronk with the features described by their teacher. As students busily worked with each other, Dr. Vermette meticulously “worked the room”. After about five minutes, Dr. Vermette announced that time was up and called on Anthony, an illustrator, to come to the front of the room. When asked if he would like his partner to accompany him, he quickly agreed. When asked to explain the Gronk, he easily spoke for several minutes on the specific characteristics of this fictitious animal.

During his debriefing, Dr. Vermette asked, “Who taught Anthony the Gronk?” When the class unanimously pointed to his partner, the ‘teacher’, Dr. Vermette retorted, “No, she didn’t teach Anthony the Gronk – I taught Anthony the Gronk. I gave him his partner, I gave him the materials he needed and I set up the conditions for him to learn. I taught Anthony the Gronk but I used the greatest asset I have – I used her (his partner) and I used cooperative learning.”

According to Johnson, Johnson and Smith (1991), developing positive interdependence is the most important, yet most challenging aspect of implementing the five pillars of cooperative learning. Since this element is solely contingent on the quality of the task assigned to each group, creating positive interdependence requires that the assigned task demand participation from all group members. Copying down lecture notes or answering simple recall questions will not force positive interdependence and therefore will not reap the benefits of cooperative learning.

This Gronk activity was an example of positive interdependence because students were dependent upon each other in regards to their product, resources and roles. The ‘illustrator’ could not have completed the task without his/her partner’s description and the
‘teacher’ could not have fully understood the Gronk without utilizing the material in a meaningful way. The success of both participants was contingent on the successful completion of a single product, and neither individual had the knowledge or resources available to complete the activity alone. It was impossible for any student to assume the roles of both illustrator and teacher. Johnson, Johnson and Smith would describe these specific types of interdependence as product goal interdependence, resource interdependence and role interdependence (Johnson, Johnson and Smith, 1991).

In the Gronk vignette, it is evident that Anthony, ‘the illustrator,’ also felt that positive interdependence was built into this activity. When asked, he immediately wanted his partner to join him in his public debriefing, acknowledging the shared responsibility and shared ownership in his task. Requesting to have his partner come to the front of the room with him provides some evidence that Anthony felt his individual success was related to his partner’s success, thereby demonstrating the power of positive interdependence. As one of the very first icebreaker activities students engaged in during this course, this activity inexplicably set the tone for successful cooperative learning activities throughout the semester.

**Promotive Face to Face Interaction**

As detailed earlier in this piece, there is hesitation among those in higher education to try cooperative learning (Paulsen & Faust, 2008). Novices attempting to utilize these structures will often put students in teams, give students a single task to complete and allow them to do whatever they need to do to get the job done. With no structure, students will often use the “divide and conquer” method whereby they split up the work, complete their specific parts at home, and essentially creating a collection of individualized assignments. But is this cooperative learning?

As Johnson, Johnson and Smith (1991) describe, promotive face-to-face interaction is a foundational component to cooperative learning. The result of positive interdependence, promotive face-to-face interaction occurs when students are given time in class to discuss, ask questions and support each other in the completion of their task. Students must understand that it is not only the final product that matters in cooperative learning but also the ongoing dialogue process that is a critical part of their success. Promotive interaction is an essential part of establishing cooperative learning because face-to-face interaction provides the critical verbal and non-verbal feedback needed for group success (Johnson, Johnson & Smith, 1991).

In this multicultural education course, Dr. Vermette used the cooperative learning structure of a modified jigsaw (Aronson, 2008) as a way to discuss addressing the issue of culturally relevant teaching in Multicultural classrooms. As you analyze Dr. Vermette’s use of this cooperative learning structure in this lesson, try to note how the use of face-to-face interaction guarantees that structured cooperative learning is taking place.

Prior to their in-class experience with Gloria Ladson Billings’ text *The Dreamkeepers,* students individually created artifacts demonstrating their understanding
of the teacher assigned to them from the book. On the day the project was due, students discussed the book in a format reminiscent of a jigsaw.

First, homogeneous groups organized by assigned teacher met to discuss things they liked and questions they still had about the teacher they studied. Then after ten minutes, they moved to their base groups, where each briefly described what they learned, and together they created a list of 10 things they collectively want to remember about culturally relevant teaching and the teachers in the book. Since each base group contained a student “expert,” all of the teachers were covered and teams were able to compare and contrast the approaches of culturally relevant educators. Finally, Dr. Vermette fostered a whole group discussion where he reviewed the contexts of the book, delve into notion of culturally relevant teaching and highlighted some of the student made artifacts.

Jigsaw is a cooperative learning technique rich in opportunities for promotive interaction (Aronson, 2008). Using this technique, students first discuss their assigned material from peers with the same role within the class. By using face-to-face interaction, students work to understand the material itself, and develop a plan of how to teach it to others. This occurred in Dr. Vermette’s class when students with the same assigned teacher met to discuss and develop questions to bring back to their base groups. Second, student experts return to their base groups and this new team pieces together each of their separate components to develop the bigger concept. In Dr. Vermette’s class, this occurred when students met to compare and contrast the culturally relevant teaching practices of all of the teachers. Just as with the Gronk activity, it is impossible to teach someone else a new concept without providing and receiving feedback. Due to its multiple instances of promotive interaction, this jigsaw technique has become one of the most widely used cooperative learning structures at all academic levels (Aronson, 2008).

**Individual Accountability**

To establish the importance of individual accountability in the college classroom is look no further than the 2006 New York Times headline “Those Low Grades in College May Haunt Your Job Search” (Koeppel, 2006). As this article explains, “In its Job Outlook 2007 survey, the National Association of Colleges and Employers found that 66 percent of employers screen candidates by G.P.A., and 58 percent of those surveyed said they would be much less likely to hire graduates with grades averaging less than a 3.0.” As a result, students who are understandably concerned about grades must feel that they are individually accountable for their performance in groups in order for cooperative learning to be successful. An obvious issue of concern for students in cooperative learning setting is ‘social loafing’ whereby one student does all of the work while the rest of the group gets a free ride (Johnson, Johnson and Smith, 1991). This complaint however is more an indication of ill-defined and unstructured group work, not ‘five pillars’ based cooperative learning (Tannen et al., 2003). A model of how graduate level students were individually accountable for their work in cooperative learning settings in Dr. Vermette’s class is below.
In Dr. Vermette’s Multicultural Education class, grades were composed of both of product and process grades. Everything turned into the professor was marked with an individual grade. These product grades included projects, authentic assessments and daily out slip reflections and comprised the bulk of the students’ overall points. However, being that a majority of the class was spent working in cooperative learning groups, when students worked with their peers, Dr. Vermette examined their daily “process” of learning using a four point rubric. As advocated in his book, *Making Cooperative Learning Work – Student Teams in K-12 Classrooms* (1998), students were assessed individually through their daily process grade based on teacher observations. With over 30 students in the class, a student did not receive a graded rubric everyday, but Dr. Vermette very meticulously provided every student with daily oral feedback. This occurred during instruction, as well as before and after class. A completed copy of Dr. Vermette’s four point rubric is shown in figure 2.

As a pillar for cooperative learning, individual accountability ensures that “students learn together, but perform alone” (Johnson, Johnson and Smith, 1991). If we acknowledge that the whole point of cooperative learning is to provide students with the resources they need to subsequently perform better on their own, than individual accountability strengthens the group dynamic as well as individual performance (Foundation Coalition, 2008). In Dr. Vermette’s class, the use of the performance rubric above provided every student with the opportunity to grow in his/her own personal, social and academic development. By informing students of the potential to receive a 4 on this rubric and providing them with frequent opportunities to display and practice such competencies, Dr. Vermette created a community supportive of cooperative learning based practices.

**Social Skills**

Much to the dismay of educators, placing students in close proximity to each other with a task to accomplish does not ensure cooperative learning will take place (Johnson & Johnson, 1994). Often it is not a matter lack of interest or defiance, but rather students (even at the college level) do not have the social skills necessary to work effectively with others. So much emphasis in American schools is placed on individualism and competition that students need help developing the teambuilding and group maintenance skills necessary for cooperative learning to work. Just as teachers build academic skills to ensure cognitive gain, for cooperative learning to be successful, teachers need to use the same dynamic and intentional teaching of social skills (Optiz, 2008). This means the teacher must develop expectations for each specific social skill, provide opportunities for students to practice them and then provide feedback regarding their implementation. According to Johnson, Johnson & Smith (1991) of all the competencies needed for cooperative learning to be effective, post-secondary students should have instruction in leadership, decision-making, trust-building, communication, and conflict-management skills.
Figure 2.

<table>
<thead>
<tr>
<th>Class Participation Rubric</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
</tr>
<tr>
<td>Period</td>
</tr>
<tr>
<td>Name</td>
</tr>
<tr>
<td>Effort</td>
</tr>
<tr>
<td>Student consistently puts forth poor effort and corrects few to none of his/her work.</td>
</tr>
<tr>
<td>On-Task Behavior</td>
</tr>
<tr>
<td>Show Work/Proof</td>
</tr>
<tr>
<td>Timeliness</td>
</tr>
<tr>
<td>5 Minute Check</td>
</tr>
<tr>
<td>Preparedness</td>
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<tr>
<td></td>
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</tbody>
</table>

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As you read how Dr. Vermette introduced these essential social skills, please note how he (1) set up the specific guidelines for working in cooperative learning groups (2) gave students the opportunity to practice their social skills with a relatively low-risk task (3) provided feedback and suggestions for continuous improvement.

Before assigning any cooperative learning tasks, Dr. Vermette made it a priority to introduce and draw attention to the interpersonal and small group skills needed to ensure group success. Since these were future teachers, he asked them to think of what they would expect from their students, posing the question “How would you expect your students to act in cooperative learning groups?” Dr. Vermette asked the learners to work individually at first, recording three different norms they would expect from their middle or high school students. By utilizing a think-pair-share model of debriefing, Dr. Vermette facilitated the construction of a comprehensive list of personal and social competencies necessary for cooperative learning groups. Student generated social skills included:

- Treat each other with respect
- Value other opinions
- Listen to other group members
- Stay focused
- Equally contribute
- Disagree agreeably
- Talk only to your own group
- Encourage others to talk

With this list created, Dr. Vermette announced that he expected to see the same social skills exhibited by his students throughout the semester. In their teams, they were to better familiarize themselves with these skills by adapting the class-generated list into a set of class expectations that would use for the remainder of the course. As the students worked in teams, Dr. Vermette “worked the room” listening, making informal notes and using the class participation rubric mentioned above. He then discussed the social skills he noticed with individual students at the end of the class.

Social skills, like all other skills cannot be developed or improved without careful planning and intentional practice (Optiz, 2008). As Dr. Vermette did in his classroom, before any successful implementation of cooperative learning can occur, students need to know not only what competencies they must possess, but also their current level of aptitude and suggestions for improvement. It is important to note that throughout the semester these students had numerous student-teacher conferences with their professor, as well as ample formal opportunities to reflect on their successes and set goals for continuous improvement. In this way, these students had the opportunity to not only experience the cognitive benefits of cooperative learning, but the affective gains as well.

**Group Processing**

Providing students the opportunity to reflect upon the quality of their group work will ultimately determine the success of cooperative learning teams (Johnson, Johnson and Smith, 1991). Providing time for individual and group reflection will increase the quality of cooperative learning teams by strengthening intrapersonal and interpersonal compe-
tencies. Allowing students to provide constructive feedback to their peers fosters metacognitive awareness while strengthening group synergy and allowing for continuous improvement (Johnson, Johnson and Smith, 1991). In Dr. Vermette’s class, formal group processing took the form of “outslip” questions, as explained below.

One of the required assignments for this class was the completion of ten “outslip” reflections. These outslips were comprised of a series of questions relating to group progress and the overall progress of the course. These outslips were completed individually, outside of class, and then read and commented on by the professor. Dr. Vermette would often use the issues raised in these outslips as a means of fostering group discussion. Sometimes he also distributed examples of individuals’ outslips to the class to address a class concern. At least once a week Dr. Vermette gave his groups time to chat in their base groups about the individual issues raised in their outslips. Two examples of completed student outslips have been included as figures 3 and 4.

Cognitive theorist James Bruner (1960) stated, “Reflection is central to all learning.” Cooperative Learning theorists Johnson, Johnson and Smith (1991) more specifically stated that reflection is central to all cooperative learning. One of the keys to the group processing technique utilized by Dr. Vermette was that it provided a cohesive structure students could use to practice their metacognitive and intrapersonal skills. These outslips promoted constructive feedback, while putting students at the center of their learning process by putting them in control of their class and group processes. By communicating clear group expectations, students were able to maximize their own and each others learning, while strengthening the quality of their cooperative learning environment.

Cooperative learning is a very well-researched yet underutilized pedagogical strategy in the college classroom (Weimer, 2007). Regardless of subject matter, the age of the students or academic ability, if utilized correctly under Johnson, Johnson & Smith’s (1991) five pillars, cooperative learning will only enhance student performance and success. The learning activities and classroom structures set forth by Dr. Paul Vermette in his Multicultural course epitomized Johnson, Johnson and Smith’s notion of successful cooperative learning at the college level. Through this course, not only did his students learn about cooperative learning and multicultural education, but also they took an active role as they participated in it and flourished under his guidance. Through examination of key learning experiences that occurred in Dr. Vermette’s class, one can thereby apply these same notions into other college classroom settings, acquiring the similar affective benefits and cognitive gains for all students.
Figure 3.

See me please!!!

John T

1. One thing I thought deeply about and want to remember is teaching. It is easy but teaching is difficult. Even though it may seem like everyone understands, it is not. I am one of the few who actually understand.

2. One way that I helped build our classroom community was by contributing to open forum discussions. I was able to answer and give ideas to other classmates.

3. Freedom, power, sense of belonging are Glasser’s motivation.

4. One thing that Ladson-Billings (1994) would’ve liked about class was...

5. One thing that I am very proud of today was... and NOT a klutzy.

6. I hope that the instructor understands that LH 8% hospital very important.

7. Gardner’s (1983) “multiple intelligences” were utilized today by...

8. Diversity was a strength when...

9. Today, class is like a good day because we had multiple professionals in one lecture and they spoke on education. It is also beneficial seeing different people lecture as it sparks our interest.
1. One thing I thought deeply about and want to remember is that when people talk about the Canadian school system, I felt as though I managed to generate further discussion on the topic by introducing new and interesting material.

2. One way that I helped us build our classroom community was that my response about the Canadian school system. I felt that people could see that I was interested in generating further discussion on the topic by introducing new and interesting material.

3. Fun, freedom, power, sense of belonging are Glasser’s (1986) 4 motivators.

Today, I felt a definite sense of belonging. Though the exercise was difficult, I felt that people could see that I was interested in generating further discussion on the topic by introducing new and interesting material.

4. One thing that Ladson-Billings (1994) would’ve liked about class was that people could see that I was interested in generating further discussion on the topic by introducing new and interesting material.

5. One thing that I am very proud of today was that people could see that I was interested in generating further discussion on the topic by introducing new and interesting material.

6. I hope that the instructor understands that it is sometimes difficult to stick with the discussion in class. It can often times get confusing as many different ideas are being talked around at the same time.

7. Gardner’s (1983) “multiple intelligences” were utilized today by people could see that I was interested in generating further discussion on the topic by introducing new and interesting material.

8. I saw that diversity was a strength when we did the exercise in which we were asked to create groups of students from De Vette’s descriptions. I was especially taken back by the diversity of the students in the exercise, which showed through their participation.

9. Today, class as a whole was not very different because people could see that I was interested in generating further discussion on the topic by introducing new and interesting material.
References


The Effect of Concept Mapping on Preservice Teachers’ Reflective Practices when making Pedagogical Decisions

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Abstract

The purpose of this study was to determine the effect of using concept mapping to promote reflective instructional decision-making among junior level education preservice teachers when planning lessons for elementary and secondary students. The researchers were interested in determining if there was a connection between the use of concept mapping to help preservice teachers improve their instructional decisions when planning lessons and their reflective practices when striving to improve the quality of their lessons. The eighty-five participants in the study were junior education majors enrolled in an introductory education course (Planning and Teaching Strategies for Effective Classroom Practice). This course provided opportunities for reflection of classroom practices, curriculum design and planning. The intervention group consisted of forty-one (n = 41) preservice teachers and the control group consisted of forty-four (n = 44) preservice teachers.

Keywords: Concept mapping, reflective processes, pedagogy, instructional decisions.

In 2002 President Bush stated, “The effectiveness of all education reform eventually comes down to a good teacher in the classroom. A good teacher can literally make a life-long difference”. Teacher education programs assist prospective teachers on the road to becoming effective teachers by providing the basic knowledge and skills necessary. The ability to reflect on one’s work and improve practice based on these reflections are important pieces to becoming an effective teacher. University instructors assist preservice teachers by teaching them about the instructional situations they will encounter in the classroom and asking them to reflect on their observations. According to Moore (2003), field experiences hold great potential for providing preservice teachers the opportunity to practice instructional decision making and reflective practice. Through reflection, preservice teachers analyze classroom situations in order to make appropriate pedagogical instructional decisions as they plan lessons. These decisions are key to effective instructional planning and teaching. Their skill in reflection will be a vital skill as preservice teachers enter the teaching workforce.

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The training process for preservice teachers often includes planning several days of lessons related to a common theme or concept. Lim, Cheng, Lam and Ngan (2003) pointed out that many preservice teachers demonstrate difficulty making content connections when planning sequential lessons that span several days. The skill to effectively organize and reflect upon the content during planning can be a key to assisting preservice teachers with this task. Zeichner and Liston (1996) stated that preservice teachers who practice reflective teaching give careful thought to the instructional choices made throughout the process of planning and teaching. They also anticipate and assess the impact their choices have on student learning. According to Veal and MaKinster (1999), the theoretical basis for reflective practices includes constructivism, metacognition, and the notion of pedagogical reasoning. In order to help preservice teachers adequately construct knowledge in regard to effective instructional planning, it is important for them to be aware of the process of learning. Constructivism is a theory of how people learn - the belief that we construct knowledge in unique ways, based on our prior knowledge and experience. Metacognition involves a person’s awareness of the process of learning. Pedagogical reasoning defines the process of identification and selection of strategies for representing key ideas in the lesson. Reflection requires preservice students to think about what they know as well as how students learn and to understand that this impacts their effectiveness as teachers.

Several research studies have been conducted that investigated reflective practices of preservice teachers. One such study, conducted by Bainer and Cantrell (1995), identified nine dominant themes or categories of reflective units on which preservice teachers reflect. Their findings revealed that preservice teachers improved in their reflective abilities when addressing issues related to teaching and learning and they achieved somewhat higher levels of reflection when focusing on these nine themes. Another study conducted by Penso, Shoham, and Shiloah (2001), focused on combining the development of teaching skills with reflective activity. Their findings pointed to the need to consider ways of creating opportunities for the development of reflective thinking among preservice teachers, which could promote the development of their ability to think critically and be flexible in solving problems. A third study, conducted by Lim et al. (2003), studied the effect of semantic mapping on the reflective and thinking skills of kindergarten teachers. They found that visual maps were excellent as a medium for displaying a network of visual information. Implications for further study included using mapping as a way to categorize, link and organize concepts while planning lessons.

Hyerle (1996) recommended the introduction of a common visual language, such as concept maps, to help in the development of reflective thinking. When consistent and flexible patterns of thinking are introduced, applied, and reinforced, a deeper level of understanding of interrelated thinking processes could develop over time. The use of a common tool, such as concept maps, by the university instructor in the teacher education class provides a “common visual language” so that all preservice teachers have a similar format when discussing planning and instructional practice. Fraser (1993) pointed out that a concept map is intended to externalize an individual’s cognitive structure. Through the actual process of constructing a concept map, the individual can also make new connections and recognize concepts which should be added.
Fosnot (1996) stated that reflection of both content and the learning process is paramount to the development of effective lessons. The findings of a study conducted by Weiss and Pasley (2004) reported that of the 350 representative lessons studied, only 15% were classified as being of high quality. The researchers pointed out that many lessons judged to be highly effective included a variety of experiences that enabled students to tap into multiple pathways in developing or reinforcing a concept. Martin (1994) conducted a study in which he taught education majors to use concept maps to develop lesson plans. Professors in the study stated that their students viewed concept mapping as a way of providing a more comprehensive understanding of what they were preparing to teach, eliminating sequencing errors, and enabling teachers to develop lessons that are truly interdisciplinary.

Reflecting on decisions involved in producing high quality lessons is only the beginning. In order to be considered effective teachers, preservice teachers are required to demonstrate pedagogical content knowledge as well. Veal and MaKinster (1999) defined pedagogical content knowledge as the ability to translate subject matter to a diverse group of students using multiple strategies and methods of instruction and assessment while understanding the contextual, cultural, and social limitations within the learning environment. These pedagogical strategies included: planning, teaching methods, evaluation, group work, questioning, wait time, feedback, individual instruction, lecture, demonstration, and reinforcement. According to Hyerle (1996) the process of developing pedagogical content knowledge can be aided by the use of visual webs.

Brooks (2004) stated that the uncontested purpose of our education system is to teach for meaning, prepare students for the varied worlds beyond school, foster students’ deep understandings of content areas, and lead students to achieve and to develop the disposition to want to achieve. Searching for meaning is the purpose of learning, so teaching for meaning is the purpose of teaching. With this in mind, Brooks (2004) further stated that researchers have extensively studied concept mapping in K-12 learning environments as a tool to help learners understand the concept of similarities and differences, cause and effect, part as opposed to whole and analogical sets. Yet the education system does not stop with the K-12 learning environment. Understanding these types of relationships is an essential component of conceptual change and cognitive growth in the development of content meaning in all departments at institutions of higher education as well.

Kinchin (2000) pointed out that work by Novak has shown concept mapping to be a classroom technique that can enhance learning in the sciences. Harpaz, Balik, and Ehrenfeld (2004), studied the use of concept mapping as a method for advanced learning in nursing education. Nursing school students and instructors were asked to compare concept mapping with traditional teaching methods of instruction. Their findings suggested nursing programs could benefit from incorporating the use of concept mapping as a teaching method. Other programs at institutions of higher education have explored the use of concept mapping to help university students develop a deeper understanding of the content. Freeman (2004) conducted an experiment using a typical business consulting scenario that involved two treatment groups enrolled in a US business school. Results of
this experiment showed the concept map to be a good communication tool, beneficial, easy to use, and useful to undergraduate university students.

The findings from these cited studies aided the researchers in conducting this study and drawing conclusions based on results of its findings. The implementation and findings from this study are discussed in the following sections.

**Statement of the Problem**

The purpose of this quasi-experimental research study was to determine the effect of using concept maps to promote reflective instructional decision-making among junior level preservice teachers when planning lessons for elementary and secondary students. The effect on the quality of lesson plans prepared by junior level preservice teachers using traditional instruction and concept mapping was compared to junior level preservice teachers who planned lessons using more traditional methods of instruction. Another purpose of the study was to examine the effect of concept mapping on the reflective processes of junior level preservice teachers when making pedagogical instructional decisions.

**Hypotheses**

Hypothesis #1:

The lesson plan quality of junior level preservice teachers using concept mapping and receiving traditional instruction will not differ significantly from the lesson plan quality of junior level preservice teachers receiving only traditional instruction.

Hypothesis #2:

The reflective practices of junior level preservice teachers making pedagogical instructional decisions using concept mapping and receiving traditional instruction will not differ significantly from the reflective practices of junior level preservice teachers making pedagogical instructional decisions receiving only traditional instruction.

**Limitations of the Study**

One limitation of this study was one of the researchers instructed participants and scored lesson plans and reflective journals of both groups. Experimenter bias could result in the instructor/researcher unintentionally transmitting expectations about the outcomes of the study to the participants, subsequently affecting their behavior. Kaptchuk (2003) stated that awareness of subjectivity will make assessment of evidence more honest, rational, and reasonable. Nevertheless, awareness of the systematic errors that can occur in evaluative processes may facilitate the self regulating forces and help produce reliable knowledge. Precautions taken to avoid the risk of experimenter bias consisted of numbering the papers rather than having students write their names on lesson plans and journals, mixing the lesson plans and journals of the treatment and control groups when scoring and, the
recruitment of an outside scorer to insure reliability. A second limitation may have been that the course was taught during a full summer school term. This could have added to the intensity of the course; however, the preservice teachers received the same amount of contact time with the instructor, the same content and had to meet the same requirements as in the regular fall or spring terms.

**Delimitations**

A delimitation of the experimental study was that the researcher used four junior level classes during a full summer term. The time frame for full summer courses was a two month period, from the beginning of June to the end of July. The summer classes were taught two times a week for two and one-half hours per class session. The fall and spring classes were taught two times a week for one and one-quarter hours per class session. Summer school students attended a total of fourteen class sessions while fall and spring students attended a total of twenty-eight class sessions, yet contact hours were equal.

**Design**

A quasi-experimental nonequivalent design was used in this study since the research participants were not randomly assigned to the experimental and comparison groups. The independent variable was the intervention method – concept mapping plus traditional instruction and traditional instruction only. The dependent variables were the scores on the Reflective Journal/Teacher Work Sample (TWS) and the Student Teacher Assessment Instrument (STAI) Checklists.

**Participants**

The convenience sampling for this study consisted of eighty-five university students in four junior level education classes. The groups were formed by the university’s course enrollment procedures, with all participants meeting prerequisite requirements for the course. Prerequisite requirements included the completion of 45 hours of core curriculum, a grade point average of 2.50 or above, passing scores on the Praxis 1: Pre-Professional Skills Tests, successful (“C” or better) completion of junior level pre education courses, and approval by the Teacher Education Committee. Each class consisted of no more than thirty-five students. Students agreed to participate by signing a consent form.

Table 1 contains demographic information about the participants’ age ranges. The majority of the participants (58%) were in the traditional twenty to twenty-five year age range. Twenty-six of the forty-nine participants in this range were in the intervention group while twenty-three were in the control group. Twenty-three percent (23%) of the students were in the non-traditional twenty-six to thirty-five age range. Nine of this 23% were in the intervention group while eleven were in the control group. The remaining nineteen percent (19%) consisted of participants that were over thirty-five years of age.
Seven participants over the age of thirty-five were in the intervention group with nine in the control group.

Table 1. Age of Participants.

<table>
<thead>
<tr>
<th>Age Range</th>
<th>Intervention</th>
<th>Control</th>
<th>Number</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>20-25</td>
<td>26</td>
<td>23</td>
<td>49</td>
<td>58%</td>
</tr>
<tr>
<td>26-30</td>
<td>6</td>
<td>5</td>
<td>11</td>
<td>13%</td>
</tr>
<tr>
<td>31-35</td>
<td>3</td>
<td>6</td>
<td>9</td>
<td>10%</td>
</tr>
<tr>
<td>36-40</td>
<td>2</td>
<td>2</td>
<td>4</td>
<td>5%</td>
</tr>
<tr>
<td>41-45</td>
<td>2</td>
<td>5</td>
<td>7</td>
<td>8%</td>
</tr>
<tr>
<td>46-50</td>
<td>2</td>
<td>2</td>
<td>4</td>
<td>5%</td>
</tr>
<tr>
<td>Over 50</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>1%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>41</strong></td>
<td><strong>44</strong></td>
<td><strong>85</strong></td>
<td><strong>100%</strong></td>
</tr>
</tbody>
</table>

Table 2 indicates the number and percentage of traditional and non-traditional students in both the intervention and control groups. As shown in this table, the percentage of traditional and non-traditional students was closely distributed, with 49% being traditional and 51% being non-traditional. The number of participants in the traditional group were evenly distributed, with twenty-one in both groups. Non-traditional participants in the control group (23) slightly outnumbered the traditional participants in the intervention group (20).

Table 2. Traditional or Non-Traditional Classification of Participants.

<table>
<thead>
<tr>
<th>Classification</th>
<th>Intervention</th>
<th>Control</th>
<th>Number</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Traditional</td>
<td>21</td>
<td>21</td>
<td>42</td>
<td>49%</td>
</tr>
<tr>
<td>Non-Traditional</td>
<td>20</td>
<td>23</td>
<td>43</td>
<td>51%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>41</strong></td>
<td><strong>44</strong></td>
<td><strong>85</strong></td>
<td><strong>100%</strong></td>
</tr>
</tbody>
</table>

Table 3 shows the number of participants representing three education programs, elementary, secondary, and special education. The largest percentage of the participants (84%), were elementary majors, followed by 14% of the participants in the secondary program and 2% of the participants in the special education program. The elementary and secondary participants were evenly distributed between the intervention and control groups. The two special education participants were in the control group with no special education participants in the intervention group.

Table 3. Program Classification of Participants.

<table>
<thead>
<tr>
<th>Classification</th>
<th>Intervention</th>
<th>Control</th>
<th>Number</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Elementary</td>
<td>35</td>
<td>36</td>
<td>71</td>
<td>84%</td>
</tr>
<tr>
<td>Secondary</td>
<td>6</td>
<td>6</td>
<td>12</td>
<td>14%</td>
</tr>
<tr>
<td>Special Education</td>
<td>0</td>
<td>2</td>
<td>2</td>
<td>2%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>41</strong></td>
<td><strong>44</strong></td>
<td><strong>85</strong></td>
<td><strong>100%</strong></td>
</tr>
</tbody>
</table>
Table 4 shows the percentage of male and female participants, with the large majority of participants (85%) being female. The distribution of male students shows that more male participants were found in the intervention group and more females were in the control group.

Table 4. Gender of Participants.

<table>
<thead>
<tr>
<th>Classification</th>
<th>Intervention</th>
<th>Control</th>
<th>Number</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>9</td>
<td>4</td>
<td>13</td>
<td>15%</td>
</tr>
<tr>
<td>Female</td>
<td>32</td>
<td>40</td>
<td>72</td>
<td>85%</td>
</tr>
<tr>
<td>Total</td>
<td>41</td>
<td>44</td>
<td>85</td>
<td>100%</td>
</tr>
</tbody>
</table>

The study was guided by two hypotheses. Instruments used to gather quantitative data included a pre-test (one-day lesson plan checklist), a post-test (three-day lesson plan checklist), and a TWS reflective journal checklist.

**Instruments**

Quantitative data to assess lesson plan quality was obtained from a pretest and a posttest. The Student Teacher Assessment Instrument (STAI) one-day lesson plan checklist provided pretest data and the STAI three-day lesson plan checklist provided posttest data. The STAI instrument was developed by a committee of university faculty, considered experts in the field, from the teacher preparation institutions in the state. This instrument is used by all institutions in the state to assess preservice teachers. It was based on six standard domains developed by the Interstate New Teacher Assessment and Support Consortium (INTASC). Domains included: planning and preparation, communication and interaction, teaching for learning, managing the learning environment, assessment of student learning, and professionalism and partnerships. Content validity is determined by a judgment of whether the items on the checklist measure what they are intended to measure. After initial use of the checklist, revisions were made to the items to insure their validity. The score range for this instrument was 0 – 35 points. Selected items from the STAI were used to gather data to assess lesson plan quality for this study. Both checklists assessed the following STAI standard indicators on a scale from one to four:

1) Specifies or selects learner objectives for lesson.
2) Specifies or selects teaching procedures for lessons.
3) Specifies or selects content materials and technology for lessons.
4) Specifies or selects materials and procedures for assessing learner progress.
5) Uses information about students to plan and organize instruction.
6) Uses knowledge of students’ backgrounds, interests, experiences and prior knowledge to make instruction relevant and meaningful.
10) Uses acceptable written communication in lesson plans and student material.

Quantitative data from the Teacher Work Sample/ Reflective Journal provided information for assessing pedagogical decisions. The Teacher Work Sample (TWS) provides evidence of a preservice teacher’s ability to design and implement standards-based instruc-
tion, assess student learning and reflect on the teaching and learning process. Each section of the TWS checklist contained three components that guided students’ responses. The components were scored on a scale from one to three. The TWS instrument was designed by the Renaissance Partnership for Improving Teacher Quality and is a Title II federally funded project with offices at Western Kentucky University. The score range for this instrument was 0 – 96 points. Information assessed using this instrument included:

- Instructional Design
- Analysis of Student Learning
- Instructional Decision-Making
- Reflection of Teaching and Learning

Results of a study conducted by Denner, P., Norman, A., Salzman, S., Pankratz, R., and Evans, S. (2004) provide initial support for important aspects of content validity for the Teacher Work Sample when used for the purpose of assessing teacher candidates’ ability with respect to teaching process standards. Their findings demonstrated that the teacher work sample performance provided a credible means for teacher education programs to verify teacher candidate performance levels. Faculty were trained in using both the instruments to insure inter-rater reliability. This facilitated the consistent rating of student work across all raters.

The concept maps were graded using a holistic rubric created by Novak and Gowin (1984). They provided three theoretical foundations that are used for a holistic scoring rubric for assessing students’ conceptual growth of ideas using concept maps: clarifying, expanding, and assimilating. Each of these areas is essential for conceptual growth.

The holistic scoring rubric called MAPPER (Minimum to Reflective) is based on the level at which students are applying their thinking processes to content learning and how students generated and organize their ideas to construct a final product. At the lower level (Minimum to Attending), students demonstrate a relatively simplistic understanding of the content. At the middle level (Participating), students have integrated unique (Patterns) of information and conceptual depth. The higher levels (Effective and Reflective) are demonstrated by students’ final products that reveal novel applications and reflectiveness on the process.

**Intervention and Control Conditions**

Traditional lesson planning instruction consisted of teacher lecture, class discussion, group activities, individual conferences, and the introduction of various instructional tools and strategies for effective planning. Individual conferences with preservice teachers were conducted to ensure understanding of the lesson planning process. The STAI template, with lesson plan components, was used as a guide for instruction along with the course text and STAI manual. Prior to planning the three-day lesson, the intervention group was provided instruction on the construction of concept maps. Instruction consisted of a power-point presentation and a demonstration by the course instructor. Instruction
was followed by an activity in which preservice teachers brainstormed ideas on a chosen topic and constructed a concept map to share with the class. The students in the intervention group were then instructed to develop a concept map based on their chosen topic for the three-day lesson plans. Both groups prepared their three-day lessons during the following weeks. Students in both the intervention and control groups turned in a three-day lesson plan. In addition, preservice teachers in the intervention group turned in their concept map. The three-day lesson plan was graded using the posttest instrument. Both the intervention and control groups turned in their Teacher Work Samples/Reflective Journals one week later, which were assessed using the TWS/Reflective Journal Checklist. These instruments provided the quantitative data for the study.

**Data Analysis**

The purpose of this study was to determine the effect of using concept maps to promote reflective instructional decision-making among junior level preservice teachers when planning lessons for students in grades K-8. Specifically, the two areas to be studied in conjunction with the use of concept mapping were the quality of the lesson plan completed by junior level preservice teachers and the effect on their reflective processes when making pedagogical instructional decisions.

**Analysis of the data for Hypothesis 1**

Hypothesis 1 stated: The lesson plan quality of junior level preservice teachers using concept mapping and receiving traditional instruction will not differ significantly from the lesson plan quality of junior level preservice teachers receiving only traditional instruction. Descriptive statistics were computed to determine the mean scores for the pretest and posttest for both groups. An analysis of covariance (ANCOVA) was conducted in which the posttest mean of the intervention group was compared with the posttest mean of the control group with the pretest scores used as a covariate.

An independent samples t-test was used to test null Hypothesis 1. Before testing the significance of the difference in post-test scores, the researcher conducted a t-test to compare the pre-test mean scores for the intervention group and control group. Pre-test scores of the intervention group (\(M = \text{Mean} = 25.12, S.D. = 5.19\)) were found to be significantly higher, \(t(83) = 2.80, p = .006\), than the pre-test scores of the control group (\(M = 22.23, S.D. = 4.31\)).

A one-way ANCOVA was conducted to compare post-test scores for the intervention and control groups while controlling for differences in pre-test means. A preliminary analysis evaluating the homogeneity-of-slopes assumption indicated that the relationship between the covariate and the dependent variable did not differ significantly as a function of the independent variable, \(F(1,81) = .126, p < .72\). The dependent variable used in the ANCOVA was the three-day lesson plan (post-test). The covariate was the one-day lesson plan (pre-test). Results of the ANCOVA, \(F(1,81) = .592, p = .44, \eta^2 = .007\), supported the null hypothesis. Although the effect size was moderately high (\(d = .67\)), no statistical significance was found between the intervention group (\(M = 29.585, S.D. = 4.31\)) and the control group (\(M = 24.73, S.D. = 4.31\)).
3.2919) and the control group (\(M = 27.398, \text{S.D.} = 2.6667\)). Therefore the null hypothesis was not rejected.

**Table 5. T-test Results for Pre-test Scores.**

<table>
<thead>
<tr>
<th>Group</th>
<th>F</th>
<th>p</th>
<th>t</th>
<th>df</th>
<th>p</th>
<th>Mean</th>
<th>SD</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intervention</td>
<td>.836</td>
<td>.363</td>
<td>2.80</td>
<td>83</td>
<td>.006</td>
<td>25.12</td>
<td>5.19</td>
<td>41</td>
</tr>
<tr>
<td>Control</td>
<td>2.79</td>
<td>77.98</td>
<td>.007</td>
<td>22.23</td>
<td>4.31</td>
<td>44</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Table 6. ANCOVA Results of Comparisons of Intervention and Control Groups.**

<table>
<thead>
<tr>
<th>Groups</th>
<th>Sum of Squares</th>
<th>df</th>
<th>Mean Square</th>
<th>F</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between</td>
<td>3.77</td>
<td>1</td>
<td>3.77</td>
<td>.592</td>
<td>.44</td>
</tr>
<tr>
<td>Within</td>
<td>515.83</td>
<td>81</td>
<td>6.37</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Analysis of the data for Hypothesis 2**

Quantitative data from the reflective journal checklist was used to test hypothesis 2 which stated: The reflective practices of junior level preservice teachers making pedagogical instructional decisions using concept mapping and receiving traditional instruction will not differ significantly from the reflective practices of junior level preservice teachers making pedagogical instructional decisions receiving only traditional instruction.

Descriptive statistics were computed to provide information on the mean scores and standard deviations for both groups. To test the hypothesis, a \(t\)-test was run to determine the level of statistical significance (\(p < .05\)) of an observed difference between the sample means.

The \(t\)-test allowed the researcher to compare the mean post-test scores for the intervention and control groups. Scores on the reflective journal for the interventions group (\(M = 91.585, \text{S.D.} = 5.7052\)), were found to be significantly higher, \(t(83) = 3.83, p < .001\), than the reflective journal scores for the control group (\(M = 82.034, \text{S.D.} = 14.9901\)). The effect size was moderately high (\(d = .64\)). The null hypothesis was rejected.

**Table 7. T-test Results for Reflective Journals.**

<table>
<thead>
<tr>
<th>Group</th>
<th>F</th>
<th>p</th>
<th>t</th>
<th>df</th>
<th>p</th>
<th>Mean</th>
<th>SD</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intervention</td>
<td>15.24</td>
<td>.000</td>
<td>3.83</td>
<td>83</td>
<td>.001</td>
<td>91.59</td>
<td>5.71</td>
<td>41</td>
</tr>
<tr>
<td>Control</td>
<td>3.93</td>
<td>55.95</td>
<td>.001</td>
<td></td>
<td>82.03</td>
<td>14.99</td>
<td>44</td>
<td></td>
</tr>
</tbody>
</table>

Novak and Gowin (1984) created a holistic scoring rubric for assessing students’ concept maps. They provided three theoretical foundations that are used for a holistic scoring rubric for assessing students’ conceptual growth of ideas using thinking maps: clarifying, expanding, and assimilating. Each of these areas is essential for conceptual growth.
These three areas are also worthy filters for looking at how students construct their ideas for completing final products, or for evaluating performance and objectives.

The holistic scoring rubric called MAPPER (Minimum=1 to Reflective=5) is based on the level at which students are applying their thinking processes to content learning and how students generated and organize their ideas to construct a final product. At the lower level (Minimum to Attending), students demonstrate a relatively simplistic understanding of the content. At the middle level (Participating), students have integrated unique (Patterns) of information and conceptual depth. The higher levels (Effective and Reflective) are demonstrated by students’ final products that reveal novel applications and reflectiveness on the process.

Analysis of the concept map scores provided the researcher with the information presented in Table 8. Of the forty-one participants in the intervention group, twenty-nine of the participants (71%) scored three or higher on their concept maps. Twelve of the forty-one participants (29%) scored a one or two. This statistical data indicates that the majority of the students had a clear understanding of how to accurately construct a concept map.

Table 8. Concept Map Scores.

<table>
<thead>
<tr>
<th>Score</th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>5</td>
<td>12%</td>
</tr>
<tr>
<td>2</td>
<td>7</td>
<td>17%</td>
</tr>
<tr>
<td>3</td>
<td>11</td>
<td>27%</td>
</tr>
<tr>
<td>4</td>
<td>4</td>
<td>10%</td>
</tr>
<tr>
<td>5</td>
<td>14</td>
<td>34%</td>
</tr>
<tr>
<td>Total</td>
<td>41</td>
<td>100%</td>
</tr>
</tbody>
</table>

Discussion of Results and Conclusions

Analyzing data acquired from a one-way analysis of the covariance (ANCOVA) to test hypothesis 1, revealed that no significant difference was found in the lesson plan quality of junior level preservice teachers using concept mapping and receiving traditional instruction and the lesson plan quality of junior level preservice teachers receiving only traditional instruction. Junior level preservice teachers often find it difficult to plan multiple lessons of high-quality that connect concepts related to a central theme. Even though Hypothesis 1 was not rejected, the notion that using concept mapping as a way to help preservice teachers organize lessons would appear to be educationally sound since research has shown that visual tools graphically link mental associations in order to create a pattern of information. Novak (n.d.) pointed out that one of the reasons concept mapping is so powerful for the facilitation of meaningful learning is that it serves as a kind of template to help organize knowledge and to structure it, even though the structure must be built up piece by piece with small units of interacting concepts.
Figures 1–4 provide examples of content area concept maps submitted by participants.

**Figure 1.**

![Figure 1](image1.png)

**Figure 2.**

![Figure 2](image2.png)
Figure 3

![Concept Map]

**Figure 4.**

![Citizenship Map]
One possible explanation of these results could be the quality of traditional instruction each group received. Several strategies to assist in making the connections between concepts for effective planning were included in the course. In addition, each student received specific feedback and individual assistance through one-on-one conferences with the instructor. One instrument used to provide quality traditional instruction on how to plan effective lessons was Hierarchy for Effective Lesson Planning (HELP). This hierarchy provided direction for including procedures that involved students in rich and authentic learning experiences while taking into account the student’s sensory engagement with the material. Holmes (2002) specified the levels of experiences teachers should include in instructional activities as follows: 1) real world experiences, 2) real world artifacts, 3) representations of real-world artifacts, 4) pictures and visuals, 5) written descriptions, and 6) oral descriptions.

Another example of quality traditional instruction included a deductive strategy introduced to both groups to assist in developing effective lessons was Madeline Hunter’s Decision Line. This deductive approach to instruction included seven-steps to effective lesson planning and focused on the application of research to help teachers make more informed and appropriate decisions in the classroom. These steps included an anticipatory set, objectives/standards, teaching and modeling, guided practice, check for understanding, independent practice, and a closure. Numerous inductive strategies were also included in the traditional instruction, including unguided inquiry, learning cycle, concept formation, cooperative learning, concept attainment, and inquiry training. This extensive use of instructional planning strategies included in both the control and treatment group may have affected the results.

A possible contributing factor to the results of this finding could be the length of the study. Ruiz-Primo, Araceli, and Shavelson (1997) indicated that students can be trained to construct concept maps in a short period of time with limited practice. Taking a closer look at students’ maps, the researchers determined that practice improved map characteristics, yet even with limited practice at constructing concept maps, students were able to demonstrate their knowledge on the topic assessed.

Findings from the ANCOVA conducted to test Hypothesis 1 led the researchers to test for a possible correlation between individual concept map scores and the quality of students’ lesson plans. To test for a possible correlation, gain scores on the pre- and post-test for the intervention group and concept map scores were analyzed to determine if there was a correlation. No significant correlation between gain scores on the pre- and post-test for the intervention group and the concept map scores was found. These results were unexpected since the researchers had anticipated that higher scores on the concept maps would result in higher scores on lesson plans.

During the research process, some students indicated difficulty in constructing the concept maps. These students commented that it would have been easier for them to just plan and write the lesson plans rather than trying to construct a concept map first. The
researchers then began to question if scores on concept maps indicated a clear understanding of how to construct concept maps. Scores on the concept maps indicated that the majority (71%) of the preservice teachers in the intervention group had a clear understanding of how to accurately construct a concept map. This finding led the researchers to question whether these comments by students were related to their different learning styles and multiple intelligences.

Hypothesis 2 stated that the reflective practices of junior level preservice teachers making pedagogical instructional decisions using concept mapping and receiving traditional instruction would not differ significantly from the reflective practices of junior level preservice teachers making pedagogical instructional decisions receiving only traditional instruction. Quantitative data from the Teacher Work Sample/Reflective Journal Checklist provided information for assessing pedagogical decisions. Each section contained three components that guided students’ responses. The components were scored on a scale from one to three, with one being the lowest rating and three being the highest rating. Information assessed using this instrument included:

- Instructional Design
- Analysis of Student Learning
- Instructional Decision-Making
- Reflection of Teaching and Learning

Analysis of the results of a t-test used to test Hypothesis 2 revealed that a significant difference was found. These findings implied that the construction of a concept map during the lesson planning process would help preservice teachers be more reflective in their instructional decision making. This finding was of special interest to the researchers because of its potential impact on the training of preservice teachers. Cruickshank, Jenkins, and Metcalf (2006) perhaps the most important benefit of reflection in preparing to teach is that it enhances our learning about teaching. They also pointed out that it is important for university instructors to determine what preservice teachers need to reflect on in order for them to become reflective practitioners and to improve the quality of their lessons.

**Recommendations Based on Findings**

The results of this study indicated no difference in lesson plan quality among students using concept maps to plan instructional lessons and those not using concept maps. Martin (1994) noted that responses from follow-up questionnaires indicated concept maps intrinsically portray the essentials of sound lesson preparation, and thus are seen as ideally suited to guide teachers in their development of lessons. The method and timeline in which the preservice teachers were introduced to concept mapping in the treatment group may have had an effect on the outcome in this study. The researchers recommend the gradual development of concept maps in conjunction with planning lessons rather than completing the concept map prior to writing the plans.

With respect to the reflective practices of preservice teachers when making pedagogical instructional decisions, findings from this study support Hyerle’s (1996) recommendation...
that concept mapping should be perceived as an effective tool to enhance the reflective process. However, it was found in this study that some junior level preservice teachers preferred not to use concept maps. This could be due to individual learning styles or a result of multiple intelligences. It could also be a result of the length of time the preservice teachers had to become familiar with and use the concept mapping strategy. Again, the gradual development of concept maps in conjunction with planning lessons might positively affect the results.

**Recommendations for Further Study**

It is recommended by the researchers that further study be conducted on how perceptual modality preferences and multiple intelligences impact the construction of concept maps. During the research process, some preservice teachers demonstrated frustration with the process of creating a concept map, stating that developing the concept map was harder than writing the lesson plans. Lim et al. (2003) indicated the need for further study using mapping as a way to categorize, link and organize concepts while planning lessons. The researchers recommend conducting a longitudinal study of preservice teachers spanning from the junior year to the end of the senior year, to better determine the effectiveness of using concept mapping in the planning of units of study. In addition, including a survey to determine students’ style of learning or multiple intelligence as well as their attitudes about concept mapping may provide valuable information. It is also suggested that research be conducted to determine what effect the quality of traditional instruction has on the effectiveness of a tool such as concept mapping.

**References**


The Effect of Concept Mapping

The Record in Educational Leadership, 18(1), 62-73.