

*The Journal of  
Effective Teaching*

*J&T*

*an online journal devoted to teaching excellence*

*Special Issue on  
Student Learning*

*Volume 7/ Issue 1/February 2007*

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## CALL FOR PAPERS

Manuscripts for the second issue will be due May 31, 2007. Articles will be accepted in any of the Content Areas supported by the journal. Consideration of articles for a future special topics issue on *Controversy in the Classroom* will begin in 2007. Closing and publication dates will be set when and if a sufficient number of articles have been submitted.

## 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. We are particularly interested in topics addressed in the particular Content Areas described 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](mailto: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.

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<b>Deadlines for Upcoming Issues</b>		
	<b>Fall 2007</b>	<b>Spring 2008</b>
<b>Submissions Due</b>	May 31, 2007	October 31, 2007
<b>Notification of Acceptance</b>	July 31, 2007	December 31, 2007
<b>Final Manuscripts Due</b>	August 31, 2007	February 28, 2008

## Letter from the Editor-in-Chief

Russell L. Herman<sup>†</sup>

*The University of North Carolina Wilmington, Wilmington, NC*

We are pleased to bring the academic community *The Journal of Effective Teaching* in its new format with this special issue on *Student Learning*. *The Journal of Effective Teaching* (formerly called *Effective Teaching*) has been in existence since 1996. Originally the journal was one of the first to highlight a forum for discussing teaching by providing an online journal with multimedia content. However, the journal was ahead of its time and there was little interest in providing such content at that time.

We are now entering an era in which information is commonly transmitted through the web and publications in many fields are provided under open source environments. In this spirit we have decided to change the format of the journal and to offer authors a new avenue to publishing their findings in a readily available format. While there are now several other such journals, we hope to expand our services to accommodate those seeking a place to describe their experiences in the classroom, highlighting effective teaching in undergraduate instruction.

The first article in this issue is about rubrics. Wolf and Stevens argue that rubrics can be just as important in higher education as they are for schoolteachers and their students. So, "what is a rubric?", you may ask. I know colleagues who have never run into the term "rubric", even though they may be using them without knowing it. Some detest rubrics, thinking that they may be too restrictive in the learning process. Others may reply, "we do not want to lead students by their hands". Wolf and Stevens make the case that rubrics do advance student learning, improve teaching and are important for assessment. In their article they describe how to design effective rubrics for higher education.

Technology is continually changing and the students of today are more comfortable with technology (computers, cell phones, podcasting, etc.) than students were a decade ago. Therefore, the technology in the classroom and its impact on student learning must be assessed continually. In the second article, Teeter et al. relay their investigations of the paperless accounting classroom. In particular they provide an account of the use of student response pads (or, clickers), course management systems and instructor use of Tablet PCs in content delivery. One of their main concerns is that the business world has adapted to the use of technology faster than the academic world. We need to be preparing students for that world. In attempting to do this, how do accounting students respond to these changes when they are not used to a "high tech" approach? The authors present findings based upon the perceptions of their students as expressed in journals and surveys.

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In recent years we have seen the growth of learning communities. These have taken many forms, all incorporating shared experiences in the classroom amongst students taking linked classes and often living inside the same physical walls. There have even been virtual classrooms. In their paper, McDougall and LaMonica make the case that many linked classes involve coupling what they call "content" and "application" courses. They are instead interested in linking two content-based courses. In particular, they describe their experiences with linking courses in history and religion and how to approach curricular activities and goals thematically. While some students greatly benefit from such linked courses, the authors are quick to point out some lessons that they wish to pass along to others.

Many educators link the success of learning to critical thinking. There is an ongoing struggle in academia, or even inside each instructor's mind, as to how to balance content-based learning and critical thinking skills. However, how much does learning rely upon creativity? Gomez reviews the literature on the various types of creativity. Is creativity linked to intelligence? Are creative students better learners? Does cooperative learning help, or hinder, creativity and the development of critical thinking skills? If creativity is a desirable thing, then how can we nurture it? Educators are always looking for ways to tap into students minds to turn on that key, winding up the creative thinker inside. Would understanding creativity lead to strategies to unlock these eager minds?

On the other hand, Klemm investigates learning through memorization skills. While acknowledging the importance of creativity and critical thinking, Klemm emphasizes the need to have a base of known ideas and skills. The process of thinking consists of mentally moving around chunks of information. Klemm is careful to separate out from the process of memorization what we often call rote memorization. Such memorization does not promote student learning. So, what does the literature tell us about memory so that we can help students retain what they have learned as a basis for becoming better problem solvers? Klemm provides some insights as to how one might structure teaching methods to take advantage of how students digest information.

Finally, Courtney gives us our first featured book review on *Rewriting: How to do things with texts*, by Joseph Harris (2006). In this book we are reminded that one of the most important aspects of writing is recognizing that it is not just important for students to communicate their first thoughts, but should also have the opportunity to revisit their first thoughts and spend time rewriting their own work and learning how to use sources to support their arguments.

These are not all of the issues affecting student learning. I expect that additional voices will want to be heard. Our vision for future issues of *The Journal of Effective Teaching* is to allow a place for these voices. We are seeking articles on teaching in which authors share their insights in pedagogy, innovations in teaching and learning, and classroom experiences in the form of a scholarly communication. We hope that you have enjoyed these articles and we look forward to working with new authors and reviewers. For additional information, feel free to explore the journal web site: <http://www.uncw.edu/cte/et/>.

## **The Role of Rubrics in Advancing and Assessing Student Learning**

Kenneth Wolf<sup>†</sup> and Ellen Stevens  
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### **Abstract**

A rubric is a multi-purpose scoring guide for assessing student products and performances. This tool works in a number of different ways to advance student learning, and has great potential in particular for non-traditional, first generation, and minority students. In addition, rubrics improve teaching, contribute to sound assessment, and are an important source of information for program improvement. In this article, we discuss key features of a quality rubric, present an example of a rubric for assessing a social science research study, and describe three basic steps in designing an effective rubric.

**Keywords:** Rubrics, assessment, planning, instructional design.

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While schoolteachers and their students have long seen the value of assessment rubrics, our experience in working with faculty is that rubrics have been largely ignored in higher education contexts (with the exception of Schools of Education). These multi-purpose scoring guides for assessing student products and performances work in a number of different ways to advance the goals of an educational program. Not only do rubrics contribute to student learning, they have great potential for non-traditional, first generation, and minority students. As well, rubrics improve teaching, provide feedback to students, contribute to sound assessment, and are an important source of information for program improvement.

So, what exactly are rubrics? How are they developed? What are their key features? Why are they useful? What are their limitations? What role can they play in program improvement? These questions, and more, will be addressed in this article.

Before we define and describe rubrics, here are a couple of scenarios to help set the stage (modified from Arter & McTighe, 2001, pp. x-xi):

An undergraduate student in an American History course spent many hours working on her “museum display” on the Gold Rush. She received a “B” on her project with no other comments. She expressed concern that she had met the project guidelines and asked the professor what she could have done to get an “A.” The professor responded, “I reserve ‘A’ for a highly creative project.” When asked for

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an example, the professor replied, “Well, you could have presented it from the point of view of the Native Americans affected by the Gold Rush.”

What’s the problem here...? There are no explicit performance criteria to inform students in creating their projects or to guide the professor in assessing them. A rubric here could help address this situation.

How do you think this student felt? Probably the same way that students in any course feel when the criteria for an assignment are ambiguous and the assessment seems arbitrary. When the curriculum is “hidden,” students who can’t guess what the expectations are will be more at risk than those who know how to “play the game” (Jackson, 1990). A good rubric can take the mystery out of assignments for *all* students. As Eisner notes: “More than what educators say, more than what they write in curriculum guides, evaluation practices tell both students and teachers what counts. How these practices are employed, what they address and what they neglect, and the form in which they occur speak forcefully to students about what adults believe is important” (Eisner, 1991, p. 81).

Now, let’s look at another scenario:

In an English department class, a professor introduced her students to the qualities of an effective oral presentation by showing them videotaped examples of excellent, as well as poor, speeches and presentations. Guided by the teacher, the students identified four key criteria (traits) that they agreed were important for an effective speech—content, organization, delivery, and language. They defined each of these and what would constitute strong, middle, and weak performance on each trait. They then referred to these performance criteria when preparing their own speeches, and the teacher used the same criteria when providing feedback on, and grading, their presentations.

What’s going on in this scenario? Not only are there criteria that define the features of a speech, but the professor has shown strong and weak examples of oral presentations and even invited the students to generate evaluation criteria based on these examples and their own experiences. Clearly, both students and professor use the criteria in talking about and giving feedback on the speeches. In other words, the learning process is anchored by a rubric--a scoring tool used to evaluate a performance in a given outcome area based on a list of criteria describing the characteristics of products or performances at varying levels of accomplishment.

### ***A Rubric for Springboard Diving***

We always have criteria in mind when we evaluate something—whether it’s a piece of art or a dive off a springboard. It’s just that these criteria aren’t always explicit, sometimes even to ourselves. When we judge a springboard diver’s performance as good or bad, for example, we are basing that judgment on something. We have some criteria in mind. Maybe it’s the number of body rotations or the splash the diver makes on entry. Maybe it’s something that really has nothing to do with the performance itself such as the diver’s

smile or nationality.

As we become more informed about springboard diving, though, we may begin to draw on the five criteria used by the professional association (Federation Internationale de Natation, 2006): Starting Position, Take Off, Approach, Flight, and Entry. These criteria are then elaborated in a rubric that describes what we mean by each. “Entry,” for example, is based on a number of considerations about body position. “The entry into the water shall in all cases be vertical, or nearly so, with the body straight, the feet together and the toes pointed. When the entry is short or over, the judge shall deduct according to his opinion (p. x).” Each of these criteria is then described on six levels of performance from “complete failure” to “very good” (see Table 1).

A rubric in springboard diving makes it more clear to the judges how to rate the performance, though these judges still need to draw on their extensive professional knowledge in applying these criteria. As well, coaches study the criteria so that they can provide effective instruction to their athletes. And the athletes themselves examine the criteria to guide them in planning and perfecting their dives. In the same fashion, for an assignment in a course or for other types of learning experience, such as studios or internships, learning is best achieved if all participants are clear about the criteria for the performance and the levels at which it will be assessed.

**Table 1. Springboard Diving Rubric**

	<i>Complete Failure</i>	<i>Unsatisfactory</i>	<i>Deficient</i>	<i>Satisfactory</i>	<i>Good</i>	<i>Very Good</i>
Starting						
Take-off						
Approach						
Flight						
Entry						

### Developing a Rubric

Sometimes rubric development stops after the performance criteria have been identified and performance levels established (as portrayed in Table 1), but the best rubrics include another step in which each of the cells in the matrix contains a description of the performance at that level. These three steps in designing a rubric will be discussed in the following section, though the particulars can vary across rubrics depending upon, for example, the context for the course or nature of the learning being assessed..

**Identifying Performance Criteria.** The first step in developing a rubric is to identify the criteria that define the performance. Suppose the performance task or expected learning outcome is that “students will be able to give an effective oral presentation.” What are the key features or criteria of an effective oral presentation? While it depends upon the purpose and context for the speech, four general criteria might be identified: delivery, content, organization, and physicality.

Three to six criteria seem to work best. It is not so many that it overwhelms the memory and not so few that meaningful distinctions in the performance can't be made. Sometimes these criteria can be weighted as well. There may be one or two criteria that are valued more than the others and they could be given a higher value when calculating the overall score for the performance or product.

Another important consideration is that the performance to be assessed should be observable and measurable. Some descriptions of learning outcomes or performance criteria are so vague that accurate measurement is difficult. For example, if the criterion is that "Students will know the states of the union," it may not be clear what "know" means. Does "knowing" mean that students need only to be able to list the states, or be able to fill in the names on a map, or draw a map of the United States, or discuss the history of the state, or ....? The measurement problem can be lessened if the performance to be assessed is described with more specific action verbs where possible, such as list, identify, draw, discuss, explain, compare, critique, predict, and so on.

Often the performance criteria are determined ahead of time by the instructor or a professional organization, but sometimes they can be created by the students in a course, especially if the assignment is new to the instructor. Having students generate the criteria for assessing the performance can serve several purposes. Engaging students in a discussion about "What makes for a good speech" (or essay or model or dance or...) can help them deepen and internalize their understanding of the criteria for a quality performance in that particular area. As well, involving students in this conversation before they begin the assignment or project can help them make more informed choices as they begin to identify the topic for their laboratory study, the medium for their performance, or the design for their model. Another benefit is that students can sometimes offer insights into the performance that the instructor may not have envisioned. When a student asks if their oral presentations can be a video of themselves before a live audience rather than a live in person in class presentation, it can open possibilities the instructor hadn't considered. An additional pedagogical benefit is that the students' comments can reveal to the instructor misconceptions that students may have about the topic, and the instructor can adjust his or her teaching of these concepts accordingly. A valuable activity can be to make a list of the assessment criteria that students identify as the project is introduced and another list again after they have completed the project, and then have them compare their pre-and-post lists to see if their understanding of the key concepts have changed or deepened. Even if the rubric has already been developed in advance however, asking students to engage in a discussion about the assessment criteria before the rubric is handed out can still be a valuable activity for many of these same reasons.

**Setting Performance Levels.** The second step in the process is to decide how many levels of performance are appropriate for the assessment. Typically, rubrics have from three to six rating levels. What drives the choice of the number of levels is the purpose for the assessment. If the main purpose is to make summative decisions, such as whether someone will pass or fail a course or an exam for example, then fewer levels are better. The fewer the levels of performance for the rater to consider, the greater the reliability and effi-

ciency in scoring the performance. The more levels, the lower the reliability in scoring and the more time it will take for raters to make the decision.

If, however, the primary purpose of the assessment is formative, or to give feedback to learners to support them in improving their performance, then more performance levels (and more performance criteria) give the learner more specific information about the features of the performance that need attention. The trade-off again is that the greater number of scoring levels and performance criteria, the more time it takes the rater to assess the performance.

The headings for the different performance levels can vary depending upon the purpose and contexts for the assessment. For some contexts, developmental language is the best choice, such as “Emerging, Developing, Arrived.” A developmental scale is respectful to the learner and recognizes that all of us are learners in any number of areas. The emphasis is on growth. Other times, more mastery-oriented language is appropriate as in “Below Proficient, Proficient, Above Proficient.” If the purpose of the assessment is to demonstrate whether or not students have met the standards for the course or program or profession, then identifying whether a learner is proficient or not is the key. Sometimes, numbers are used instead of words, while at other times numbers and words are used together (see Table 2).

**Table 2. Performance Criteria and Levels for Speech Rubric**

	<i>Below Proficient (1)</i>	<i>Proficient (2)</i>	<i>Beyond Proficient (3)</i>
Delivery			
Content			
Organization			
Physicality			

***Creating Performance Descriptions.*** The third step in the process is to write a description for each cell in the matrix. For example, “delivery” is described in a brief statement at each of the three performance levels (see Table 3). The challenge in creating these paragraphs is to provide enough information to guide the creation and scoring of the project, but not so much that it overwhelms the reader or the performer. Keep in mind that the rubric is not intended to replace the instructor but instead to guide and support him or her in exercising informed judgment.

Parallel structure across descriptions for each criterion (e.g., delivery) is important. The more parallel the descriptions are in form and content, the more dependable and efficient the scoring will be. One way to increase parallelism across descriptions is to identify a set of attributes for each criterion and then build each statement around those attributes. For example, the “delivery” descriptions were developed around three attributes: volume, pacing, and rapport. The same process is then followed for the other three criteria (e.g. content, organization, physicality) until all of the cells in the matrix are completed (see Table 4).

**Table 3. Speech Rubric with Performance Statements for the “Delivery” Criterion**

	<i>Below Proficient (1)</i>	<i>Proficient (2)</i>	<i>Beyond Proficient (3)</i>
Delivery <ul style="list-style-type: none"> <li>• Volume</li> <li>• Pacing</li> <li>• Rapport</li> </ul>	It is difficult to hear the speaker, and the pace is either too slow or too fast. Speaker has little connection with audience.	Speaker is easy to hear and pace keeps audience’s attention.	Speaker varies volume to fit the message, with a pace that is appropriate to the rhythms of the topic. Audience is clearly engaged.

When using the rubric in making an overall decision about a performance, the final rating can be based on an analytic process of adding up the scores for each of the four criteria (i.e., content, delivery, language, physicality) and calculating an average, or, alternatively, by looking over the ratings for the four criteria and making a holistic judgment that considers each of the scores but blends them in an overall judgment-based rating process. For example, if the scores were delivery = 2, content = 3, organization = 2, and physicality = 3, then an analytical rating (assuming equal weighting of the four criteria) would give an overall mean score of 2.5. A holistic rating might end up as a 2 or 3 however, depending upon the rater’s overall sense of the performance. When the criteria are not equally weighted, numerical calculations need to be adjusted accordingly

**Rubric for Assessing a Social Science Research Study**

The rubric presented in this section was developed by Kenneth Wolf (a co-author of this article) and his colleagues in the School of Education and Human Development for use in research methods classes for students who are earning a master’s degree in education or counseling (see Table 5). The main assignment for the course, which counts for half of the course grade, is for students to work together in small groups to design and carry out small-scale research studies on topics in their fields. Students are encouraged to conduct studies that advance the learning or development of their students or clients, or that contribute in some way to the organizations in which they work. Students in education might, for example, conduct a pilot experimental study to examine the effectiveness of a new literacy curriculum that their school is considering purchasing, interview Latino parents about their understanding of the school district’s policies on bilingual education, or observe an individual student on the playground as a way of understanding that student’s social skills and development. Students first submit a research proposal and receive ungraded, written feedback (based on the rubric). At the end of the semester they turn in their completed studies and receive written feedback along with an overall rating based on the rubric performance levels (e.g., proficient).

**Table 4. Speech Rubric**

	<i>Below Proficient (1)</i>	<i>Proficient (2)</i>	<i>Beyond Proficient (3)</i>
<b>Delivery</b> <ul style="list-style-type: none"> <li>• Volume</li> <li>• Pacing</li> <li>• Rapport</li> </ul>	It is difficult to hear the speaker, and the pace is either too slow or too fast. Speaker has little connection with audience.	Speaker is easy to hear and pace keeps audience's attention.	Speaker varies volume to fit the message, with a pace that is appropriate to the rhythms of the topic. Audience is clearly engaged.
<b>Content</b> <ul style="list-style-type: none"> <li>• Accuracy</li> <li>• Relevance</li> <li>• Organization</li> </ul>	The content of the speech is inaccurate or incomplete, or not relevant to the topic or audience. The sequence of ideas is confusing.	The content is accurate and complete, and relevant to topic and audience. The content is well sequenced and the relationship among ideas clear.	The content is precise and comprehensive, and customized to the audience and appropriate for the topic. The sequence and organization of ideas are powerful.
<b>Language</b> <ul style="list-style-type: none"> <li>• Vocabulary</li> <li>• Enunciation</li> <li>• Grammar</li> </ul>	Vocabulary is simplistic or trite, or is not appropriate to audience or topic. Speech is sprinkled with "ums" or is difficult to understand. Speaker makes many grammatical mistakes.	Vocabulary is appropriate to audience and topic. Speech is clear and easy to understand. Grammar and syntax are sound.	Vocabulary is rich and vivid, and appropriate to audience and topic. Speech is clear and easy to understand, with careful attention to pronunciation. Grammatical and syntactical structures are complex and effective.
<b>Physicality</b> <ul style="list-style-type: none"> <li>• Body Movement</li> <li>• Eye Contact</li> <li>• Facial Expression</li> </ul>	Body movement is too much or too little. Speaker displays little eye contact and facial expression.	Body movement is appropriate to the context. Speaker makes regular eye contact with audience and varies facial expressions.	Speaker customizes body movement and gestures to context and topic. Speaker engages audience through varied and compelling eye contact and facial expressions.

**Table 5. Rubric for Research Project in Education**

	<i>Below Proficient</i>	<i>Proficient</i>	<i>Above Proficient</i>
<b>Abstract</b>	The <u>abstract</u> is missing, incomplete, or inaccurate.	The <u>abstract</u> summarizes the study in 50-150 words (essentially drawing a sentence from each of the main sections of the completed research report).	The <u>abstract</u> concisely summarizes the study in 50-150 words.
<b>Introduction</b>	The <u>introduction</u> section may be incomplete or unclear. Potential problems may include a vague problem statement, research question(s) may not be measurable, or constructs may not be clearly defined.	The <u>introduction</u> section includes a rationale, problem statement, literature references and research question(s). The rationale and problem statement are clear and credible. Three or more literature references are cited. The research question is stated and can be addressed with empirical evidence. Constructs are defined and variables explained.	The <u>introduction</u> section is complete and clear. Additionally, the rationale and problem statement are compelling (and may be linked to a conceptual framework) and the research question(s) insightful.
<b>Methods</b>	The <u>methods</u> section may be incomplete or unclear. Possible problems may include insufficient information about subjects/informants, instruments not fully described in terms of their conceptualization or aligned with the research questions, or procedures not accurately reported.	The <u>methods</u> section provides essential information about the subjects, data collection procedures, and, if appropriate, treatment. The research question has been translated into appropriate choices at the design level. Subjects are described in terms of number and important characteristics. Data sources and collection procedures are described in terms of underlying conceptualizations. If appropriate, scales are described, and examples of items given. Data collection protocols (e.g., questionnaires, interview questions, structured observation protocols) are included in the appendix.	The <u>methods</u> section provides essential information about the subjects, data collection procedures, instruments, procedures, and, if appropriate, treatment. In addition, the instrument or procedures, for example, might represent a novel and insightful approach to the research problem.

**Table 5. Rubric for Research Project in Education (cont'd.)**

	<i>Below Proficient</i>	<i>Proficient</i>	<i>Above Proficient</i>
<b>Results</b>	<u>Results</u> are inaccurate or incompletely presented. Typical problems include incorrect statistical analyses in quantitative studies and unsupported claims in qualitative-type studies.	The <u>results</u> section in a quantitative study presents only the “facts.” Brief and accurate interpretation is offered, indicating understanding of how the data respond to the research questions. Tables or graphs are easy to interpret and correctly present the data. In a qualitative study, results and interpretation may be interwoven, and each theme is illustrated with two or more data segments (e.g., quotes from informants).	<u>Results</u> are correctly presented and the analyses are extensive and sophisticated.
<b>Discussion/ Conclusion</b>	The <u>discussion</u> section may be incomplete or not clearly connected to the results.	The <u>discussion</u> section soundly interprets the findings. The discussion section may also include conclusions, limitations of the study, recommendations for action, and future study directions.	The <u>discussion</u> section soundly interprets the findings and is carefully connected with all sections of the report, including the introduction, research questions, instruments, and results.
<b>Limitations</b>	<u>Limitations</u> of the study are not discussed.	<u>Limitations</u> of the study are discussed.	<u>Limitations</u> are extensively described.
<b>References</b>	<u>References</u> may be missing, incomplete, or incorrectly cited.	<u>References</u> are given (and correctly cited in the body of the report and included on a separate reference page in APA format).	<u>References</u> are correctly cited in body of the report and on a separate reference page in APA format.
<b>Written Report</b>	The <u>written report</u> is incomplete or unclear. Typical problems include missing or inadequately described sections.	The <u>written report</u> is clear and well organized. The vocabulary in the report demonstrates an understanding of key terms and concepts (e.g., construct, subject, treatment). The report contains few mechanical errors (e.g., punctuation) and is in APA format. Study is ethical.	The <u>written report</u> is clear and well organized and demonstrates an understanding of basic and advanced research concepts and terms.

In this course, both “beyond proficient” and “proficient” translate into “A” grades on the projects, but “beyond proficient” recognizes performances that go beyond what was required, which is not an uncommon occurrence with graduate students who may be presenting their findings at their school’s faculty meetings or to school boards. “Below proficient” performances most often result in “B” grades since graduate students’ projects typically suffer from only minor omissions or problems. The “beyond proficient” rating assumes that the students have demonstrated all of the features of a “proficient” performance, but with remarkable grace or insight.

A group’s overall rating for their project could be based on an analytical averaging of the ratings for each of the individual sections of the report (e.g., “proficient” for the abstract, “beyond proficient” for the introduction section), assuming each of the sections is of equal weight or value. However, these projects are rated in a more holistic manner in which the faculty member considers a group’s ratings on the individual sections but then steps back and makes an overall rating (while keeping each of the individual section ratings in mind), recognizing that sometimes the whole is larger than its parts.

### **Benefits of Rubrics**

Rubrics contribute to student learning and program improvement in a number of ways—some obvious, others less so.

***Rubrics make the learning target more clear.*** If students know what the learning target is, they are better able to hit it (Stiggins, 2001). When giving students a complex task to complete, such as a building an architectural model or putting together a portfolio of their best photographs, students who know in advance what the criteria are for assessing their performance will be better able to construct models or select photographs that demonstrate their skills in those areas.

***Rubrics guide instructional design and delivery.*** When teachers have carefully articulated their expectations for student learning in the form of a rubric, they are better able to keep the key learning targets front and center as they choose instructional approaches and design learning environments that enable students to achieve these outcomes (Arter & McTigue, 2001).

***Rubrics make the assessment process more accurate and fair.*** By referring to a common rubric in reviewing each student product or performance, a teacher is more likely to be consistent in his or her judgments. A rubric helps to anchor judgments because it continually draws the reviewer’s attention to each of the key criteria so that the teacher is less likely to vary her application of the criteria from student to student. Furthermore, when there are multiple raters (e.g., large lecture classes that use teaching assistants as graders), the consistency across these raters is likely to be higher when they are all drawing on the same detailed performance criteria. Additionally, a more prosaic benefit is the decided decrease in student complaints about grades at semester’s end.

***Rubrics provide students with a tool for self-assessment and peer feedback.*** When stu-

dents have the assessment criteria in hand as they are completing a task, they are better able to critique their own performances (Hafner & Hafner, 2004). A hallmark of a professional is the ability to accurately and insightfully assess one's own work. In addition, rubrics can also be used by classmates to give each other specific feedback on their performances. (For both psychometric and pedagogical reasons, we recommend that peers give only formative feedback that is used to help the learner make improvements in the product or performance, and not give ratings that are factored into a student's grade.)

***Rubrics have the potential to advance the learning of students of color, first generation students, and those from non-traditional settings.*** An often unrecognized benefit of rubrics is that they can make learning expectations or assumptions about the tasks themselves more explicit (Andrade & Ying, 2005). In academic environments we often operate on unstated cultural assumptions about the expectations for student performance and behavior and presume that all students share those same understandings. However, research by Lisa Delpit (1988) and Shirley Heath (1983), for example, highlights the many ways that expectations in schools are communicated through subtle and sometimes unrecognizable ways for students of color or non-native English speakers who may have been raised with a different (but valid) set of rules and assumptions about language, communication, and school performance itself.

### **Limitations of Rubrics**

While well-designed rubrics make the assessment process more valid and reliable, their real value lies in advancing the teaching and learning process. But having a rubric doesn't necessarily mean that the evaluation task is simple or clear-cut. The best rubrics allow evaluators and teachers to draw on their professional knowledge and to use that professional knowledge in ways that the rating process doesn't fall victim to personality variations or limitations of human information processing.

A serious concern with rubrics, however, is how long it takes to create them, especially writing the descriptions of performances at each level. With that in mind, rubrics should be developed for only the most important and complex assignments. Creating a rubric that is used to determine whether students can name the parts of speech would be like using a scalpel to cut down a tree: Good instrument, wrong application.

Another challenge with rubrics is that if poorly designed they can actually diminish the learning process. Rubrics can act as a straitjacket, preventing creations other than those envisioned by the rubric-maker from unfolding. ("If it is not on the rubric, it must not be important or possible.") The challenge then is to create a rubric that makes clear what is valued in the performance or product—without constraining or diminishing them. On the other hand, the problem with having no rubric, or one that is so broad that it is meaningless, is to risk having an evaluation process that is based on individual whimsy or worse—unrecognized prejudices. Though not as dangerous as Ulysses' task of steering his ship between the two fabled monsters of Greek mythology, Scylla and Charybdis, a rubric-maker faces a similar challenge in trying to design a rubric that is neither too narrow nor too broad.

While not a panacea, the benefits of rubrics are many—they can advance student learning, support instruction, strengthen assessment, and improve program quality.

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## **The Perceptions and Experiences of Students in a Paperless Accounting Class**

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### **Abstract**

Although financial accounting practices in business have capitalized on the use of technology, this technology has not been fully integrated in higher education for accounting students. While traditional accounting courses laboriously involve rote transcription of debits and credits, educational technology in accounting courses may prove inherently beneficial. Faculty members at one U.S. institution designed and offered a paperless accounting course that utilized a variety of technologies. This study explored student perceptions regarding the satisfaction and effectiveness of three of these technologies: 1) the Classroom Performance System (CPS) response pad (clicker) from eInstruction.com, 2) Tablet PC (teacher use); and 3) a course management system. This study analyzes the reflective journals of sixty-two (62) students from two sections to find perceptions of satisfaction and effectiveness as well as initial feelings towards the use of educational technologies in the classroom. Within these findings key themes are discovered and discussed.

**Keywords:** Accounting Education; Teaching and Learning; Educational Technology; Course Management System.

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Technology has been integrated into financial accounting practices in business for years (Nearon, 1999); however, higher education has not fully capitalized on technology in the classroom for accounting students. According to De Lange, Suwardy, and Movondo (2003), “while commercial enterprise are generally the first to adopt new technologies, educators and their institutions have also seen the necessity to remain abreast of change in information technology” (p. 1). The need for the integration of technology and education appears to be clear. Specifically, the accounting profession (American Accounting Association; Accounting Education Change Commission, and academics) and others concede that there is a need for new technologies to be incorporated into the classroom (De Lange et al., 2003). Because technology is continually changing the way businesses operate, these advancements also force educators to re-examine and modify their delivery methods.

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Although the need for higher education to make changes in the accounting curriculum is apparent (Bryant, 2001), higher education has been slow to respond. Craig and Amernic (2002) purported,

How can we properly teach accounting, management control, and financial reporting, until we comprehend how the context of such accounting has been altered, and in turn how accounting and context reconstitute each other? The problem seems to be that whereas the practice of accounting is mutating, accounting education is not responding to the emergent changes in a timely fashion. (p. 154)

According to Ainsworth (2001), most accounting educators believe this change is needed, but they disagree about the depth and breadth of needed change. Nevertheless, educators must continue to develop new programs, approaches, and pedagogies as well as evaluate their success or failure against institutional learning objectives (Ainsworth, 2001).

In 2000, Bryant and Hunton claimed that the accounting literature offered little research on the pedagogical benefits of delivering instruction through the use of technology. However, in the educational technology research arena (at least in the early 1990s), studies had focused on evaluation research, media-comparison, intra-medium, aptitude-treatment interaction, and alternative research designs (Thompson et al., 1992). De Lange et al. (2003) agreed that the need for research and evaluation is now more pressing as “technological advancements are increasing at an ever faster pace especially with respect to telecommunications and multimedia” (p. 11). Bryant and Hunton (2000) stated that, among other foci, research in accounting education needs to be conducted (and assessments created) regarding student satisfaction and attitudes regarding classroom technologies. Finally, Boyce (1999) and Lane and Porch (2002) stated their concern over the lack of research to substantiate the views that educational technology specifically in accounting education enhances student learning.

It is also important to note that the discipline of accounting has evolved to include a worldwide audience. In addition, an interest in improving and expanding accounting education has also received international attention among educators. Educators will ultimately have the opportunity to capitalize on the use of technology in the classroom. Currently, nearly anyone (instructor or student) who has access to the web also has the availability of a high-tech classroom. Many online classes are now becoming virtually paperless. The advantage for online accounting education is the electronic homework feature, available to any student worldwide, which now ties together electronic texts, PowerPoint, practice exercises, practice quizzes, and article links. Virtual training and education can now be managed anywhere in the world, and international virtual presentations are being implemented successfully. Many publishers appear to be in tune with the international market and are committing more resources to make these products widely available. Fortunately, among accounting educators throughout the world there is agreement that the need for research into the integration of technology and education is now more pressing than ever before. Inasmuch as students are increasingly using cutting-edge technology, it is important to ascertain their satisfaction with and attitudes about the technologies utilized in accounting classrooms (Bryant & Hunton, 2000).

This article reports qualitative findings regarding a newly designed and implemented paperless accounting classroom which utilized a variety of in-class and online technologies. A secondary purpose of this paper is to extend the dialogue about teaching, curriculum, and pedagogy in the area of accounting education and technology. A paperless accounting course (Financial, Managerial, Cost Accounting) was designed and offered to business and technology management students at an undergraduate U.S. institution during the fall of 2004. The goal of this course remained to familiarize students with the process of systematically evaluating, recording, and interpreting business activities through the application of generally accepted accounting principles. The instructors wanted to identify and implement the teaching strategies that would provide students with the most beneficial learning experiences. This course was designed to use the following technologies: tutorial software, online textbook resources, electronic homework system, course management system, student clicker system, Tablet PC, electronic slides, and a computer testing device (examinations) (see Table 1 for descriptions).

This paper focuses on the CPS system, the Tablet PC, and a course management system. The instructors were optimistic about this teaching methodology. They deemed it beneficial to investigate its advantages and disadvantages (a type of cost-benefit analysis) to provide the data to consider in future utilization decisions related to the redesign of this and other accounting courses in the business school.

Hence, the primary purpose of this research study was to explore student satisfaction and attitudes regarding cutting-edge classroom technologies. This research asks the overarching question, “What are the student perceptions of satisfaction and effectiveness before and after completing an undergraduate paperless financial accounting course?” More specifically, this report focuses on the following research questions used to drive this study:

1. What are the initial (beginning-of-semester) perceptions and expectations of college students regarding the use of various educational technologies in this paperless accounting course?
2. What are the students’ semester-end attitudes, satisfaction, and perceived learning from their experiences in using the CPS system?
3. What are the students’ semester-end attitudes, satisfaction, and perceived learning from the use of the Tablet PC in their classroom?
4. What are the students’ semester-end attitudes, satisfaction, and perceived learning from their experiences in using the course management system?

### **Theory and Literature**

Cognitive learning theory provides a theoretical foundation for this study. This theory argues that the learner’s degree of interactive participation is highly influential in enhancing learning outcomes (Bryant & Hunton, 2000; Thompson et al., 1992). Thompson et al. (1992) explained that when students actively and interactively participate in the learning process (understanding and interpreting), the learning experience is heightened. This theoretical perspective on learning, according to Bryant and Hunton, indicates that educa-

**Table 1. Course Technologies**

<i>Technology</i>	<i>Product</i>	<i>Description</i>	<i>Uses in this course</i>
Tutorial software	Topic Tackler (McGraw-Hill)	A tutorial (video clips, PowerPoint slides with animation, drag-and-drop, fill-in-the-blank exercise, self-test quizzes) that focuses on problem areas	Supplement in book to help them study
Online textbook resources	Online Learning Center (OLC)	An online learning aid that follows the book. Includes tutorial, glossary, flashcards, overviews, quizzes, links, presentations, updates, magazine articles	Practice quizzes, vocabulary, resources
Electronic homework	Homework Manager (McGraw-Hill)	A web-based study and review aid that students can use to obtain, complete, and submit assignments to the publisher's website where it is graded. Grades are automatically submitted to the student's and instructor's grade book	Student homework
Course management system	WebCT	A provider of e-learning systems for educational institutions with a complete set of teaching and learning tools for course preparation, delivery, and management.	Grading, case discussion groups, and reflections
Student response system	The Classroom Performance System (CPS)	A wireless response system that provides students and the instructor with immediate feedback; gathers assessment data during class; exercises reinforce learning objectives and skills taught	Attendance, practice quizzes, graded quizzes
Tablet PC	Tablet PC	Tablet PC for a chalkboard. Lectures can be saved and put online.	Class lectures
Electronic slides	PowerPoint	A tool to help instructors create and use dynamic and professional-looking visual presentations.	Class lectures
Computer testing system	Digital Desk	Tests in testing center (reliability not good); electronic testing; he can write this test at the desk.	Examinations in the campus testing center

tional technology is “likely to be most effective if it provides for a dual exchange between the technology and the learner” (p. 137). Cognitive learning theory outlines eight primary components or elements (Bryant & Hunton, 2000; Thompson et al, 1992). The perspective of cognitive theory as contrasted with traditional/behavioral theory is presented in Table 2.

Educators and researchers (e.g., Albrecht & Sack, 2000; Bhattacharjee & Shaw, 2001; Bryant, 2001) have addressed the criticism that the traditional accounting and management curriculum is falling short of providing many of the critical skills required by the accounting profession (Bryant, 2001). Skill areas that graduates were found to be deficient in include written and oral communication, analytical/critical thinking, decision-making, problem solving, teamwork, leadership, continuous learning, interpersonal, project management, professional demeanor, and computing technology. With regard to the latter (the focus of this paper), Albrecht and Sack (2000) used the term *technological adeptness* as a student’s ability to “utilize and leverage technology in ways that add value to clients, customers, and employers” (p. 56).

In today’s ever changing workplace environments, successful students graduating in nearly all fields of study must be literate in various modes of information technology (Mabey, Topham, & Kaye, 1998). In fact, there is a continuing trend for institutions of higher education to incorporate certificates in information technology literacy for all their graduates. According to Stoner (1999), there also appears to be a general consensus by educators that training and education in information technology skills be integrated within the accounting curriculum. In addition, Bhattacharjee and Shaw (2001) suggested that accounting students learn and use different types of technology to obtain information from various sources.

Over a decade ago, Bromson, Kaidonis, & Poh (1994) argued that computers in accounting education should be acknowledged as a part of a process that should be understood and influenced. Nicholson and Williams (1994) warned that the way technologies are used in accounting and management teaching settings needs to be carefully scrutinized to make certain they are achieving meaningful and worthwhile educational objectives (Mabey et al., 1998). Another important element of teaching and learning through information technology is the discovery of how technology has reshaped what we do (Albrecht & Sack, 2000).

A vast amount of educational research discusses “what good teaching looks like and what constitutes the underlying principles that inform it” (Evans & Foster, 1997, p. 244) (e.g., enthusiasm about the topic/content, ability to explain concepts clearly, concern and respect for and of students, need for students to see clear goals and be intellectually challenged, and student recognition that they must be engaged with the content). Implementation of classroom technology should enhance these good teaching practices, and educational objectives and goals must be considered in educational design. Evans and Foster (1997) explained that students and educators can be benefited by a more informed match between appropriate technology and educational objectives. However, Mabey et al. (1998) informed match between appropriate technology and educational objectives.

**Table 2. Primary Components of Learning<sup>‡</sup>**

<i>Primary Components of Learning</i>	<i>Traditional/Behavioral Theory</i>	<i>Cognitive Theory</i>
1. How is a learner viewed?	Learners are seen as passive and reactive to the environment.	Learners are seen as active and mastering the environment.
2. What is learning?	Learning is solely an interaction among or between the stimuli and response.	Learning occurs when the learner actively tries to understand the environment.
3. What is knowledge?	Knowledge consists of learned sets of associations.	Knowledge is presented as organized mental structures and procedures.
4. What does learning consist of?	Learning is considered as the acquisition of new associations.	Learning is a change in mental structures through mental reasoning.
5. What is the importance of prior knowledge?	Prior knowledge influences new learning primarily through indirect processes, such as positive or negative transfer because of similarity of stimuli between situations.	New learning is based on using prior knowledge to understand new situations and changing prior knowledge to deal with new situations.
6. Discussion of activities of the mind (as in psychology)	Is not particularly encouraged.	Is encouraged, as opposed to other learning theories.
7. Verification of theories	Theories can only be verified through strong experimental research.	Various kinds of research—such as observation, thought, experiments, and logical analysis—can be used.
8. What does the process of education consist of?	Education consists of arranging stimuli.	Education consists of allowing and encouraging “active mental exploration of complex environments”.

However, Mabey et al. (1998) warned that as the use of computer-based learning in accounting courses becomes more commonplace and acceptable, professional educators should carefully consider applicable design criteria.

Studies (e.g., Mabey et al., 1998; McInnes, Pyper, Van der Meer, & Wilson, 1995) examining the impact of using computer-based course materials have primarily concentrated on the learners’ experiences, attitudes, and motivations as well as its possible value as an alternative to traditional teaching methods. Generally, findings have concluded that sup-

<sup>‡</sup> Adapted from information found in Bryant & Hunton (2000) and Thompson et al. (1992).

plementing conventional teaching with computer-based instruction can offer a practical educational alternative. De Lange et al.'s (2003) research suggested that the "use of IT to support delivery of an introductory accounting subject has potential to improve students' motivation and satisfaction with the subject. This improved motivation may result in enhanced learning outcomes" (p. 11). Butler and Mautz (1996) noted that "multimedia computer-aided presentations can enhance learning if the unique characteristics of the technology influence the ways in which individuals represent and process information" (p. 263). Other research also supports the premise that students are motivated by new and innovative presentation media especially when it is interactive. Therefore, the challenge for educators is to ensure that the novelty effect does not wear off.

Bryant and Hunton (2000) explained that, among other areas, accounting education research needs to focus on student satisfaction and attitudes regarding classroom technologies. Limited research in these aspects of accounting education has been reported. However, Angelo and Cross (1993) did confirm that students must have positive perceptions of their technological ability to have successful expectations (as cited in Bhattacharjee & Shaw, 2001). Their findings validate that self-efficacy and outcome expectations affect a student's reactions and interactions with information technology. Further, Lane and Porch (2002) studied changes in performance, attitudes, and perceptions of non-specialist accounting students towards Computer Aided Learning and accounting. Bhattacharjee and Shaw (2001) studied students who participated in a financial analysis project where independent research primarily on the Internet was required. Students responded to various questions on their Internet skills and perceptions both before and after the project. These researchers found that "enhancing an existing teaching tool like a company analysis research project can not only develop computer-based skills but, more crucially, improve perceptions toward technology" (p. 96). Bhattacharjee and Shaw concluded that "while today's students have many opportunities to develop their technology-related skills, improving their perceived abilities to use technology is vital to ensure the successful utilization of computers in the workplace" (p. 96). They determined that technology can be effectively used to supplement the traditional education process and help teach technological skills and perceptions.

Although the use of technology for educational purposes has succeeded and continues to be promising, accounting educators and researchers have noted several limitations (McCourt Larres & Radcliffe, 2000):

- There is a decrease in motivation and ability with increased reliance (Boyce, 1999);
- Students do not acquire problem-solving and critical thinking skills (Helmi, 1986; Leidner & Jarvenpaa, 1995);
- There is a lack of learning of underlying principles and concepts (Togo & McNamme, 1997); and
- Software may be technically insufficient (McCourt Larres & Radcliffe, 2000).

Interestingly, even with these concerns, 74 percent of McCourt Larres and Radcliffe's (2000) students felt computer-based instruction should be included in the course in future

years. Some researchers recommend that this type of instruction not be used as a supplement to face-to-face teaching methods (Boyce, 1999; McCourt Larres & Radcliffe, 2000).

Other research focuses on the technological teaching methodologies of programmed learning, expert systems, interactive video, simulations, intelligent knowledge-based tutoring systems, second-generation interactive video, and reflective analytical tools (e.g., Bryant & Hunton, 2000; Mabey et al., 1998). However, because the technology used in this research study is not specifically related to these technologies, the literature will not be reviewed at this time.

### **Purpose and Method**

This study included 62 students who were primarily computer science, technology management, and business management majors. Demographic data was not compiled for this class but the age of these primarily non-traditional students ranged from 20 to 57 years old. Approximately 25 percent were women and over half were married and many had children. Most students were juniors and seniors and most were employed part-time or full-time in addition to attending school full-time. Notably, this was the first paperless course experience for nearly all of the students. The two sections were taught by different instructors, one professor and one adjunct instructor. The professor designed the course and reflection assignments, and then worked closely with the adjunct instructor throughout the semester on all related issues.

Students were given 15 open-ended probing questions at week one and week sixteen. These questions were designed to extract information about the students' experiences and perceptions of the educational technologies used. Qualitative data were collected through the three written reflection assignments. Students were awarded points for completion and not content of these assignments. Reflection questions were posted on the course management system and students were asked to use the *Mailbox* or *Assignment* function to submit responses via confidential submission directly to the instructor. The instructors read the responses for grading purposes. A research assistant downloaded the responses into a structured word processing document for further analysis.

A number of steps were utilized to analyze the data. First, all written reflections were transferred into a word processing document for further analysis by a research assistant. The course instructors were not involved in this step. Second, after each reflection was read and reread key ideas and phrases (typically two to four) about their perceptions and experiences were extracted from each response. With 15 reflective questions, approximately 30 to 50 phrases (in total) were extracted from each student. Third, all phrases or statements were grouped by topic (most often by question). Fourth, phrases were analyzed and primary answers and themes emerged. Finally, similar responses were counted and tracked for some general quantitative results. These results originated from four of the questions. It is important to note that the analysis was conducted by a faculty researcher/colleague who had not used these technologies or even visited the actual paperless classroom.

**Table 3. Initial Perceptions (Week 1)**

<i>Initial Feelings</i>	<i>Perceived Benefits</i>	<i>Initial Concerns</i>
Anxiety	Acquiring new technological skills	A hassle
Apprehensive	Applicability to other courses	Electronic may be different than text
Comfortable	Convenient to use	Harder for students without a tech background
Excited (positive perceptions)	Easier for students	Have to learn content and technology in one semester
Expect a good experience	Effective for students at all levels	Lack of confidence
Fear	Eliminates error	Learning curve
Good idea	Flexible	Less time with teacher
Interested to see results	Growing and learning experience	May take more time at first
Intriguing	Help me get a good job	May not be reliable
Like the combination (classroom and online)	Interactivity in class	Nervous about keeping up
Mixed feelings	Knowledge and skills will transfer into the workplace	Prefer traditional course
Nervous (assignments getting lost, things happening that are not in my control)	Learn better this way	Some students don't have internet at home
No expectations	Learn technological skills	Still need to learn to do accounting without tech (just in case)
Not excited	More effective course	Take more time
Nothing new	More interesting in class	Teacher and students must be patient with glitches
Okay	Push us to learn to adapt like you do in the workplace	Waste of money
Optimistic	Reduces clutter	
Skeptical	Saves time for the teacher (can use time helping students)	
Unsure	Saves time for the students (can use more time understanding and studying)	
	This is the way things are going anyway	
	Timely feedback	
	Valuable	
	Will keep me keep up-to-date with technology	

## Findings and Discussion

### *Initial Perceptions*

The first reflection assignment asked students about their perceptions of the paperless class. During the first week of class, the instructors outlined the technology and how it would be integrated into the class. One student exclaimed,

I am very excited for this new “high tech” approach. I think that when technology is creeping into every corner of our lives, it only makes sense to make use of it when we can in our educational experience. I think it is a perfect time to use it in a setting like this. It can only help the learning experience.

Although many students felt the same way, some did not and had a variety of responses. Table 3 summarizes the responses from the first reflections.

Of the 58 students who submitted the first reflections, 27.6 percent mentioned initial excitement, 15.5 percent thought it would be a good learning experience, 17.2 percent felt it made sense, 22.4 mentioned the word “positive perceptions”, 19 percent were concerned about internet/computer challenges, 29.3 mentioned technology concerns, 8.6 percent were not excited, 2 students felt it would be a hassle, 19 percent had high expectations, 13.8 percent felt it would help prepare them for their careers, nearly 25 percent mentioned that it would save them time while 12 percent stated it would waste their time and money, 10 students talked about instant and accurate feedback being a benefit, 4 students noted that it would help them increase their computer proficiencies, 15.5 percent felt it would be more convenient, and 41.4 percent of the students said they were apprehensive. Overall, most of the students made positive statements regarding the heavy use of technology in this course and, interestingly, many of these students also expressed some apprehension or concern as well. Although there were some initial concerns among students, most of the students were positive as they anticipated the benefits of the paperless accounting classroom experience.

### *Semester-end Perceptions*

During the last week of the semester, students were asked to reflect on their experiences related to three of the technologies used in this course: clicker (CPS system), the use of a Tablet PC by one of the instructors, and the course management system.

**CPS.** Questions asked about the CPS system included the following: 1) How do you like the CPS system? 2) Has the system enhanced your learning, and if so, how? 3) Would you recommend that we keep using this system in future classes? Is it worth the additional cost? Do you have any recommendations for future use? Fifty students responded to these items but the responses from the two sections of the course were very different. Hence, we separated the student’s responses by section and instructor. One instructor was a full professor and spent a great deal of time and effort ensuring that the technology

worked well; he also utilized it often. It was apparent by the student responses that the adjunct instructor did not.

In the professor's section, 96 percent of the students who responded (n=28) said that they enjoyed or liked the CPS system, and 93 percent of the respondents commented that the *immediate feedback* was a major reason for their satisfaction. Fifty-seven percent commented that they would recommend the CPS system to other professors and students, and 32 percent stated that more teachers should use this system in their classrooms. No student said they would not recommend it. Although they liked it, 21 percent cited cost as an issue or concern while 54 percent said cost was not an issue. Nearly 30 percent of the students stated that the CPS system enhanced their learning, 21 percent felt it made learning easier, and 14 percent noted slight problems with the CPS system which did not detract from its benefit. One student stated:

I've really enjoyed using the CPS system. It is useful for keeping track of attendance. I loved the quizzes. It provides instant feedback on our understanding and comprehension. Taking quizzes in class and being able to see the results helps me to see what I really know. It is worth paying the extra money, especially since it can be used in other classes. It is definitely a system that I feel works well, and more classes should use it.

Another explained,

I think this system was great. We never had problems with it, and it was a great tool to get immediate feedback. In other classes I sometimes find out my scores on quizzes too late to learn anything from them. Using the CPS for quizzes allowed me to use them as a learning tool instead of just a testing tool.

The second section's results were quite different (n=22). While 45 percent wrote that they could see some helpful aspects of the CPS, including immediate feedback (23 percent), only 14 percent said they would recommend it. Sixty-eight percent reported that the cost was an issue or a waste primarily because the instructor only used it three or four times during the whole semester. They resented spending money and not having the instructor utilize it. Interestingly, 77 percent of the students felt that they could obtain benefits from this system if it were used correctly. Over half of the respondents noted that the system should have been used more often, and 32 percent stated that the instructor wasted time getting the CPS set up each class period. Students said that the adjunct instructor "needed more training" on the system. Over 60 percent noted problems stemming from the instructor not taking the technology "seriously" or his lack of preparation to use such a technology tool.

Reflections made by students during the last week of the semester revealed a significant interaction component in the study. Thus, student responses differed considerably between the two sections. Indeed, the students taught by the fulltime professor were unanimously impressed with the system. They enjoyed the experience and none of these students said they would not recommend it. They especially appreciated the immediate

feedback provided on quiz results. On the other hand, of the students taught by the adjunct instructor, only 14 percent said they would recommend it. It is apparent that for the paperless accounting approach to be successful, the classroom instructor must be committed to invest adequate time in becoming well-trained in its use.

**Tablet PC.** There were three questions asked about the Tablet PC: 1) What is your reaction to the use of the Tablet PC in the classroom versus using a traditional chalkboard? 2) Have the presentations been easy to follow? 3) Do you have any recommendations? Only one instructor (the full professor) used the Tablet PC in his classroom.

Twenty-six students responded to these questions at the end of the semester. The responses show that this technology was a successful tool for teaching these students. All students said that they liked it, enjoyed it, or thought it was “awesome” or “great”. One student explained, “The Tablet PC was the most influential of all the technologies in my learning. It was easy to follow.” Another stated,

I really enjoyed the Tablet. I felt that the lectures were much more effective than using the white board. By using the Tablet, the instructor was able to add to the lecture charts, graphs, and other important information. It helped me pay attention as well.

A third said,

I have really enjoyed how our instructor has used a Tablet PC to show slide shows and to make notes on the slides while discussing difficult concepts. It has made a big difference to me (even more than I thought it would) in my ability to understand the material. It has felt more organized to me than would the use of a traditional chalkboard. I like having the presentations and annotations together. It has been much easier to follow.

Fifty percent of the students found that that the Tablet PC saved class time and was easy to follow (54 percent). Twenty-seven percent explained that it helps the instructor interact with the students, and 27 percent said that more instructors should use it. All students said they would recommend that the professor continue to use this technology. A few provided suggestions for improved visibility of the screen from the back of the classroom.

In conclusion, we found a strong positive reaction to the use of the PC Tablet. In fact, all of the students in the classroom responded enthusiastically to its use. They felt that it was much more effective than traditional use of a chalkboard. It enabled the instructor to add significantly to his presentation and discussions. Students enjoyed their involvement.

**Course Management System.** The course instructors used six primary components of the integrated course management system: grades, chat rooms, emails, reflection submissions, announcements, and discussions. Three questions were asked regarding the student’s perceptions, satisfaction, and challenges related to the system: 1) What is your re-

action to this course management system as a learning/classroom management tool? 2) Is it effective? 3) What do you like most and least about this product?

Most of the students (78 percent) found the course management system to be at least partially useful, while 31 percent did not like the major components of the system. Positive comments revolved around having a place to easily access grades and assignments (29 percent), easy communication with the instructor (12 percent), organizational benefits (10 percent), and convenience. Most students did not sound overly excited about the technology (compared to responses about the Tablet PC) but found the system at least somewhat useful. The students used this technology primarily to access grades, send emails to the instructor, and to submit their reflections for this study. They completed the discussions only because they were assigned, and they did not use the chat. It was clear that most students wanted to make the course as simple as possible and did not want to use any optional system elements.

Most of the students had suggestions for the improvement of the course management system. First, many students felt that the effectiveness of the technology resides in the consistency of its use. They didn't feel that the system in this course was utilized to its fullest because of the other technologies in use. Second, about one-fourth of the students mentioned e-mail issues. They wanted the instructor to add regular e-mail addresses to the system so they could be notified when course e-mails are sent. Some students didn't check the course management system often and sometimes found they had missed assignments. Third, the majority of the students felt that the system was not reliable enough. For example, they mentioned problems with submitting assignments when the system was not working. They wrote of having problems downloading assignments. Fourth, they felt that if more instructors would use the system it would be easier and more consistent. Many students said that this was their only class that utilized the course management system, so it was difficult to remember to access the site on a daily basis. Finally, respondents wrote about needing more training on how to use the system. They insisted that most instructors who use technology assume that their students already know how to use it. Only a few students suggested that the system was easy to navigate when first accessing and using it. Many said that once they were comfortable with the course management system they didn't have any problems.

## **Conclusion**

It is important to note the limitations with this research study. First, because of the exploratory nature of this research, the findings of this study are not transferable to the general population; however, they do add to the body of knowledge concerning attitudes and perceptions of students taking accounting courses with regard to selected educational technologies. Second, there were different instructors for each section of the course. Absolute consistency in both sections would have been ideal. However, having different instructors did provide some interesting discussion on the CPS system. Third, this research did not take into account perceptions related to student technological ability when entering the course. This may have been an important determinant for satisfaction with various technologies. Fourth, another limitation is that data on the student's actual technology

proficiency prior to the class was not assessed. Technology proficiency would be expected to influence satisfaction levels. This was not addressed. Finally, the context in which this study was undertaken was the U.S.A. Therefore, it is important to consider possible cultural characteristics and differences that might be present in this student sample.

Although this paper describes research results based on one U.S. sample, understanding student perceptions of educational technologies can be helpful for educators throughout the world who are interested in creating effective learning experiences for their students. In addition, while this research was focused on individuals taking an accounting course, the participants were non-accounting majors. Hence, educators who teach in various business programs should consider these results when designing technology for use in various business school classrooms. In fact, many of the technologies presented in this paper are already being used in an array of business and non-business courses on college and university campuses.

As Lange et al., (2003) mentioned, “Further research exploring the impact of the use of technology in teaching will assist educators committed to enhancing learning outcomes” (p. 12), and we would agree. In-depth research on the effectiveness of these newer educational technologies has not been conducted and/or reported. Research in this arena needs to focus on quantitative and experimental methodologies to provide sound implications for educators. Research related to strategies and methods of training and educating instructors in the use of technology is needed. Many faculty members struggle with effective utilization of many technologies, but most are not given in-depth training. Many instructors struggle through semester-long pilot tests, yet few report on their findings. More candid qualitative and quantitative research discussing the design, implementation, learning, satisfaction, and other constructs would be most helpful.

Craig and Amernic (2002) stated that, “we need new and more-encompassing ways to thinking about accounting and accounting education in an Internet age – one that is replete with new metaphors and new gestalts. But all this new thinking should have a critical edge, and the ideologies thereby accepted and rejected should be made explicit, along with the consequences” (p. 153). To identify and understand this critical edge and these ideologies and consequences, educators throughout the world must carefully consider new technologies and their usefulness and effectiveness to accounting education. This study is at least a start in scratching this surface. Although educating adults is a complex phenomenon, the discovery of potentially effective strategies and pedagogies is most beneficial for those who love their profession and have the desire to make a difference at the grassroots level.

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## What Do We Know About Creativity?

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### Abstract

Creativity has been defined in many different ways by different authors. This article explores these different definitions of creativity; the relationship between creativity and intelligence, and those factors which affect creativity, such as convergent and divergent thinking. In addition, the article explores the importance of computer technology for testing ideas and the importance of reflective thinking and the evaluation of thoughts. It concludes with a synthesis of the basic attributes of highly creative students and present some ideas of what scholars have said about strategies we can use to enhance creativity in students. Although originality and creative imagination are private, guidance and training can substantially increase the learner's output.

**Keywords:** Creativity, intelligence, convergent thinking, divergent thinking, reflective thinking.

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David Bohm's opening words in his book *On Creativity* were "Creativity is, in my view, something that is impossible to define in words" (Bohm, 1998, p. 1). Reid and Petocz (2004) mention that creativity is viewed in different ways in different disciplines: in education it is called "innovation"; in business "entrepreneurship"; in mathematics it is sometimes equated with "problem-solving", and in music it is "performance or composition". A creative product in different domains is measured against the norms of that domain, its own rules, approaches and conceptions of creativity (Reid & Petocz, 2004, p. 45). The World Conference on Higher Education proclaimed creativity as "an innovative educational approach" in Article 9 of their statement of Missions and Functions in Higher Education (Reid & Petocz, 2004, p. 51).

Cannatella (2004) mentions that the need for creativity is biologically, physically, and psychologically an essential part of human nature, and that it is necessary for human-reproduction, growth and cultural striving (p. 59). Clarkson (2005) has mentioned that there are many traits which have been associated with creativity, such as divergent thinking, introversion, self-esteem, tolerance for ambiguity, willingness to take risks, behavioral flexibility, emotional variability, ability to absorb imagery, and even the tendency to neurosis and psychosis (p. 6).

In this paper, I will attempt to make an exhaustive review of the literature as it pertains to different kinds of creativity, the relationship between creativity and intelligence, factors

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which affect creativity, such as convergent and divergent thinking, environmental factors, access to manipulative tools for testing ideas such as computer technology, and the importance of reflective thinking and evaluation of thoughts. I will conclude with a synthesis of the basic attributes of highly creative students and present some ideas of what scholars have said about strategies we can use to enhance creativity in students.

### **Different kinds of creativity**

The literature on creativity is sparse, but it is becoming apparent that there may be several kinds of creativity. Donald N. MacKinnon (2005) has outlined three different kinds of creativity used as a basis for research at the Institute of Personality Assessment and Research Laboratory (IPAR), Berkeley, California. The first is artistic creativity, which reflects the creator's inner needs, perceptions and motivations. The second type is scientific and technological creativity, which deals with some problem of the environment and results in novel solutions but exhibits little of the inventor's personality. The third type is hybrid creativity, found in such fields as architecture that exhibits both a novel problem solution and the personality of the creator (p. 290-295).

In studying creativity, the IPAR group, along with most other research groups that have investigated this process, have assumed that all kinds of creativity share common characteristics, and these assumptions seem to be true. It appears that most creative persons are relatively uninterested in small details or facts for their own sake; that they are more concerned with meaning and implications. Creative people have considerable cognitive flexibility, communicate easily, are intellectually curious, and tend to let their impulses flow freely (MacKinnon, 2005, p. 308-309).

### **Relationship between creativity and intelligence**

For many years, it was assumed that creativity and intelligence were closely related. The incidence of highly creative individuals, such as Edison, Churchill and Einstein, who at some time experienced difficulty in school, led to a closer examination of the issue sometime during the 1960s. One of the most widely publicized studies was done by Getzels and Jackson (1992), who produced evidence that creativity and intelligence were largely independent traits (p. 24). On the other hand, just a few years later Hasan and Butcher(1996) found creativity and intelligence so highly correlated that they were almost indistinguishable (p. 10).

Since the late 1960s, these and other conflicting studies have made the issue of creativity and intelligence a controversial one. Perhaps the most prevailing view today is that beyond a minimum level of intelligence necessary for mastery in a given field, additional intelligence offers no guarantee of a corresponding increase in creativity. The idea that the more intelligent individual is necessarily the most creative person is fallacious. According to Reeves & Clark, all available tests of creativity suggest there is merely a relationship between intelligence and creativity. In no way do they suggest that one causes or necessarily contributes to the other. Most IQ tests measure convergent thinking almost exclusively. In essence, such tests require the student to apply what he or she has learned

to new problems or to abstract some rule from previously developed examples. Usually, there is only one correct answer, and correctness is determined on the basis of logic, rules, or laws. However, even the best known creativity tests are somewhat invalid because of the subjective nature of the elements they measure and the lack of any predetermined right answer (Reeves & Clark, 2000, p. 118).

### **Factors that affect creativity**

#### ***Convergent and divergent thinking***

There are at least two different ways of thinking: (a) convergent thinking, which emphasizes reproduction of existing data and adaptation of old responses to new situations in a more or less logical manner; and (b) divergent thinking, characterized by flexibility and originality in the production of new ideas. Convergent thinking is characterized by the reproduction of known concepts and the adoption of known responses to new situations. Divergent thinking, on the other hand, involves fluency, flexibility, and originality, and is essentially concerned with production of large numbers of new ideas (Copley, 1998, p. 212). Both convergent and divergent thinking are essential to the problem-solving experience, but when students are developing possible solutions to a problem, evaluation of each solution as it is presented tends to inhibit the flow of ideas.

An idea is creative when it brings a new insight to a given situation. The process of creativity includes the ability to change one's approach to a problem, to produce ideas that are both relevant and unusual, to see beyond the immediate situation, and to redefine the problem or some aspect of it (Kneller, 2005, p. 77). All individuals are to some extent creative, although some are much more creative than others are. While a small part of this difference may be due to heredity, a large part likely results from the failure of individuals to express their creative potential. In fact, many essential attributes of creativity are discouraged in the typical college classroom.

In addition, there is the myth that to the truly creative and talented, their skill comes naturally, and the creative works they produce come with ease. However, the evidence shows that the creative experience only comes after considerable effort and time has been put into the project (Samuels, 2004, p. 111).

The creative act often occurs suddenly and is short lived. It originates in the right side of the brain (Left Brain/Left Brain Studies, 2005, p. 2). This moment of insight usually occurs after a prolonged period of searching, sometimes comprising months or even years of observation and search (Parnes & Harding, 2001, p. 98). It seldom follows a period of intensive reflection; often it occurs much later, when least unexpected. The educational principles that support creative learning are that students need to be supported as they determine the problems to be solved and that they need to be given enough latitude to reach a conclusion (or product) that enables them to make interesting and innovative connections (Reid & Petocz, 2004, p. 52).

### ***Environmental factors***

It also has been known for a long time that in order to exercise creativity students need a responsive environment. Torrance defines the term as "one which involves absorbed listening, fighting off criticism and ridicule, stirring the unresponsive and deepening the superficial; one which requires that each honest effort to learn be met with enough reward to insure continued effort: the focus is on the potential rather than norms" (Torrance, 2005, p. 312).

Creative processes can be encouraged in all instructional activities. Creative teaching could be said to consist of setting up a learning environment that encourages students to see the essence as well as the detail of the subject, to formulate and solve problems, to see the connectedness and interrelations between diverse areas, to take in and react to new ideas, and to include the elements of surprise in their work (Reid & Petocz, 2004, p. 45).

Experts on creativity repeatedly stress the importance of discovering both problems and solutions. Original ideas should be actively sought. For example, a student assigned an oral report might be encouraged to add a personal evaluation and to employ any unique techniques that he or she wishes. Too often, correct thinking requiring one solution and one method has been emphasized. Alternative solutions to a problem need not have been previously suggested by others to be viable. Alternatives not found in textbooks should be solicited from students. Students should be forced to advance more than one alternative, and computer technology can help (Axelrod, 1997, p. 8).

For many years, educators also have viewed creative thinking as a process that could only be pursued on an individual basis. Recognizing the innate developmental quality of creativity, educators placed relatively little emphasis on furthering and enhancing creativity through group-teaching methods until Osborne and his associates developed the brainstorming technique for sales personnel in the 1950s and early 1960s. Today's widely known Synetics Education Systems Laboratory of Cambridge, Massachusetts is devoted exclusively to techniques for class use. Like all attributes of learning, creativity can be developed through carefully selected class experiences; although like other approaches to problem solving, much individualized instruction is also needed.

Creative problem solving in carefully organized group situations is not only effective, but probably also an economical use of time. Although the processes of creativity are individualistic in nature, they are often imitated and developed in-group settings, as when teachers use the technique of brainstorming. In many cases, creativity is not fully exploited because the teacher is not aware of the factors that tend to block the creative process. In addition, although people tend to express admiration and high regard for creativity and those who exhibit it, students who exhibit creativity in the classroom are often regarded as nonconformist by their teachers (Tuckman, 2001, p. 78). Thomas A. Edison, one of the world's greatest inventors, was declared mentally "deficient" by one of his early teachers. Almost immediately after, his mother withdrew him from school and

taught him herself. Edison contributed numerous inventions even after he was eighty-years old (Copley, 1998, p. 214).

However, group activities, although helpful, should be used with care. Hillmann (2006) mentioned that misuse or an over-emphasis on cooperative learning could contribute to degeneration of individual creation, imagination, and production; and that this could weaken intrinsic motivation, hinder the development of problem-solving and decision-making capabilities, and inhibit personal freedom to be creative (p. 5).

### ***Access to manipulative tools for the test of ideas (Computer Technology)***

Some authors have mentioned that the technology explosion is already enhancing creativity without educators doing anything. Clements & Sarama (2003) wrote that whether used to read or write, to acquire knowledge and insight into science, mathematics and other areas; to express oneself; or to learn content in a new medium, computers can support the expression and development of creativity (p. 35).

Research and various studies have shown that using multimedia in the classroom increases creativity, innovation, problem-solving and improves communication between people (Hollenbeck & Hollenbeck, 2006, p. 1). Multimedia software appeals to all senses and stimulates high interest, appealing to students and teachers (Marsh II, 2002, p. 6).

Computer technology, and especially the World Wide Web, has revolutionized speed and access to information and aided in problem solving (Marsh II, 2003, p. 4). Marsh II mentions a popular computer program called Oregon Trail, which creates problems for students to solve in a hypothetical wagon trip in 1850. Schell (2004) mentions the existence of LSP, a computer program available in both PC and Mac versions, which allows students to determine their particular learning style and provides recommendations about the best ways to take advantage of this style in both educational and social situations (p. 14). Marsh II (2001) also mentions the futuristic view that in the future every college student will have a database of knowledge and information available through attachments to his or her body, and maybe even a personal intelligent agent that advises, consults, and tutors (p. 26).

### ***Reflective thinking and evaluation of thoughts***

Reflective thinking and evaluation of thoughts is basic to the process of creativity. In general, ideas are evaluated for the purpose of facilitating the problem-solving process at every step. However, continuous evaluation limits the generation of ideas. A suspension of judgment enables one to further examine seemingly wild or impossible ideas. Wrong ideas may be right in the final analysis. Emphasis shifts from the validity of a particular point to its usefulness in producing new arrangements or patterns. Withholding judgment enables an idea to survive long enough to generate other ideas and encourages those who may have useful input, but are afraid to state their viewpoints for fear of being wrong. This technique can be used in a variety of ways in the classroom. For example, a quota on the number of hypotheses for the potential causes of a problem can be established and

judgment on each suggestion withheld until the quota has been met (University of Maryland University College, 2000, p. 17).

### **Basic attributes of highly creative students**

Creative students show certain characteristics that make them "stand out" from their peers, and these characteristics can be enhanced through computer technology and hypermedia, especially the ability to use graphics more than text to convey meaning and provide links (Marsh II, 2002, p. 25). Among these characteristics are:

**Originality.** This is the ability to produce unusual ideas, to solve problems in unusual ways, and to use things or situations in an unusual manner. Sometimes, originality is viewed as uncommonness of response, the ability to make remote or indirect connections. Creative students, being skeptical of conventional ideas, are willing to take the intellectual risks associated with creative discovery. However, it is unlikely that originality alone will provide sufficient creativity, because it also needs to be combined with other factors, such as a strong cultural presence, an intellectual mind, sensitivity toward form, the involvement of rational trains of thought, the acquisition of certain occupational skills such as writing, engineering, architecture, painting or music, and even the temperament to experience emotional and phenomenological wonder (Cannatella, 2004, p. 61).

**Persistence.** Creative students are usually persistent individuals who are willing, if necessary, to devote long hours to a given task and to work under adverse conditions. Above all, creative people are willing to face failure. Frustrations seem to motivate them to increased effort (McKinnon, 2005, p. 309).

**Independence.** Creative students are independent thinkers, who look for the unusual, the unexplored. Such people notice things that other people do not, such as colors, textures, and personal reactions. Frequently, these people explore ideas for their own sake to see where they may lead. Unlike the nonconformists who flout convention because they feel a compulsion to be different, independent thinkers maintain a balance between conformity and nonconformity. Unlike conformists, creative persons are open to experience and confident in the worth of their ideas. However, they are often their own most severe critics (Samuels, 2004, p. 112). Rockman has reported that students independently using laptops spend more time with computers, spend substantial amounts of out-of-school time completing schoolwork on their notebook computers, and improve their research and analysis skills (McKinnon, 1995, p. 310).

**Involvement and Detachment.** Once a problem has been identified, creative students become immersed in it, first researching how others have tried to solve it, and becoming acquainted with its difficulties and complexities. Thus, involvement sets the stage for their own creations. Creative students soon become detached enough to see the problem in its total perspective. By setting work aside temporarily, creative persons give ideas the freedom to develop (Schell, 2004, p. 14).

**Deferment and Immediacy.** Creative students resist the tendency to judge too soon. They do not accept the first solution, but wait to see if a better one comes along. This tendency to defer judgment seems to be an attribute of an open-minded person, one who is unwilling to reach a decision prematurely (Hillman, 2006, p. 5).

**Incubation.** By putting the problem aside temporarily, creative students allow the unconscious mind to take over, make various associations and connections that the conscious mind is unable to do. The incubation may be long or short, but it must be utilized. Sleep or almost any change of activity helps to encourage illumination. This period of purposeful relaxation permits the mind to run free (Reeves & Clark, 2000, p. 118). After a long period of frustrated effort, creative students may sometimes suddenly solve a problem. This sudden flash of insight is the fruit of unconscious inner tensions. It may be that the powers of association are enhanced when the mind runs freely on its own. The flash usually occurs after a period of incubation, when individuals are not actively pursuing the problem. A Japanese inventor says that his most creative ideas come when he forces himself to dive in his swimming pool until his lungs run out of oxygen (Reeves & Clark, 2000, p. 117).

**Verification.** Although illumination provides the necessary impetus and direction for solving a problem, the solution must be verified through conventional objective procedures. Sound judgment must complete the work that imagination has set in progress. Activating the imagination puts the intellect in touch with deeper levels of the psyche and arouses positive feelings of well being (Clarkson, 2005, p. 2). A flash of insight may be partially if not totally unreliable and merely serve as a catalyst for liberating the creator from a restricted approach to the problem. Sometimes, one flash of inspiration will precipitate others.

**Discovers problems.** Until recently, most studies of creativity focused on the problem-solving aspect of creative behavior. It is clear that the divergent thinker solves problems differently from the convergent thinker. The question of how the divergent thinker, or creative person, finds problems, however, has not been given much attention. Is the process essentially one of evolving a new solution to an old problem? Or is it more likely to be finding a new solution to a new problem, discovered by the creative person? On the basis of some three decades of research, Getzels & Csikszentmihalyi (2001) believe that the way in which a person discovers problems is the essence of the creative process (p. 67). They have identified three problem situations in which the learner is given both a problem and a method for solving it. The first situation is, for example, to find the area of a rectangle, which requires the subject to multiply side a by side b. The second is the situation in which the learner is given a problem, but not a method. For example, find the area of the rectangle. Here, the individual must engage in reasoning and analysis in order to solve the problem. The third situation is one in which the learner is given neither a problem nor a method for solving it. For example, how many important questions can you ask about a rectangle? Here, the problem solver must become a problem finder. Once each problem has been formulated, solutions must be sought.

Getzels and Csikszentmihalyi (2001) believe that many potentially creative learners prefer to work in problems they discover themselves. Others may be more comfortable in more structured situations. Certainly, problem finders, as well as creative students in general, have been sorely neglected in our educational institutions. Cannatella (2004) has expressed that problem solving, conceptual ability, aesthetic experience, intuition, observational analysis, imagination, and experimentation are among the indispensable guides that promote and enhance creative activity (p. 63).

***Generates alternatives.*** One of the basic characteristics of creative thinking is finding different ways of viewing problems. In convergent or logical thinking, the process of searching for alternatives usually stops after a few approaches are suggested and one is selected as the final solution. All unreasonable or far-fetched approaches are summarily dismissed.

In creative thinking, one deliberately searches for as many alternatives as possible. A promising solution suggested early in the process is acknowledged and put aside for later reference. The generation of other alternatives continues. Unlikely, wild or very unreasonable possibilities are tentatively accepted without evaluation, which is done later. Basically, the objective is to delay a final decision by loosening up fixed patterns of thinking. Most problems can be solved in a variety of ways. While a logical approach may seem ideal, there is no guarantee that it is the best solution. A deliberate generation of alternatives enables one to consider other possibilities that appear unacceptable at first (Osborn, 2000, p. 133).

In addition to generating alternatives in-group problem-solving processes, individualized assignments for generating them can be developed in a variety of ways. According to deBono (1990), who studied creativity in elementary school children, geometric figures are ideal, since they can be developed in an unequivocal forms. The student is merely asked to generate different ways of describing a figure. As students find out what the generation of alternatives is all about, they move on to less artificial situations (p. 156).

Pictures provide another useful way of generating alternatives. Students are requested to describe what they think is happening in the picture. The different interpretations are then used to disclose alternative ways of seen things. According to deBono, there are different levels of description: what is shown, what is going on, what has happened, what is about to happen, etc. He suggests that the teacher leaves the assignment quite open at first, but later requires more specific descriptions.

Brief anecdotes also provide excellent sources for generating alternatives, especially when the anecdotes concern different people or animals (deBono, 1990, p. 160). The assignment becomes one of asking for a point of view from each of the parties concerned. Kimball (2000) illustrates with an example: A boy and his dog are watching a squirrel in a tree; in the background are a man and a woman; describe what is happening from the viewpoint of the boy, dog, squirrel, man, and woman (p. 11). Again, the variety of responses can be used to illustrate differences in perception. Sometimes, a favorable description of an event may be changed to an unfavorable description by merely altering the

emphasis given to the various facts, but not the facts themselves. While all those techniques apply more to elementary school children than college students, there may be ways in which the professor could adapt those findings to encourage creativity in other educational settings.

**Challenges basic assumptions.** In solving problems, one must begin with basic assumptions. These are any ideas, principle, or truth deemed self-evident. They provide the foundational structure for problem solving. Unfortunately, they also set boundaries for reducing problems to manageable proportions. If one or more basic assumptions are false, however, the resulting solution will also be false. Many assumptions are handed down by tradition. To challenge them may be considered unfair, sacrilegious, or downright stupid. Certain verifiable false assumptions have been held above suspicion for years. At one time, for example, the tomato was considered poisonous (Williams, 2001, p. 33). For years, scientists were thwarted in their attempts to learn about the human body because it was considered sacrilegious to examine cadavers (Scholl & Inglis, 2001, p. 313-314).

In a similar manner, the boundaries imposed on problem solving often lead to faulty conclusions. These boundaries, often self-imposed, are rarely challenged because they represent a natural structuring process of the human mind. If someone steps outside the boundaries and solves the problem, this person is considered to be operating unfairly. Yet the boundaries are arbitrarily imposed (Scholl & Inglis, 2001, p. 316).

In challenging basic assumptions, both the limits and validity of individual concepts should be questioned for the purpose of restructuring established patterns of thinking. This can lead to different and sometimes improved results.

Professors often discourage creativity by emphasizing the mistakes on written exercises. A better procedure would be to call attention to what was done well and then to point out sources of difficulty, leaving the student with the task of discovering the exact mistakes. The student can then rework certain assignments for credit (Eble, 1996, p. 8).

**Minimizes labels or categories.** By using labels, one risks misrepresenting information. It is convenient to function with relatively few categories, but this often results in polar thinking, one must be either right or wrong. Sometimes even those categories that at one point were rather functional tend to become outdated over time. However, the label remains permanent and contributes to rigid thinking. Hoover (2000) mentions that all young adults, for example, are aware of the restrictive influence of the term "son" or "daughter". It is appropriate to supervise young children closely; but when children get older, close supervision may even be harmful. Some parents fail to realize that the reality behind the fixed term is changing constantly as they grow. They may even seek to control a young person's behavior even after he or she has entered college (p. 113).

Despite the problems they present, labels or categories are necessary. They can be used effectively if qualified. For example, an individual may be "partly right" and "partly wrong", not for or against something but someplace in between (Davis, 1993, p. 88). One learns to use labels cautiously by engaging in experiences designed to challenge them, to

do without them, or to establish new ones. Teachers might ask students to pick out certain words in the newspaper that seem to generalize or categorize ideas and concepts. For example, students might examine how the words "justice", "equality", "disadvantaged youth", "women's liberation", and "patriotism" are used (Kozma, Belle, & Williams, 2000, p. 99). A class debate also provides an excellent opportunity for examining how certain labels can be used to influence listeners. Technology expands the horizons of the students, and is now an indispensable tool in society, which allows students to engage in real-world interactions with people by means of electronic mail, computer conferencing, video conferencing, and groupware. The computer may be more useful in serving as a basis for solving real-world problems than the passive lectures many of us have been accustomed to use in the past (Marsh II, 2000, p. 32).

### **Strategies for enhancing creative-thinking skills**

Creativity can also be encouraged by establishing a class environment that accepts and reinforces new ideas. These ideas can be weighed on their own merits. It should be emphasized that most creative achievements seem revolutionary when first introduced (Berte, 1985, p. 22). Osborne (2000, p. 15) reminds us of some of them:

- When John Kay invented the flying shuttle, it was considered such a threat to labor that weavers mobbed him and destroyed the mold.
- When Charles Newbold worked out the idea of a cast-iron plow, the farmers rejected it on the grounds that iron polluted the soil and encouraged weeds.
- When Doctor Horace Wells used gas on patients while pulling teeth for the first time, the medical profession scorned his new ideas as humbug.
- When Samuel P. Langley built his first heavier-than-air machine flown by steam, the newspapers dubbed it "Langley's folly", and scoffed at the whole idea of self-propelled planes!

It has also been proposed that rather than present fact or theory, the instructor should place students in situations where they are forced to seek out the information for themselves (Lancaster, 2000, p. 8). Above all, creativity involves self-direction (Ericksen, 2004, p. 1). From time to time, students should be placed on their own to work on projects, to make their own mistakes, to toy with ideas, and to follow up hunches that may not seem promising at first. Students, in turn, will be encouraged to evaluate for themselves the fruits of such endeavors. Curiosity motivates one to analyze problems that others have taken for granted. By constantly probing with such questions as "What would happen if...?" curiosity can be enhanced (Entwistle & Hounsell, 2005, p. 2).

Perhaps, the greatest deterrent to creativity is the conventional college teacher (Milton, 2002, p. 6). Ideas tend to "pop up" at any moment, often catching the teacher by surprise (Crutchfield, 1993, p. 16). All too frequently, instructors may view this behavior as the student's impertinence or criticism of their teaching methods (LaFauci & Richter, 2000, p. 1). Actually, such a suggestion may merely reflect an individual's "brainstorming" an idea. Such brainstorming may be encouraged by permitting the individual (and the group that may be involved) to develop a plan for putting the idea to work.

Tremendous creative potential can be lost by inadequate planning. The typical college student tends to postpone term projects until the last minute. When he or she gets started, it is necessary to rush through, perhaps borrowing heavily from established sources. Any ideas or insights that may emerge are quickly pushed aside to save time. Although there is no established pattern for activating the imagination, Osborn (2000) suggests a number of guidelines that many creative people have found to be effective, such as:

***Make a start.*** Too often, a person defers action until the mood strikes, or until one can "find the time." There is no substitute for getting started. By setting up intermediate check points for term projects, for example, the professor can see that students make an early start.

***Taking notes.*** Most really creative individuals carry a pencil and note pad with them at all times. Whenever they attend a lecture or meeting of any kind, they take notes.

***Setting deadlines and quotas.*** In a sense, this is a form of self-discipline. Deadlines and quotas intensify emotional power, since we fear the failure of not meeting our goals. The pressure of deadlines tends to force one to become more efficient in carrying out daily routines that take time away from creative effort.

***Fixing a time and place.*** We should take time for thinking up ideas. This activity should take precedence over our daily routines. By setting a time and place for such cognitive thought, one may "lure the muse." Some people allow ideas to incubate by napping, listening to soft music, or just sitting quietly in a dark corner. Of course, sudden illumination can come at any time, even in the middle of the night. Here again, a handy pencil and note pad ensures retention of an idea (Osborn, 2000, p. 123). The process, of course, can be helped with computers. A practical application with integrating technology in the classroom is the use of personal digital assistants or PDAs. These electronic devices when equipped with graphic organizers, electronic dictionaries and word processing programs can assist students in a multitude of learning tasks. The PDA can help the students take notes, record lab data and even produce short audio-visual files. These electronic helpers can provide learners with the ability to interact more effectively in class, acquire language skills and even improve their science learning (Hollenbeck & Hollenbeck, 2006, p. 6).

The instructor must assume responsibility for guiding learners into creativity. Too often, teachers concentrate on the less motivated student at the expense of the truly creative individual.

Although originality and creative imagination are private, individual virtues, guidance and training can substantially increase the learner's output, as in any other area of education.

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## **Interdisciplinary Education and Critical Thinking in Religion and History: The Delivery of Two "Content-Based" Linked Courses**

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### **Abstract**

Primary sources in religion and history enable first year university students to connect "content-based" linked courses in the core curriculum. Fifty-four first year university students in three separate pairs of courses worked in teams to present oral critical reports on texts related to the Reformation, the Enlightenment, and the Modern Era: themes intersecting religion and history.

Critical thinking skills equipped students to address content while team collaboration enabled both textual comprehension and formation of academic community. Both sets of skills informed related writing assignments.

The overall learning experience facilitated development of intellectual connections between the two courses (a primary goal of linked courses). Greater clarity in assignments and more time in the linked course format would enhance the learning experience.

**Keywords:** College Teaching, Linked Courses, Learning Communities, Integrated Curriculum, Interdisciplinary Education, Interdisciplinary Teaching.

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Within the last twenty years linked courses have been developed as models for forging curricular relationships among academic disciplines (Smith, 1991) and building learning communities among students and their professors (Smith, 1991; Luebke, 2002). Linked courses are two courses in which the same group of students is enrolled, for example, a "content-based" course such as science and an "application course" such as writing (Kellogg, 1999).

It is noteworthy that proportionally few examples of two "content-based" linked courses appear in the literature. On the other hand, there are several examples of links created between "content-based" and "application courses." Most of the "content-application" courses are between courses in the humanities, sciences or social sciences on the one hand, and writing or speech on the other (Thompson, 1998). Chemistry 101 and English 101 constitute an example (Dunn, 1993).

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Links can also be created between two "content-based" courses (Luebke, 2002). This article addresses the need in the literature to describe the construction and implementation of "content-based" courses. In this case the courses which are described are offered in the core curriculum at LaSalle University in Philadelphia; they are entitled The Christian Tradition and Global History from The Reformation to The Present.

### ***Background***

The idea for the Christian Tradition-Global History link at LaSalle University came from a first year student who was enrolled simultaneously in both courses as individual stand-alone courses. The student found that both professor and students in the Global History course were turning to her as a student in the concurrently (but separately) running Christian Tradition course. She served as an important resource in providing insight into the religious context, significance, and implications of particular historical events, such as the Reformation, for example. She was supplying material from a religious perspective which, in turn, lent deeper significance to the historical movements being studied. Hence, the importance of this article, which describes the development of two "content-based" linked courses.

### ***Purpose***

The purpose of this report is to explore, via a quasi-case study model, the helpfulness of studying primary source texts in religion and history as means of enabling first year university students to make intellectual connections between two linked courses in the core curriculum. The report describes, first, the organization of the content in the two linked courses and, second, some pedagogical processes developed in order to assist students (a) to find meaning in the texts and (b) to collaborate with their peers in the process of comprehension and meaning-making.

### ***Research Questions***

The primary research question for this study is: How can primary source texts in religion and history, focused through the lenses of critical pedagogical processes, enable first year university students to understand and to make intellectual connections between two linked courses (representing two different academic disciplines) in the core curriculum?

There are several related sub-questions: (1) What are some curricular links between the two courses, The Christian Tradition and Global History from The Reformation to The Present? (2) What does the application of pedagogical processes entail? (3) How can student responses to questions (including those indicating triangulation) posed by the Office of Institutional Research at LaSalle University demonstrate the validity of this study? (4) How can related literature and a limited degree of member-checking support the findings of the study and affirm its validity?

This paper aims to respond to the primary research question. At the same time, material appropriate to the sub-questions is relevant in addressing the primary research question.

### ***Significance***

The paper contributes to the literature from the perspective of scholarly research as well as from the perspective of teaching practice. The paper contributes to the relatively small collection of articles written about the implementation of two "content-based" linked courses which are paired together. The greater body of literature on "content-application" linked courses needs to be balanced through the addition of more material describing the delivery of "content-based" linked courses.

In addition, this paper contributes a detailed descriptive example of the actualization of two "content-based" courses paired together in the undergraduate core curriculum. While the literature contains very few such descriptions, there is a need, especially for those who may be about to teach "content-based" linked courses for the first time, to review what others have done in order to stimulate ideas for their own teaching practice.

Hence, this paper addresses two lacunae: the dearth of material on "content-based" linked courses, and the absence of detailed descriptive writing on curriculum design and development for "content-based" linked courses.

## **Methods**

### ***Participants***

The sixty full-time undergraduate, traditional-age, first-year university students who comprised the study were enrolled in three sections of the Christian Tradition-Global History link. Two sections were offered in the fall 2004 semester while one section was offered in the spring 2005 semester. Fifty-four students were present in class on the respective dates when the demographic information and linked course evaluation forms were administered. Demographic information focused upon gender, living arrangements and majors as indicated in the tables below.

### ***Measures***

A key component of a liberal arts education is to establish links across the curriculum. The objective is to break the tendency to view each subject as monolithic and detached from others, and to allow the students to realize the connections between various disciplines. LaSalle University's Doubles Program achieves this by pairing a variety of required introductory-level courses. The Double (a pair of linked courses) at LaSalle is mandatory during the first year in order to introduce students to interdisciplinary education early in their university life, and to lay a foundation for their academic careers. Doubles classes are kept small in order to promote student/instructor interaction as well as a sense of community. Twenty first-year students are enrolled in each of the two courses. It is the responsibility of both the religion and the history professors to teach their courses in ways that link subject matter. This essay presents one possible model for establishing such connections in "content-based" linked courses. At the same time, it seeks to explore the worthwhileness of primary source readings as means to enable students to experience

some interdisciplinary connections between religion and history as academic subjects in the core curriculum.

In this paper, a course dealing with the development of Christianity is paired with one covering major themes in Global History. In addition to highlighting points in which

**Table 1. Demographic Information**

**Gender**

<i>Type</i>	<i>Number</i>	<i>Percentage</i>
Male	19	35%
Female	35	65%
Total	54	100%

**Living Arrangements**

<i>Type</i>	<i>Number</i>	<i>Percentage</i>
Resident	45	83%
Commuter	9	17%
Total	54	100%

**General Description of Majors**

<i>Type</i>	<i>Number</i>	<i>Percentage</i>
Business: accounting, business, finance or management	23	43%
Education: elementary, special, with American Studies or with English	20	37%
Other: biology, criminal justice, nursing, social work or undecided	11	20%
Total	54	100%

these two topics intersect, the instructors place emphasis upon cultivating the students' abilities to read, think, speak and write critically and analytically, as opposed to merely memorizing course material.

Their linked teaching is characterized by mutual respect, excellence in pedagogy, good humor, and interest in students. In addition, their dialogue with one another, in the presence of the students, aims to model the kind of academic conversation in which students can also engage with one another. Such qualities are somewhat infectious and have served over time to communicate a mutual enthusiasm for student reports both spoken and written. The high energy the professors are continuing to develop serves as a significant motivating influence for the students. While, as of this writing, the authors can only offer their impressions, it would appear that students in the linked courses often, but not always, are more comfortable with group oral reports and individual writing assignments

than are their counterparts in stand-alone courses. The greater comfort may be indicative of greater facility and mastery of the requisite skills. This impression is confirmed by a recent set of course evaluations in which the students specifically express the desire to engage in a greater number of group activities, characterized by research-based dialogue, during which both professors would be present. Thus, the goals of reading, thinking, speaking and writing--critically and analytically--seem to be significantly enhanced by the framework provided through the linked courses.

Co-ordination before the start of the term, usually during the preceding semester, served logistical purposes. It was during the first of these preliminary discussions that the professors chose to utilize short primary sources as foundations for the common assignments. It was out of this conversation that the principal research question developed. How can primary source texts in religion and history, focused through the lenses of critical pedagogical processes, enable first year university students to understand and to make intellectual connections between two linked courses (representing two different academic disciplines) in the core curriculum?

Very worthwhile anthologies of edited readings, thematically grouped, were readily available for classroom use. Two were selected; each contained a helpful introduction to each unit of readings in the collection. In addition, there were accessible introductions to each specific selection in the two anthologies. *A Cloud of Witnesses: Readings in the History of Western Christianity* (Harrington, 2001) offered fine contextual material for each individual reading. *The Human Record: Sources of Global History: Volume II Since 1500* (Andrea & Overfield, 2005) followed a nearly identical format, but added critical questions at the end of each piece to aid student understanding of material. Selections from each of these anthologies were used in order actualize the primary source interdisciplinary focus of the two linked courses.

During the first preliminary planning session for the religion-history link, the two professors also determined that group presentations would be a major aspect of their Double. The second research question arose: what learning processes enable students to work productively with primary sources in the religion and history interdisciplinary curriculum? Ideas derived from *Critical Thinking: Tools for Taking Charge of Your Learning and Your Life* (Paul & Elder, 2001) proved to be pertinent in directing students to consider material from critical points of view. For example, it was necessary to direct students to note the author's purpose in writing, or implications of the reading, particularly as they related to history or religion. Since the students were to be working in study groups, *Active Learning: Cooperative Learning in the College Classroom* (Johnson, Johnson & Smith, 1991) proved beneficial in setting guidelines for the composition and functioning of the groups. In addition, *The Wisdom of Teams* (Katzenbach, 1994) from the field of business provided hints for motivation and problem-solving in team situations. Each of these resources was both substantive and practical in enabling the professors to strategize in the minute details of implementing the religion-history Double. Finally, "Changing Students' Attitudes: Writing Fellows Programs" (Haring-Smith in McLeod & Soven, 1992) demonstrated how an integrated use of reading and writing as-

signments can lead to deep student learning; this material was helpful in planning some of the writing assignments formulated in the teaching of the religion-history Double.

## **Procedures**

### ***Content***

The themes of the Reformation, the Enlightenment and Religion, and Christianity in the Modern Era were selected for the Christian Tradition course. Similarly, the Reformation, the Enlightenment and the Modern Era were chosen for the Global History course. These three units constituted the framework for the development of the "links" between the two "content-based" courses.

The process of planning required both professors to decide how to structure their courses in order to make them conducive for linking with each other. This led the professors to deviate from ways in which they would traditionally present material. For example, a thematic approach to Global History allowed for more opportunities to make connections with Christianity than a strictly chronological format would have done.

### ***Goals***

In teaching the Reformation, both Protestant and Catholic, the religion instructor had two major goals in mind for the students. The students were to become acquainted with some of the reformers as human persons with qualities of leadership and genuine human struggles. They should also have developed a sense of "the church," an institution which embodies and teaches Christian beliefs and principles, and yet is comprised of human persons who bring both strengths and limitations to their roles as leaders. Excerpts from Martin Luther's "Table Talk;" The Council of Trent's "Decrees;" John Calvin's "Institutes of the Christian Religion;" Ignatius Loyola's "Spiritual Exercises;" and John and Charles Wesley's "Collection of Hymns" comprised the Reformation focus in the "Christian Tradition-Global History" link (Andrea & Overfield, 2005; Harrington, 2001).

One study group of students read Luther's "Table Talk" and developed its presentation. While the reading was just a few pages long, it contained a number of examples in which Luther pointed to irony and contradiction in the church. Most first year university students tend not to notice the subtlety in Luther's thinking. The critical thinking tools contained in the classroom process for the "Christian Tradition-Global History" link helped to direct students towards an understanding of the criticism implied in Luther's words. The critical thinking tools discussed below provide the professors with language through which they encouraged students to think deeply about what they were reading in relation to what they already knew, such as background material covered in both the religion and the history courses. Some students did then grasp the deeper significance of Luther's words.

Introducing students to the ways in which the leaders of the Protestant Reformation defied the church and the papacy and examining how the church responded to these chal-

lenges during the Counter-Reformation were basic goals of the Global History course. The prominent role of the church in Europe during the late Medieval and Renaissance periods was covered in class lectures and discussions. Luther's writing presented clear challenges to the concepts and practices endorsed by the church during that time. This primary source reading brought the historical dialogue to life for the students and highlighted the theme of revolutionary thought versus established order. Furthermore, the Luther reading provided evidence for students to consider when they were required to express in writing their own understanding of how the ideas of the Reformation challenged the church and the papacy.

The formation of community is one of the goals in the LaSalle University core curriculum, particularly in the "Doubles." The class size in the linked courses is smaller than in most core courses, and the students are together for six credit hours during the semester, rather than the three hours of a traditional course.

While the formation of community was not an explicitly stated and strategized goal of this "Double," both professors fostered a group dynamic, which included teamwork and which was sometimes characterized by humor. The group dynamic, teamwork, respect, interest in students, and good humor were, for the most part, a way of being and an outgrowth of the mutual collaboration between the professors. However, the professors took advantage of the option provided in the LaSalle University Doubles Program to take the students to visit The Franklin Institute and The Constitution Center, two cultural centers in Philadelphia. While not directly connected with course content, these educational sites provided students and professors alike with food for thought and discussion. In addition, these two trips taught some students how to utilize public transportation to visit places of interest in the city. Furthermore, the trips provided a venue for social interaction, so that some of the students developed an "esprit de corps" which deepened a bit as the semester continued. This dynamic contributed to a sense of community. Both professors favored a spirit of community among the students and professors as a by-product of their interdisciplinary collaboration. At the same time, both professors were very intentional in their efforts towards excellence in pedagogy; the focus of this article is to describe their strategies.

Through the "content-based" religion-history link students grappled with material generated by Reformation theologians. At the same time they considered some of the historical issues which surfaced during the Reformation. They entered into the religious and historical experience of the Reformation. Through guided use of critical thinking processes they interacted with some of the great persons whose minds contributed to its development.

### ***Critical Pedagogical Processes***

In order to cultivate students' rhetorical, critical and analytical skills, a class period during the first week of the semester was set aside for the purpose of introducing the concept of the Double to the students. Both instructors explained the value of the Doubles Program at LaSalle University and the goals and objectives for their Double; these were also

spelled out in each professor's syllabus. An emphasis was placed upon interdisciplinary education and critical and analytical thinking, as well as upon explaining the significance of primary sources in studying the past. This time was also used to establish five study groups of four students each. These groupings stood for the remainder of the semester in order to allow time for the strong group dynamic to develop. The groups were directed to read primary sources pertaining to topics covered during the term together, to synthesize their ideas, and to present their findings to the rest of the class. Examples of the assignment are given above for the unit on the Reformation. Each group of students was directed to prepare a ten-minute presentation on its assigned primary source reading by a designated date. The Reformation, both Protestant and Catholic, was covered in the religion and history classes in the meantime.

The groups each divided their presentation into four tasks, one for each member of the group. One student summarized the reading. While the focus was on summary of content, the student also provided biographical information about the author and the author's purpose in writing.

Another student identified the main points of the reading. This student noted especially significant concepts and drew attention to assumptions implicit in the reading. Consideration of significant concepts and assumptions required the student to move from concrete thinking to a more abstract level. Assumptions can be subtle, particularly for a first year university student; instructors can sometimes offer helpful guidance.

A third student tied the reading to topics and themes treated in both classes. He or she contextualized the reading and made connections between the primary source reading and the two courses.

A final student drew a conclusion that reflected the group's reaction to the reading. The conclusion included comments as to why the reading was important, some inferences taken from the reading, connections to other aspects of knowledge or recent events, and/or one's own opinion of the reading with a rationale for the opinion. Development of the conclusion often led to a more sophisticated level of abstract thinking.

Both professors found that generally speaking, students presented their findings more extensively and with greater confidence when they were given a structure upon which to base their presentation. The structure, designed and honed over the course of eight semesters of experience, was derived from literature on co-operative learning, team development and critical thinking (Johnson, Johnson & Smith, 1991; Katzenbach, 1994; Paul & Elder, 2001). Students were encouraged to assume different roles in presenting each report, so that during the course of the semester each student had the opportunity to approach a primary source from a different vantage point. Such rotation of responsibilities allowed students to think about the source material in different ways. Further, a student who had a little experience with one intellectual perspective was in a good position to teach another who was trying the particular critical thinking skill for the first time in a formal setting. Students indicated that occasionally the primary source readings were incomprehensible; however, when each member of the group communicated his or her par-

ticular findings about the reading to the others, the combined knowledge resulted in the ability to grasp and interpret the reading and its relevance for one or both courses. One group of students indicated that this experience of group probing of the significance of a text had been exhilarating. They had experienced an "aha" moment. This cooperative, team-based, critically structured approach provided students with tools for learning and enabled them to become agents in their own education. They became more proficient as the semester progressed. In addition, they developed a collaborative style and sometimes ease in working together.

### ***Within Course Assessment***

Both instructors were with the students during the presentations, provided feedback from religious and historical perspectives, and highlighted any key points that were overlooked by the groups. The remaining class time was allotted for discussion. Evaluating the presentations involved assessing how well each group actualized its four tasks as described above. The mechanics of the presentation: organization, voice projection, pronunciation and enunciation of words, eye contact, and ability to speak in an engaged manner to the listeners were also assessed.

Each instructor provided an independent evaluation of each student's work. Ordinarily the students in a given study group received the same grade, except when it was evident that a particular student's contribution should be evaluated differently. The work done on the Doubles presentations comprised fifteen to twenty percent of the final grade given in each of the two courses, Christian Tradition and Global History.

The next component of the assessment exercise was a writing assignment calling for each student to incorporate his or her group's findings into an essay of two to three pages. The students were presented with a question that required them to use evidence from their group's primary source reading to support a thesis of their own.

For example, in religion, a writing assignment related to Martin Luther's "Table Talk" was as follows:

Luther believed in the importance of faith in God's love and grace, particularly as demonstrated by the life, death and saving love of Jesus. He spoke out against many examples of what he considered to be false teachings and ways of living in the church.

As you reflect upon "Table Talk," select one example of Luther's criticism of the church. Explain what Luther seemed to be saying and describe how the context of the times in which he was living shed light upon the deeper meaning of his comments.

For example, do you think that Luther was merely calling for a return to the simple direct faith Jesus taught his first followers? Or, on the other hand, do you think that Luther's criticism is unduly strident and perhaps out of order? These are

merely suggestions. Develop your own statement of what you think Luther is saying. Explain your reasons.

Conclude your paper by describing how working on it has helped to you understand the Reformation. The paper is to be between two and three pages long and according to the usual MLA format as described in the syllabus.

In history, each student was asked to explain how his or her group's reading represented an important moment in the development of Christianity during the Reformation. The class was cautioned against providing long summaries and narratives in their essays in order to insure that their essays reflected the students' critical and analytical thinking and writing skills. The writing assignments were graded primarily on each student's ability to use evidence from primary sources in order to construct an argument.

Since students had previously worked with members of their study groups in probing the meaning of the primary source readings, they had developed, through their collaborative experience, a sense of the material. While each student's writing assignment was completed independently, students had the option to consult one another as their short essays took shape. Despite the fact all of the students were first year students, they enjoyed some of the same benefits which accrue to peer tutoring situations. Most particularly, they did indeed "explore ways in which writing and learning are connected" (Haring-Smith, 1992).

While this method of linking courses enabled students to understand common themes through thinking, reading, discussion, and writing, it also permitted multifaceted avenues for assessment. Through presentation, discussion and writing related to the Reformation readings, students came to understand the nature and necessity of reform and to note the theme of reform. Further, they were able to identify and explain some of the specific significant Protestant and Catholic efforts towards reform. In particular they were able to grasp differing theological perspectives, on the Eucharist, which developed during the Reformation. They were able to note different styles of reform and the differing concepts of the role of authority during a time of reform. They understood the differing approaches to authority within the Protestant and Catholic denominations, and they were able to explain the origins of these differences. In the practical realm, students developed a deeper understanding of approaches to the Christian tradition which differ from their own. In addition, students were able to explain how a religious perspective on events illumines the historical, and similarly, they were able to explain how the historical perspective grounds the religious. Hence, they understood how many aspects of knowledge have the potential to be connected, one with another. Finally, students were able to propose models for reformation, which could be implemented in contemporary times.

By the end of the entire exercise, each student has read a primary source, covered its context in both courses, contemplated its content and related issues, presented on it with his or her group, received feedback from both instructors, and written on it independently of the group. This allowed for a multi-sensory learning experience, catering to the needs of

all types of learners. Furthermore, this model fostered a high level of interaction among the students and with the instructors.

The Christian Tradition-Global History "content-based" linked courses embedded criteria for assessment into their structure through expectations articulated for the speaking and writing assignments. The presence of the criteria for assessment of student learning provided a framework through which students demonstrated the depth and breadth to which they appropriated course material in order to construct their own knowledge.

### **Analyses**

The research design for this project is loosely modeled around a descriptive case study format as explicated by John W. Creswell (1998, 2003). Having articulated the need for the study and its purpose, this report focused upon its central research question with respect to the helpfulness of primary source texts as means for connecting first year university religion and history linked courses. Then the report described the methods used with a narrative description of participants, measures and pedagogical procedures.

This portion of the report outlines the forms of analyses utilized to obtain the results of the study. A major portion of analysis is derived from two written evaluative tasks put to students towards the end of each semester by the LaSalle University Office of Institutional Research. Repetitive patterns within the wording of the tasks served a triangulating function. This major portion of the analysis is transcribed in this report in a form similar to that used by the George Mason University Office of Institutional Assessment, for purposes of discussion later in this article. Those areas having greater degrees of agreement among the students are listed at the top of each table. A minor, yet significant, aspect of analysis points to some emerging themes in the student responses. Finally while member-checking yielded just two responses, these responses do, in fact, serve to validate the study.

The final portion of this report relates results of this project to findings in recently retrieved literature. It also indicates some lessons learned and a direction for the future.

### **Results**

While the professors evaluated each student's spoken and written presentations during the course of the semester, students were also given opportunities to evaluate the experience of the linked courses. Towards the end of the courses, students were asked by the Office of Institutional Research at LaSalle University to complete a survey. In addition, one of the professors did some member-checking with a few of the students.

The Office of Institutional Research asked students to indicate their level of agreement with statements about the linked (Doubles) courses. They were also asked to rate the linked courses in comparison to other required courses they have taken at LaSalle. Some of the main findings are shown in Table 2. Finally students in two classes were asked some additional questions.

The 38 students in the fall 2004 sections of the linked courses were also asked what they liked most about the Double, what should be done differently to enhance the Doubles experience, and what they liked least about the Doubles courses. While most of the comments were unique to their authors, a few themes emerged. The material indicated below, in response to these two questions, was extrapolated from the students' comments.

With respect to the question: "What should be done differently to enhance the Doubles experience?" 24% offered substantive comments and all of those who commented indicated that aspects of the Doubles experience should be replicated more frequently within the linked courses.

Two different groups of three students suggested more combined classes (having both professors simultaneously present) and more group work (within both the separate courses and the learning activities of the linked experiences). In addition, individual students identified joint course learning activities beyond the presentations, and more connections between and within courses as ways to enhance the Doubles experience.

Member-checking was done one year after the linked courses had taken place. A few students were contacted by e-mail. As often occurs with member-checking (Creswell, 1998), the response rate was small. At the same time, the two respondents wrote thoughtfully.

When asked if his experience in the Double helped him to realize interdisciplinary links in courses that he has taken since, Sean Thomas Henry replied, "Yes, I regularly see many recurring themes and ideas in many different classes." George Attah-Asante answered, "Yes, my experience in the Double helped me realize the interdisciplinary links in other courses. I never realized that history played such an important role in the church. I came to realize that many changes that went on in the church were based on what happened in history."

When asked if his experience in the Double enhanced his ability to think critically and analytically in courses that he has taken since, Attah-Asante claimed that "My experience has helped me to break out of one-sided thinking and think in multidimensional terms."

These results generally affirm an interactive application of critical thinking skills to the reading of primary sources as an effective means of developing curricular links between the religion course and the history course. The results also suggest possibilities for future directions in curriculum development for the Christian Tradition-Global History linked courses.

## **Discussion**

This report affirms that an interactive application of critical thinking skills to the reading of primary source texts in linked religion and history courses clearly enables students to make the curricular connections between the two academic disciplines. Students made such comments as "It was kind of like learning things twice but just at a different angle,

**Table 2. Survey Results****Degree of Agreement with Statement about the Linked Courses, (54 students)**

<i>Statement</i>	<i>Strongly Agree</i>	<i>Somewhat Agree</i>	<i>Total</i>
Professors seemed to work well together.	39%	44%	83%
Connections between courses were clear.	37%	46%	83%
The Doubles courses helped me understand connections between the subjects.	30%	43%	73%
Courses were a good learning experience.	35%	37%	72%
Reading and writing assignments helped me to achieve the goals of the courses.	22%	46%	68%
Joint classes helped to achieve the goals.	24%	43%	67%
The Doubles format helped me learn the subject matter.	19%	43%	62%
I got to see relationships I would not have realized if I took each course separately.	28%	28%	56%

**Rating Aspects of Linked Courses in Comparison to Other Required Courses Taken at LaSalle, (54 students)**

<i>Aspect</i>	<i>Much Better</i>	<i>Somewhat Better</i>	<i>Total</i>
Helping you work with fellow students	28%	46%	74%
Allowing you to appreciate different perspectives	11%	46%	57%
Helping you integrate ideas	13%	44%	57%
Fostering student interactions	20%	36%	56%
Allowing you to think critically	19%	35%	54%
Allowing you to interpret ideas	24%	30%	54%
Engaging you in the learning process	16%	37%	53%
Helping you retain what you learned	13%	37%	50%
Challenging your thinking	6%	44%	50%
Helping you evaluate ideas	13%	35%	48%
Deepening your interest in subject matter	7%	39%	46%

**What did you like most about the Doubles courses? (28 students)**

<i>Theme</i>	<i>Percentage</i>
Curricular connectedness and inter-relatedness of courses	37%
The group work and/or joint classes with presentations	34%

**What did you like least about the Doubles courses? (28 students)**

<i>Theme</i>	<i>Percentage</i>
Assignments (i.e., writing a paper, 3; giving a presentation, 2; lack of clarity, 2; joint assignments, same one for both classes)	24%
Teaching styles (i.e., not on same topic, 3; same material in both classes, 2; differences in style, 2; insufficient time together in classroom, 2)	24%

so you remembered it better;" "Both classes taught similar subjects but from different perspectives; and "The group work created a bond between classmates we might not have had." In some respects the findings resemble those of Kutnowski (2005) who stresses the importance of "combining interdisciplinary and critical thinking with encouragement for social negotiation in the classroom" in order to "help students better understand the class content and feel more engaged in the college experience." Kutnowski, like the authors of this article, writes from the perspective of two "content-based" linked courses (in his case, Music of the Twentieth Century and Art Layout and Design, at Queensborough Community College in New York City). Like Kutnowski, the present authors taught thematically, yet they also retained a basic chronology in order to address, at least partially, the knowledge domain gap articulated by E.D. Hirsh and discussed by Kutnowski. The authors agree with Kutnowski that the time and effort required to engage students in the learning process prevents professors from addressing all of the gaps in the knowledge domain of the students. However, they also agree that the content and pedagogy of the linked courses, taught through a thematic approach, enables students to engage in "more active learning," and to "gain a new perspective on the value of collaboration and the connections between disciplines." (Kutnowski, 2005). Kutnowski's findings are supportive of the authors' conviction.

The results in this report on the delivery of linked courses in religion and history bear some similarities to the findings of the Office of Institutional Assessment of George Mason University (1998). In both cases students generally stressed the importance of enhanced curricular connections as well as the formation of academic and social community in their linked courses. Interestingly enough, the percentages of the total number of responses in agreement with statements on the evaluative questionnaire at each institution were nearly identical: 83% to 46% on one survey, and 83% to 37% on another.

Another similarity is that the institutional office of each university reported specifically on the same two most appealing features of their students' linked courses: the learning connections (37% at one university, 25% at the other) and the community support they offered (37% at one university, (27%) at the other. These similarities are striking in view of the fact that LaSalle's student cohort consisted of 54 students who were responding to one "content-based" link. On the other hand 342 George Mason University students were responding to a variety of "content-based" and "content-application" links.

Gammill & Hanson (1991) indicate that the primary link between their three (one "content-based" matched with two "application") courses was through the assignments. Students were to apply material from the economics course to the use of library resources and computer software to their economics course. Somewhat differently, authors of the LaSalle study stressed both the in-class presentations and their related writing assignments. However, the findings in the LaSalle study indicate the importance of greater clarity in instructions for assignments and also a slight lack of student interest in preparing both presentations and written assignments. This new knowledge equips the professors to strategize with respect to assignments in their future linked courses.

It is not possible to know if the 24% of LaSalle students who wanted more combined classes, group work, joint class learning activities, and connections between courses are the same 24% who identified teaching styles as the area they liked least. In any case, at least 24% and perhaps as many as 48% are asking for something more. This finding corroborates the thinking of both professors with respect to enhancing the learning experience. In fact, the professors have come to the conclusion that more time spent together with students in the classroom has potential for a richer learning experience for the students.

Both professors have also received the impression from some students that more time should be spent in group activities and discussion in the presence of both professors. The experience of professors and students in the Christian Tradition-Global History Double exemplifies the statement of Gabelnick, MacGregor, Matthews & Smith (1990) that

Regardless of the level of initial involvement, the faculty and students in most learning communities inevitably move toward more collaboration. This is so because the structure is a curricular vehicle for intellectual, social, and political synergy. Learning community constituents examine texts, ideas, experiences, and feelings within a group context and the public nature of this learning compels connection, reflection and revision. Students develop a sense of their own authority.

## Conclusion

This article describes the construction and implementation of The Christian Tradition and Global History from the Reformation to the Present, "content-based" linked courses in LaSalle University core curriculum. In addition to contributing to the literature on "content-based" linked courses, the article demonstrates the theory and actual practice involved in a particular pair of linked courses. There is a clear attempt to link curricular content and goals with specific learning activities and forms of pedagogy appropriate to the levels of thinking of first year university students. Forms of assessment are integrated into the learning activities and styles of pedagogy in such a manner as to incorporate substantive content into the processes of thinking and learning. The findings point to lessons from the recent past and to directions for the future.

This paper on a "content-based" link carries with it a substantive body of knowledge and a variety of scholarly tools for engaging with and constructing interdisciplinary forms of knowledge. Some of these scholarly tools are interdisciplinary, i.e., the perspective of the theologian or the historian, as well as the skills of critical thinking as outlined above in the criteria for presentation and writing. Other tools include organization and the mechanics of spoken/written presentation, again as outlined above. The design described in this article for a "content-based" link suggests models which can be developed for other "content-based" linked courses in the learning community. The authors concur with Gabelnick et al. (1990) that "the learning community structure offers great opportunities for creativity, but also a nest of concerns." They also agree that "the experience of beginning a

learning community is a little like being given a wad of clay that must be worked with and softened before it is pliable enough to take shape."

At the same time, the development of one model only serves to stimulate thinking and creativity towards the construction and development of future designs for linked courses. For example, the authors are beginning to explore the possibilities of student debates based upon the use of primary sources which relate to issues in religion and/or history. They are also investigating a new curriculum design in which they would spend more time together in the classroom with the students. Such explorations as those suggested here carry within themselves the seeds of new energy and inspiration for faculty development into the future. In addition, the outcomes can provide an enhanced learning experience for students in the linked courses.

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## What Good Is Learning If You Don't Remember It?

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### Abstract

Teachers should emphasize the educational importance of understanding, but not at the expense of overlooking the importance of memorization skills. Currently, mainstream educational theory embraces such attributes as insight, creativity, inquiry learning, and self expression. But such emphases lead to a bias and under-appreciation of the role of memory in learning. Students cannot apply what they understand if they don't remember it. Moreover, a good memory expands the repertoire of cognitive capabilities upon which new understandings can be developed and expedited. Effective thinking does not occur in a vacuum. I advocate adding another "R" to the "three Rs": Reading, wRiting, aRithmetic, and *Remembering*. This paper attempts to show teachers how they can help students become better learners — and better thinkers — by improving their memorization skills

**Keywords:** Learning; Memory; Memorization; Strategies; Attention; Association; Association; Rehearsal; Recall

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I have a faculty colleague who chastised me for writing a book for students on how to improve memory (Klemm, 2004). This colleague thinks that education should be all about understanding and using knowledge to solve problems. We need, he says, to teach students how to think. This colleague is like so many teachers these days who emphasize insight, creativity, inquiry learning, communication skills, and the like. In science education, inquiry learning is all the rage (Layman, Ochoa, & Heikkinen, 1996; Martin, Sexton, & Franklin, 2004; *Inquiry*, 1999). In the process of educational reform, the reformers discount the importance of memory.

I agree that the ultimate goal should be to teach people how to think, solve problems — and to create. Central to these capabilities, however, is the ability to remember things. The more one knows (remembers), the more intellectual competencies one has to draw upon for thinking, problem solving, and even creativity. Society does not need a workforce of trained seals, but it does need people with knowledge and skills. Knowledge and skills are acquired through memory.

Even our ability to think depends on memory. People think with their working memory, which is defined as small amounts of information accessible over short times that people can use in learning and thinking (Baddeley, 2000). I like to think of this memory meta-

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phorically as “scratch pad” memory because it is all too easily erased, scribbled over, lost, or thrown away. The thinking process is a successive operation in which successive “chunks” of scratch-pad memory are moved into the thinking process. The information on that scratch pad must either come from new experience or permanent memory store and in either case the thinker must be able to hold that information in working memory long enough to complete the thinking process. Thus, it should not be all that surprising that there is tight correlation between IQ and working memory (Wickelgren, 2001) and with problem-solving ability (Carpenter, Just, & Shell, 1990).

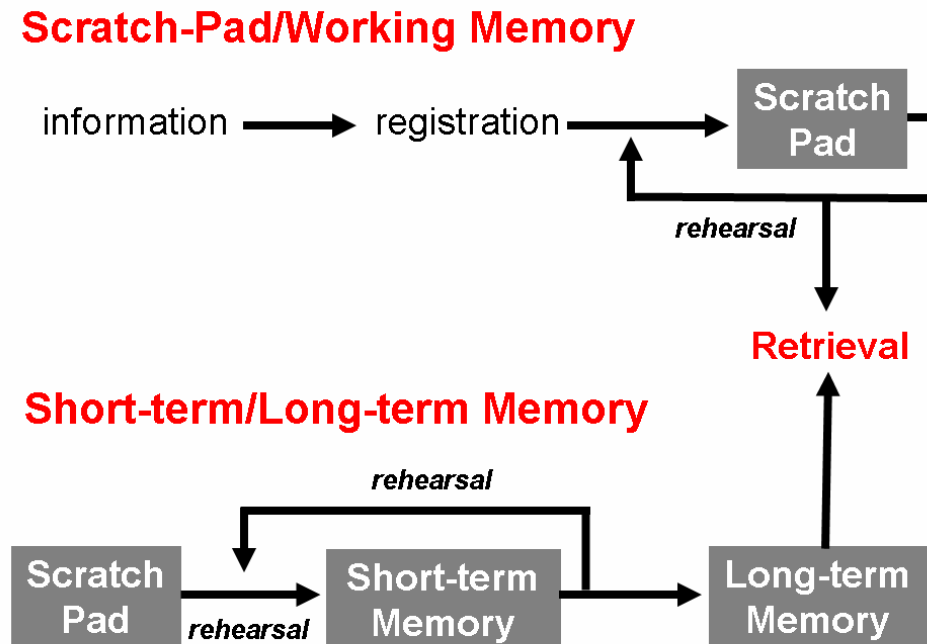
This paper’s title is an explicit statement of my thesis. Understanding information is certainly desirable, but what good is it if you don’t remember? How many Ph.Ds., for example, learned a second language they no longer can use? I will concede that there was some good, but only in the sense that this initial learning had a priming effect on memory (Bowers & Marsolek, 2003) that would make it easier for me to re-learn these languages. Parenthetically, the main burden of learning a language is on memory of rules of syntax, grammar, and vocabulary. How much understanding is needed depends on the subject of writing or talking. Learning differential equations requires more understanding than gross anatomy. But memory is even important in abstract subjects that seem to require more understanding. I remember as a college freshmen taking engineering math and going into the final exam with an F average because I was trying, and failing, to understand everything. I decided to study for the final exam by memorizing all the formulas and all the situations to which they applied. I made a 100 on the final and passed the course. Along these same lines, a middle-school math teacher once told me that her Special Education students could do the same level of math problems as regular students if only they could remember the steps.

Think back to your school days. How many teachers explicitly taught you how to remember effectively and efficiently? Your teachers may have used a couple of acrostics, and limericks. They probably warned you not to cram. That may have been the extent of your formal education in how to learn. The emphasis in school is always on *what* to learn and what it means. Who teaches *how* to learn?

Do today’s students know how to memorize? I don’t think so. Most students, and many of their teachers, memorize by rote. Rote memorization is not only inefficient, but it encourages learners not to think - just memorize. There are ways to make memorizing much more effective, with less effort, and also more fun. Durable memory assumes even greater importance than ever in this era of high-stakes testing. Students may acquire a given skill or knowledge set on the day you teach it, but will they remember it for the annual state-mandated tests? The trouble is, most teachers don’t know about these more fun ways of memorizing. Also, there are many generally under-appreciated variables that affect memory, whether done by rote or by assorted association techniques. The point of this paper is to show teachers how they can help students remember better what they have already learned and understand.

## Elements of Remembering

Contributing to the memorization processes are the following key elements: (1) Registration & Attention, (2) Association, (3) Rehearsal, (4) Consolidation, (5) Cueing & Recall. To remember, the information has to register, and to register you have to pay attention (Figure 1). To register information, attention must be paid to the sound or light stimuli that bring the information into the brain. Not registered, not remembered. The notorious decline of memory with age is commonly an attention-deficit problem (Grady et al., 1995).



**Figure 1. The process of remembering.**

No school teacher needs to be told that paying attention is important for learning. It's the kids who don't appreciate how important attentiveness is. Attentiveness is central to the process of encoding, which entails acquiring information and placing it into working memory storage (Brown & Craik, 2000). Paying attention also augments the encoding by enabling rehearsal at the same time and the information is rehearsed, the more likely it is that it will be put into longer-term memory storage. These are the reasons why good teachers strive to make learning interesting and salient enough to engage student attention. In my own experience, students with the best grades are generally more visibly attentive during class periods, showing clear signs that they are consciously aware of what is being said and seen and that they are "working with" (and rehearsing) the information by their comments and questions.

While it is true that memories can be formed when the brain is on "automatic pilot," this kind of learning is mostly implicit, and the process is more error prone and not nearly as

effective as when conscious effort is devoted to attending to memory tasks (Cowan, 1997).

Information first goes on a virtual scratch pad and even at this level some rehearsal is necessary to keep it accessible. As an example, recall what you do when you look up a phone number. If you don't rehearse it once or twice, the number will be lost before you can get it dialed.

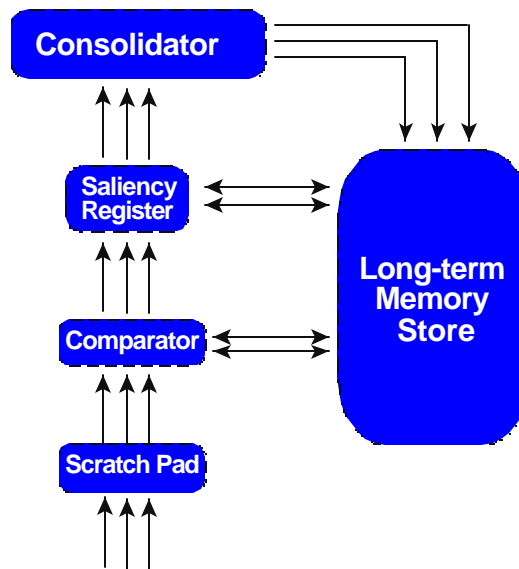
Effective memorization occurs when you can make an association between the new and what you already know. As Cowan (1988) puts it, "new information must make contact with the long-term knowledge store in order for it to be categorically coded." I would add that it seems self evident that not only the category is coded but also the content itself. Associations, whether constructed implicitly or explicitly, need to be rehearsed, with a minimum of distractions and interference (McGaugh, 2000). This rehearsal leads to consolidation into longer-term memory. Recall is expedited if there are many association cues used during the initial learning and during the recall attempt.

In the scratch pad state, memory is only accessible so long as no new information overwrites the "scratch pad." Another problem with scratch-pad memory is its limited capacity. Rehearsal during this working memory stage may make memory less volatile, and may even convert short-term memory into long-term memory. This process is known as consolidation and has been studied for about a hundred years (McGaugh, 2000).

Teachers are most interested in having students remember their lessons long after the time they are first presented. Yet most students study from test to test. Occasional rehearsal of old-test material is needed for longer-term memory. That is why final exams are so difficult for students. That is why a summer break erases much of the educational progress that was made during the year. What is really important to educational effectiveness is the consolidation process by which short-term memory is converted to long-term memory.

My own model for effective memorization (Figure 2) is based on well-accepted principles of the processes for converting temporary memory into permanent form. Initially, new information resides on the brain's "scratch pad," and it undergoes two important analyses. The information needs to be compared with what is already known. This comparison ideally includes making associations with what is already known. These associations can then serve as cues that become imbedded with the new information and can be used later to facilitate recall. New information also should be evaluated for relevance and importance. Memory is "event dependent." We remember best things that make a big impact. If there is a large emotional component, the memory may be facilitated or impaired (Cahill, 2003). If a learning experience does not make a big impact on its own, students would do themselves a service by contriving ways to enhance the salience of the information.

Salience information also becomes embedded with the new information, often in implicit ways that can facilitate later recall. If associations and salience are optimized as part of



**Figure 2. The memory consolidation process.**

the working memory stage, consolidation into long-term memory has a chance to occur.

Consolidation is vulnerable to interference from new stimuli and learning effort. Memory researchers generally embrace the “interference theory of forgetting,” which posits that remembered events or items and their associations must compete with other such associations that occur shortly before or after. Such interference can even occur with the recall of well-established memories. Interference effects diminish as the time gap increases between target learning and interference (Bower, 2000; Roediger & McDermott, 2000).

### ***Recall***

Many memories endure even though they cannot always be re-called on demand (Tulving, 1974). Classic examples in education include the common lament of students who remember certain exam answers, *after* they turn in their test papers. The explanation is that memory retrieval depends on the cues that were associated during learning. Failure to recall the right cues leaves the memory buried. Retrieval is actively impaired by stress, commonly known as “test anxiety.”

The “tip-of-the tongue” phenomenon is usually a situation where anxiety blocks retrieval of something that is in memory storage. The cure is to relax and avoid self-pressure. Students need to think of all the cues that must be associated with what they want to recall. Often, an answer comes to mind that students know is wrong. Wrong answers are more than a distraction — they actively interfere with recall of the correct answer and must be forced out of mind. Recall is facilitated by having confidence in one’s memory ability and by the belief that the memory will be retrieved once self-pressure is removed. In an exam situation when this problem occurs, test takers should move on to another question and expect the recall the “lost” information to pop-up later.

### ***Emotions***

The more important information is, the better chance a learner has to remember it. This leads us to the issue of attitude. Too often students have a negative attitude about academic subject matter, and this attitude is self-defeating. It not only makes study tedious but it impairs the ability to remember it. If you want to remember something badly enough, you will. Students do themselves a favor by contriving ways to make all their study material important and interesting. Students who indulge a negative attitude about the teacher or the subject matter mostly punish themselves.

Retrieval is mood dependent (Mineka & Nugent, 1995). In one study, college students were instructed to write a daily diary for a week, and then they were hypnotized and put in either a happy or a sad mood. Happy students remembered more of the happy events in their diary, while sad students remembered more of the unpleasant incidents. Depression, a common emotion among youngsters, generally impairs memory for everything except memories that add to the depression (Kizilbash, Vanderploeg, & Curtiss, 2002).

Negative emotions cause stress. Personal problems, puberty, social conflicts, grade pressures, test anxiety and the like are common causes of academic underachievement. One of the main reasons is impaired memory capability.

Test anxiety deserves special mention. Not only does such anxiety, if it occurs all the time, interfere with memory (Newcomer et al., 1994), but it also has the potential to kill memory-forming neurons (Sapolsky, 1992). The corticosteroid hormones released during stress can actually kill neurons, and the most vulnerable ones appear to be in the hippocampus, the brain structure that is crucial to consolidating short-term memories into long-term form. Chronic stress induces a progressive loss of memory ability that is especially pronounced in older humans (Lupien et al., 1998).

### ***Getting Enough Sleep***

A day's learning experiences are still being consolidated during that night's sleep. In fact, sleep is necessary for full consolidation (Plihal & Born, 1997; Stickgold, Whidbee, Schirmer, Patel, & Hobson, 2000; Van Dongen, Maislin, Mullington, & Dinges, 2003). The typical adolescent or college student does not get enough sleep for optimal learning. People this age often need nine or more hours of sleep a night. Numerous research studies have shown that both ordinary and dream sleep contribute to the consolidation process for experiences of the preceding day. Memory rehearsal apparently goes on subconsciously while we sleep.

## **Specific Memorization Strategies**

The strategies I will mention below work at least to some degree with all kinds of memory, which currently are often characterized as procedural (motor or cognitive skills, simple conditioning), priming, working, semantic (general facts), and episodic (personal events) (Tulving, 1995). These strategies have not been systematically compared for effi-

cacy for each category of memory, but it seems reasonable to believe that they are generally helpful.

### ***Attention***

Experienced teachers don't have to be told how important paying attention is. But most students need to be reminded. Even if a lecture or a book is boring, failure to pay attention constitutes self-punishment. Under these conditions learning may never occur or be marginal and will certainly take longer than would otherwise be necessary. Anything not learned in class may have to be learned later. Students need to be reminded that attention in class makes remembering much more efficient.

Part of paying attention is to focus. And focus does not occur when students are multi-tasking. We their elders tend to be impressed by the ability of today's youth to multi-task: they can simultaneously talk on the cell phone, browse the internet, IM message, play videogames, listen to their iPod, watch TV, and do their homework. Attentiveness degrades severely with high working-memory load. It is hard to do two complicated things at once. But actually, multi-tasking is most likely to interfere with focused attention and, in turn, degrade memory formation and recall (de Fockert, Rees, Frith, & Lavie, 2001). Studies now confirm that multi-tasking interferes with homework (Foerde, Knowlton, & Poldrack, 2006). Nobody can do anything optimally when multi-tasking. Case in point: many states have laws against talking on a cell phone while driving. And driving a car is a lot easier than memorizing something like differential equations.

### ***Organization***

The first organizational step is to identify in new information the parts you already know and the parts that can be figured out. Why memorize what you can figure out? When it comes to memory, less can be more.

Next, information is remembered best when it is organized by category. Abundant anecdotal reports, especially from "memory wizards" indicate that it is easier to remember items or concepts that are related and associated accordingly, because any one item can serve as a cue that helps to dredge up recall of the others. The value of categorization has been documented in studies of neural networks, which "memorize" new information by categorizing it. Learning progresses with progressive refinement of distinctions of input patterns. The matching process compares whole patterns, not just separate features (Carpenter & Grossberg, 1988).

Actually what makes the memorization of items more effective when they are categorized is placing items together that have natural associations, such as table/chair/dinnerware/food. Formal studies have shown that a recall list of words that have natural associations is learned better than lists of words that are not normally associated. This ability to benefit from clustering of like items is age-dependent; young children do not show the same benefit as older children (reviewed by Cole & Means, 1981).

## ***Association***

We learn best by associating the new with what we already know. Rote memory is the most inefficient kind of memory because no associations are made.

Associations are most effective when they are visual images. Memory theorists have a long tradition of analysis of procedural memory (for skills), episodic memory (of autobiographical events), and of semantic memory (for words). Only since the 1960s has much attention been given to visual-image memory, despite the thousands of years of anecdotal evidence that visual images profoundly facilitate memorization (Bower, 2000; Tversky, 2000). The little formal research that has been performed does confirm that pictures are remembered better than words.

There is a good neurophysiological reason why images are so effective. The brain devotes vastly more neuronal resources to vision than to hearing. Another indicator of vision's superior capability is the fact that there are about one million nerve fibers in the nerve coming from one eye but only about 30,000 fibers coming from one ear. And the amount of neurons devoted to understanding language is one small zone not much larger than a quarter, while the whole back of the brain is devoted to vision and much of the right hemisphere is devoted to geometric and spatial relationships.

Teachers like to talk. But students would probably learn more if teachers spent more time drawing. Likewise, students should try to put more diagrams and doodles in their notes than pure text. People who put on "memory shows," such as the six-time World Memory Champion whose astonishing feats of memory are accomplished by making visual images of whatever they are trying to remember (O'Brien, 2000). The images work best when they are bizarre or ridiculous. Images should be based on vivid nouns, because nouns are concrete and easy to image. One effective strategy is to link images together as a story.

Cues are important to good associations. The more cues used in forming an association, the more readily the memory will be consolidated and the more access routes one will have when trying to recall. The reason is that information is distributed throughout widely scattered networks of brain circuitry, much like a fish net. Cues are like the knots in a fish net, any one of which can be used to gain access to the entire net.

The situation in which learning occurs also provides cues that get imbedded with memory of the learning. Learning that occurs under the influence of alcohol, for example, is recalled best when under the influence of alcohol (Lowe, 1983). In a study where scuba divers were given a list of words to remember, either under water or on the beach, they recalled best when tested in the same place where they first learned (Godden and Baddeley, 1975). An important memory cue is spatial location where the learning occurs (Leutgeb et al., 2005). Learning acquired in a classroom is recalled best when testing is conducted in that same classroom. Students would probably perform better on state-mandated testing if tests were administered in the same rooms in which the material was taught.

### **Chunking**

Because scratch pad memory is finite and limited, trying to memorize in large chunks does not work well. Extra information cannot be held on the scratch pad. A limited capacity for working memory was firmly established in classic experiments by Miller (1956). These experiments led to the commonly accepted notion that working memory capacity is limited to a “magical number of seven, plus or minus two” items or chunks. (This is why local phone numbers have seven integers.) Strings of numbers typically have some built in dependencies and we now know that the capacity for truly independent items is typically only four or less items (Cowan, 2005). If information chunks exceed working memory capacity, the brain must either drop the extra items from further processing or it must over-write what was already there. Working memory operates on what is on the scratch pad. Consolidation of working memory cannot occur if what is there keeps changing too fast.

All chunks of learning material benefit from being linked as small steps toward a final goal. Each step is learned in the context of the ultimate purpose, and memorization builds through rehearsal as each step is linked to the next.

### **Rehearsal**

The key role of rehearsal is most obvious with rote memory, because rote memory only works when the information is repeated, often numerous times. The same effect is seen with motor learning, as practice is essential to perfect such learned actions as touch typing, piano playing, or kicking field goals. This repetition is needed to promote consolidation of working memory into longer-term form. Consolidation is time-dependent (McGaugh, 2000; Shadmehlu & Brashers-Krug, 1997) . It takes many minutes of uninterrupted rehearsal for many things to get consolidated. Interposing new information or stimuli while other information is in the process of consolidation may well interfere with consolidation. Think about the typical classroom environment: about 5-10 minutes before class is scheduled to end, students start getting agitated, looking around and shuffling papers. Then the bell goes off, and they rush out to visit in the hall or dash off to the next class. What do you think happens to the learning that was on their brains’ scratch pad?

Rehearsal strategy is something that children learn as they mature, apparently by trial and error, because many children get no specific memory training. Younger children, for example, do not perform as well as older ones on serial recall tasks and the reason is that they fail to rehearse cumulatively the study items as they are sequentially presented. Likewise, younger children do less well in “keeping track” tasks in which items in a heterogeneous group are presented and they are asked to keep track of “What was the last *food*, or *animal*, or *vehicle*?” Such inabilities are conspicuous in poor learners, regardless of age. Explicit training in cumulative rehearsal improves learning by poor learners (Cole & Means, 1981).

The goal of teachers and students should be to reduce the amount of rehearsal needed to achieve consolidation. Even with good memory practices, rehearsal needs to go on every

day, even if only for a few minutes. Such short-rehearsals close to the time of original learning greatly facilitate the formation of long-term memories in the most efficient way. If you learn something and don't rehearse it for a day or so, chances are you will have forgotten it and have to start over from scratch. There will be a residual "priming" effect, but it isn't worth much.

The extreme of bad rehearsal practice is to cram for tests a day or so before a test. Such an approach creates only short-term memory, and if sleep deprivation is involved, even the short-term memory will be impaired. Most students will invariably study by cramming if the testing is structured to allow that. No teacher should be satisfied to have students learn only for the next test, yet too often testing is not based on a philosophy that learning is to be permanent.

Another point that relates to testing is the use of multiple-choice tests. These test recognition memory, the lowest form of usable memory. Multiple-choice tests have high odds for guessing the right answer. Also, an answer can be recognized as correct even though the student may not be able to generate the answer. I have tested this matter several times with my students and observed that class test scores always go down on the order of 20-40% when I switch the same questions from multiple-choice to short-answer form.

### **A Teaching Game-plan That Works**

To put the forgoing ideas into a practical framework for teaching, I recommend a "10-minute rule." The rule goes like this: teach/learn something for 10 minutes. Then for the next 10 minutes rehearse and apply that information in some way. It might be in the form of discussing the information or re-organizing notes or developing image associations to help memory. Then take a few minutes of break where the material is rehearsed in the mind without any interruptions or new information. Then a new set of instructional material can be considered in the 10-min-rule format. Successive 10-min segments can use the chunking model just mentioned in which core knowledge is successively linked toward mastery of a larger set of competencies.

This kind of teaching strategy optimizes attentiveness, association making, chunking, and rehearsal, while at the same time minimizes interference effects. Such teaching should promote a more complete, contextualized learning environment that can not only raise test scores but also be more effective in producing memories that lead to transportable skill acquisition and problem-solving capability.

### **Conclusions**

Many students underachieve in school because they have never been formally instructed in how to memorize. They typically memorize by rote, which is the least efficient and least effective way to memorize. They also may have not been told about the many variables that adversely affect the ability to memorize, such as the way they try to memorize, their attitude and emotional state, stress, and lack of sleep. Teachers will be more likely

to get better results if they take a little time away from telling students what to learn to tell them how to learn.

The many kinds of information presented in school settings often benefit from specific tactics for optimal memorization. For that reason, I have started a free memory advice column on the Web. In addition, I have also started a Weblog where I summarize memory research that can be applied to improve everyday memory ability. Both the column and the Weblog can be found at <http://thankyoubrain.com>.

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## ***A Review of *Rewriting: How to do Things with Texts****

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### **Abstract**

*Rewriting: How to do things with texts*, by Joseph Harris, advises students, teachers, and writing professionals about the incorporation of outside sources, or voices, into academic student writing. According to Harris, the focus of his book is not just an act of writing a paper again; it involves pushing students' own learning and writing further. Concepts of "moves" (specific suggestions Harris provides for this type of rewriting) guide his organizational choices as he discusses one revision "move" in each chapter. This text fills a gap in the professional literature concerning revision because currently, according to Harris, there is little scholarship on "how to do it" (p. 7). While Harris does not cover all aspects of revision, he does provide a supplemental voice in the conversation regarding the teaching of the writing process.

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*Rewriting: How to do things with texts*, by Joseph Harris (2006), advises students, teachers, and writing professionals about how to revise essays in a concrete and specific way that Harris terms "moves." In particular, Harris offers students and readers ways to revise their papers by including a more balanced discussion of evidence and sources that did not appear in their original work.

Harris is quick to point out in his introduction that the concept of revision is discussed by several well-known writers, including Donald Murray (2000) and Peter Elbow (1999); however, Harris (2006) explains that "while there has been much talk about the importance of revision, there has been little substantive advice on how to do it" (p. 7). This concept is similar to Lester Faigley's (1989) discussions in his article, "Judging Writing, Judging Ourselves." Faigley identifies numerous conversations regarding the necessity of good writing but illustrates that there is little agreement concerning what makes up the concept of good writing or how exactly to do it. According to Harris, scholars have written little to succinctly express to students how to go about revising, and he worries that students may be missing out on needed suggestions for the act of revising. For example, many teachers express their wishes to students as, "'think critically' or 'take risks' or 'approach revision as re-vision'" (p. 3); however, the actual discussions of how to do these actions may be missing. Revision as rewriting can provide some of these suggestions.

The need for students to participate in the larger conversations around subject matters helps writers creating more intellectual prose, but this becomes difficult in a "culture

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prone to naming winners and losers, rights and wrongs. You are in or out, hot or not, on the bus or off it. But academics seldom write in an all-or-nothing mode” (p. 26). Harris describes the win-lose style of academic writing that appears in many college classrooms; academic writing is often termed as a debate-style product, where students are encouraged to defend their viewpoints in a pro versus con mentality. However, true academic writing, according to Harris, reflects an inquiry, an examination of further or other possibilities that exist beyond a simple pro-con representation, and Harris explains how to write in this manner: “you need to push beyond the sorts of bipolar oppositions that frame most of the arguments found on editorial pages and TV talk shows” (p. 26). This type of suggestion (helpful yet not prescriptive or overly directive) is found throughout the entire text. Ultimately, his main advice to readers is to think about rewriting as a way “to add to what has already been said...to rethink and reinterpret the texts he or she is dealing with” (p. 2). As a college writing instructor, I can appreciate this move; too often students are locked into a restricted win/lose view of academic writing. Harris further illustrates his own idea of voices adding to an author’s text; each chapter contains multiple “intertexts,” which are small graphics with citation references to outside materials addressed nearby in the text. These intertexts reinforce the practice of adding voices to the author’s document. These illustrations are effective; essentially, Harris is reflecting and modeling the practice.

Harris splits his text concerning rewriting into five main chapters and a concluding afterword. The five chapters reflect five main “moves” Harris illustrates as necessary for students to understand and practice the concept of rewriting, an important element of academic discourse. All five moves focus on the necessity of incorporating outside voices into a student’s own writings, and Harris explains how each move creates needed elements found in rewriting. While the moves are not expected to be linear, nor does Harris present them only as an ordered process, they do seem to follow a logical organization of thought. Each chapter contains project sections, appearing as graphics that illustrate how teachers can implement the particular “move” discussed in the chapter. The first three moves involve “marking out your words and ideas from those of the texts you are working with” (p. 74), including the use of indentations and quotations.

The first move, titled *Coming to Terms*, concerns itself with “representing the work of others in ways that are both fair to them and useful to your own aims in writing. In a sense, this is rewriting in its clearest form” (p. 5). Instead of only filling up space in an essay with another writer’s words, students need to be choosy with outside material. Outside voices should serve a purpose, and they need to be pushed further through the use of students’ own purposes. Summarize the material when necessary, Harris says, and utilize other voices to help propel your project. Writing instructors may be pleased to see outside material correctly summarized and serving a purpose in a paper (besides filling up the page requirement). The second move, *Forwarding*, relates directly to the first by building on the skills learned in *Coming to Terms*. *Forwarding*, which is connected via analogy to the forwarding of an e-mail, represents how writers can incorporate learned viewpoints from another voice in the conversation and advance that voice into a different situation or project. Because academic writing rarely involves writing directly to other conversation members “...you are less entering into conversation with him (whoever he

may have been) than with fellow readers of his work...You are recirculating his writing” (p. 37). In addition to *Forwarding*, writers frequently participate in the third move, *Countering*. *Countering* represents a writer attempting to “suggest a different way of thinking” as opposed to attempting to “nullify” a writing (p. 57). This move allows students to incorporate other voices into their own writing in a way that continues the conversation instead of engaging in a win/lose debate situation. The debate situation has a tendency to “cancel out” instead of add to the conversation (p. 61).

The fourth move, *Taking an Approach* is segregated partially from the first three moves. However, the fourth move involves “working in the mode of another writer” (p. 75), so the main ideas of one work are applied to a different approach or project than originally intended by the author. While the fourth move does require writers to fully understand the concepts and theoretical backgrounds behind the original work, the writers are not just adding the voice to the conversation; instead, writers attempt to apply the original work in a unique manner.

The fifth and final move involves a return through the first four moves in an act of *Revising*. In this section, Harris distinguishes between revising and editing and explains to readers the difference between these two writing stages through several examples of student writings with responses. These samples illustrate how students can incorporate the prior four moves within drafts. Writers revisit the prior moves as they revise their papers based upon the concepts of rewriting. Examining the different moves provide different lenses students can use to resee their own texts in the act of rewriting.

In his concluding section of the text, *Teaching Rewriting*, Harris discusses ways teachers can implement his suggestions into an ideal writing class that attempts to include outside voices as well as student voices. Harris suggests a possible link for the weakening in students’ ability to include outside material to the testing movement that began in the 1990s, which has now encouraged a culture that rewards fast production; one draft should suffice, or one ought to complete the writing assignment within a class period. This production-line mentality discourages re-seeing and rewriting; students are arriving in college English courses with little to no experience revising texts; in fact, many students and teachers confuse revising with editing. Harris suggests several activities to help teachers illustrate the various revising moves that students need to learn to make in order to produce reflective academic prose.

Harris provides pages of worthy and helpful advice on a subject that is frequently lacking in a majority of first-year writing and writing-intensive courses today. The text is not meant to be utilized in all college writing courses, but Harris hopes the text would be considered a supplemental voice, adding to other voices in the classroom community. Even though the text categorizes itself as an academic text suitable for a college writing course, the concepts (or moves) presented would be appropriate for many genres of writing. The ongoing conversations that guide our thinking or even our own private reflections can be rewritten in our thoughts; certainly, this type of conversation is not limited to a college classroom. Towards the end of the text, Harris addresses a topic of concern for many educators, the impact of the testing industry. Testing places such emphasis on producing a standard product, usually a formulaic writing product reflecting a five-paragraph

format that leaves no room for revision or re-anything for that matter. Students are pressured to produce in as little as 20 minutes. Harris addresses the testing emphasis and acknowledges “the pace and structure of American schooling, whose frequent exams reward students who can produce quick clean essays on demand” (p. 101); however, even though he discusses the culture’s shift towards writing instruction dependent upon correctness, such as grammar, he does not further explore the ramifications of rewriting for students who have not experienced much writing besides the five-paragraph format. Upon arriving at college after such experiences, students are unprepared to work with other forms of writing, such as a personal narrative piece. However, with the assistance of Harris’ advice and discussions, students may become more aware of new possibilities and conversations surrounding them.

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