The Effect of the Integration of Social Annotation Technology, First Principles of Instruction, and Team-Based Learning on Students' Reading Comprehension, Critical Thinking, and Meta-Cognitive Skills

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THE EFFECT OF THE INTEGRATION OF SOCIAL ANNOTATION
TECHNOLOGY, FIRST PRINCIPLES OF INSTRUCTION, AND TEAM-BASED
LEARNING ON STUDENTS’ READING COMPREHENSION, CRITICAL
THINKING, AND META-COGNITIVE SKILLS

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ABSTRACT

Many freshmen students enter colleges and universities without the essential academic skills needed to be successful. Colleges and universities are seeking instructional interventions to address these needs. This study explored the effect of the Social Annotation Modeling- Learning System (SAM-LS) (three instructional interventions including social annotation technology, Merrill’s (2002) First Principles of Instruction, and team-based learning) on students’ acquisition of reading comprehension, critical thinking, and meta-cognitive skills. RM ANOVA revealed multiple statistically significant ($p<.05$) effects showing both positive and negative changes in mean scores. Results showed that students most likely experienced extraneous cognitive load which decreased their initial performance during the instructional activities. However, where select interventions had negative initial effects on student performance, these same interventions showed positive delayed effects on students’ performance. The results of the study suggest future directions for research.
CHAPTER I

INTRODUCTION

Students’ Lack of Performance

The 2005 annual report from American College Testing Program (ACT), Inc. stated only a quarter of high school graduates were adequately prepared for college-level work in English, math, science, and reading comprehension. ACT defined preparation as the point at which a students’ skills indicated they had a 70% chance of earning a C or better in a first year college course. The same article showed that of 1.2 million ACT exam-takers, only 51% of students met college-readiness benchmarks in reading comprehension. In addition, a recent article published by Recruitment and Retention in Higher Education (2005) stated that in a study of high school juniors, only 26% of students were prepared for college-level English. Grimes et al., (1999) stated that possibly part of the reason for this lack of preparation is due to the fact college access has been extended to unprecedented numbers of minority, disadvantaged, and nontraditional (age 25 and over) students who are usually less academically prepared than their peers.

Regardless of the cause, students are coming to colleges and universities under-prepared. There are three areas wherein students are lacking sufficient skills necessary for success in post-secondary education include reading comprehension, critical thinking, and meta-cognitive skills (ACT, 2005; Adelman, 1996; Mendelman, 2007; Hartman, 2002). Thus, the proposed study has been designed to look at solutions to improve students’ performance in each of these skills.

Current Solutions

Research indicates students need help improving their reading comprehension, critical thinking, and meta-cognitive skills in post secondary education. The debate of how to help students improve these skills varies (ACT, 2005; Adelman, 1996; Boylan, 1999; Cox, Freisner, & Khayum, 2003; McCabe, 2000; Oudenhouven, 2002). A common solution is the provision of remedial courses for underperforming students, which usually ends in extra time for the student that is not counted toward graduation, expended resources of the university, and further financial cost for the students (Oudenhouven, 2002; Boylan, 1999).

McCabe (2000) showed that annually more than one million U.S. students enter college under-prepared and enroll in remedial courses (20% of the students in reading, 25% in writing, and 34% in math). He argued that remedial education needs to be a higher priority in the U.S.
not only because it aligns with the U.S. philosophy of access, but also because the nation cannot risk the loss of the potential workers. He claims that in the 21st century, 80% of new jobs will require some post-secondary education, and currently only 42% of postsecondary students are prepared for such skilled positions.

It is evident that the challenge of helping prepare students for post-secondary education deserves more effort and attention, and most likely will require multiple solutions to cover the comprehensive challenge. The common solution of offering remedial courses still leaves room for improvement and for other innovative solutions. Students’ learning and personal development are linearly related and therefore one cannot presume to be increased without the other (ACPA, 1994). It would seem ideal to have a holistic solution that addresses both issues. However, starting with a solution to help solve a manageable portion of the problem, before moving to such a holistic solution seems an appropriate course of action. By providing interventions that make up a portion of the comprehensive solution, under-prepared students may possibly achieve success in post-secondary education comparable to their peers (Boylan, 1999).

**Potential Solution**

In order to compensate for students’ lack of essential academic skills necessary for success in post-secondary education, universities spend resources, money, and time enrolling students in remedial training courses designed to help students acquire these skills. A more comprehensive solution would be to provide students with sufficient, effective, and deliberate practice of basic reading comprehension, critical thinking, and meta-cognitive skills in a format integrated within students’ regular first-year college curriculum. The Social Annotation Modeling Learning System (SAM-LS) has been designed as a possible solution to this challenge of helping students improve their reading comprehension, critical thinking, and meta-cognitive skills. SAM-LS is a multi-faceted approach that incorporates the latest learning technologies (social annotation technology), sound learning strategies (First Principles of Instruction; Merrill, 2002), and team-based learning principles (Johnson, Khalil, & Spector, 2007).

This study will explore the effects of the SAM-LS on college freshmen’s abilities to improve their vital academic skills. The main research question for this study is what are the effects of social annotation technology, First Principles of Instruction (Merrill, 2002), and team-based learning strategies on college students’ reading comprehension, critical thinking, and meta-cognitive performance?
CHAPTER II.
THEORETICAL BACKGROUND

This chapter provides a review of student performance variables followed by a review of three instructional interventions. The student performance variables consist of reading comprehension, critical thinking, and metacognitive skills. The instructional interventions consist of social annotation technology, First Principles of Instruction (Merrill, 2002), and team based learning. The review of each of these performance variables and instructional interventions will lead to the hypotheses in this study.

Student Performance Variables

Reading comprehension.

The ability to read, and ultimately learn from reading is a basic skill fundamental to scholastic success in any discipline of study (ACT, 2005). While reading is fundamental to college success, the percentage of college students entering post-secondary education with these skills has dropped. Between 1970 and 2000, although college enrollments expanded at an annual rate of 1.98%, during the same time period, students’ reading comprehension skills remained unchanged (Cox, Freisner, & Khayum, 2003). In a longitudinal study of the post secondary educational experiences of under-prepared students, Adelman (1996) revealed that the type of academic deficiency has a profound impact on the students’ scholastic success. Adelman stated that a deficiency in reading skills is a symptom of comprehensive literacy problems, which in turn significantly decreases the odds of a student completing any degree.

The acquisition of essential reading skills is one of the most important skills required for success in post-secondary education. The 2002 Condition of Education report suggested a reading deficiency is the greatest barrier to under-prepared students’ success in college (National Center for Education Statistics, 2002). Under-prepared college students who had a deficiency in reading, as compared to students with deficiencies in other areas such as math or science, were more likely to have multiple academic deficiencies (Adelman, 1996).

Critical thinking.

Not only is the acquisition of reading comprehension skills vital to the success of college students, but also the ability to think critically. The definitions for critical thinking vary, and there is still no one comprehensive and agreed-upon definition (Petress, 2004). However, in
order to better understand the use of critical thinking in the context of this study, multiple definitions are reviewed. Mendelman (2007) defines critical thinking in the context of reading and writing as disciplined intellectual criticism that combines research, knowledge of historical context, and balanced judgment. Halpern (1996) more broadly defines critical thinking as the use of purposeful, reasoned, and goal directed thinking that is associated with problem solving. Othman and Hashim (2006) used a variety of sources, and state, that the ability to think critically is directly related to cognitive development, enhancing students’ reasoning and logical skills, and ultimately ensures students’ success academically and professionally. Petress (2004) proposed another definition from a psychology text stating, critical thinking involves the examination of assumptions, the discerning of hidden values, the evaluation of evidence, and the assessment of conclusions. It is clear the definition for critical thinking is varied. However, Mendelman (2007) states, that in a reading context, if students are asked to provide an interpretive thesis statement, they are required to engage in creative and outside-of-the-box prescribed thinking. Since the interpretive thesis statement is open ended, it requires the students to confront and understand the ambiguities inherent in critical thinking. Therefore, for this study the measurement of critical thinking measurement will be derived from asking students to correctly identify a thesis and provide the rationale for why they selected the thesis. By students selecting a thesis from multiple elements of an essay, they will engage in Bloom’s higher order thinking skills of analysis, synthesis and evaluation (Krathwol, 2002).

Mendelman (2007) argues that students go through the steps of critical thinking through highly structured exercises, but don’t actually know how to think critically and in essence they avoid practicing it. According to Mendelman, the practice of critical thinking is somewhat apparent in our high school curriculum, but not necessarily taught as a skill to students. Students may be going through the motions of critical thinking, but may not actually understand what it is they are doing. Van Gelder (2005) states critical thinking is more of a lifelong journey and although may be seen as a simple skill, depends on a complex process. Thus, long-term increases in critical thinking require engagement in critical thinking exercises for extended periods of time. Furthermore, unless students are actively engaged in the practice of critical thinking, the students’ skills most likely won’t be enhanced.

Meta-cognition.
Meta-cognition is an important skill for students to learn as they continue with their college education. Similar to critical thinking, if students are not actively engaged in the practice of meta-cognition, their skills do not fully develop. Meta-cognition is the process of engaging in self-reflection, or thinking about one’s own thinking (Hartman, 2001), and the assumptions and implications of one’s own activities (Flavell, 1987). Meta-cognition consists of two dimensions: (a) executive/control - being able to regulate one’s own learning, or self-regulation, and (b) strategic knowledge - the process of a person’s learning, and the outcome or product of a person’s learning (Flavell, 1979; Kuhn, 2000).

The executive/control component of meta-cognition consists of four relevant areas. Those areas include planning, monitoring, evaluation, and revising (Brown, 1987). Each of these areas is related to a person’s ability to self-regulate as they go through any certain process or are engaged in any situation. Although for this study, the focus is on learners and instruction, meta-cognition has been argued to be domain general and therefore transferable to other settings.

The strategic knowledge area is further broken into two sub-components; the learning process and the learning product (Hartman, 2001; Hartman, Everson, Tobias, & Gourgey, 1996; Lee & Baylor, 2006). The learning process consists of three categories of knowledge: declarative knowledge (being able to identify something, i.e., this is a car), procedural knowledge (being able to know how to do something, i.e., how to drive a car), and conditional knowledge (knowing when and why to do something, i.e., when and why to drive a car) (Hartman, 2001; Mayer, 1998).

In the vast literature on meta-cognition, and through the lessons learned from the pilot study for this research study, it seems apparent that students may be able to walk through a structured process that leads them to engage in meta-cognitive activities, but if asked to think about their learning strategy, they are at a loss of words. One particular study by Everson and Tobias (1998) illustrated the importance of meta-cognitive skills. In their study, students with higher knowledge monitoring abilities (KMA) were more successful in academic achievement than students with lower KMA. KMA refers to how well a student can determine their level of understanding in a certain subject area. For example, students who were better able to identify their weaknesses in certain areas of math were also better able to learn the previously lacking skills, predict their future scores, and achieve higher academic performance. This happened because students who have high KMA engage in reflection of their own abilities, and by so
doing, better focus on those areas, which need more attention. These students with high KMA patch any unclear areas of a certain topic, and gain more competence in the subject area.

Meta-cognition is an important piece of the puzzle of becoming an expert learner and deserves research and attention (Sternberg, 2001).

**Three essential skills.**

Research indicates students with sufficient reading comprehension, critical thinking, and meta-cognitive skills perform better in post-secondary education (ACT, 2005; Adelman, 1996; Boylan, 1999; Cox, Freisner, & Khayum, 2003; McCabe, 2000; Oudenhouven, 2002). Thus, it is vital students gain these essential skills. The following solution elements demonstrate potential affordances for helping students acquire these essential academic skills.

**Solution Elements**

**Social annotation technology.**

The first element of the proposed solution consists of engaging students in an online collaborative system designed to increase their reading comprehension, critical thinking, and meta-cognitive skills. In 2006, Time magazine selected ‘You’ as the person of the year based on the recent boom of social computing entities such as MySpace, FaceBook and YouTube. This phenomenon signifies a new generation of social connectivity empowered by evolving web tools (O’Reilly, 2007 as cited in Edyburn, 2007). This boom of the electronic social connectivity shows that people are motivated to share with others their life experiences in a way that possibly has never been done before. Currently, an estimated 137 million users engage in MySpace (ComScore.com, 2006). Most people might assume the majority of those users are youth, however, half of the site’s users are over the age of 35. This indicates that not only are emerging high school students motivated to use such a technological exercise of free time, but also that this trend applies to a cross-section of society. The social annotation system is designed to leverage the fact that people are motivated to share their experiences and insights with others in the same manner as the social connectivity sites. It allows students to engage in a discussion of an article, online, wherein they can view others’ responses synchronously and respond appropriately. Integrating social annotation software into the instructional materials seems ideal as designers of course content are urged to examine the learning preferences of students - including an examination of learning styles and how teaching style, classroom environment, and learning style contributes to the students’ academic achievement and satisfaction (Miglietti & Strange, 1998).
Scientific evidence emphasizes the effectiveness of annotations (readers making comments in the margins of the text as they read) in increasing memory and learning of the students (Anderson & Armbuster, 1984; Bradley & Vetch, 2007; Glover, Xub, & Hardakerc, 2006; Lavagnino, 1997; Porter-O’Donnel, 2004; Simpson & Nist, 1990). Lavagnino (1997) stated a marginal annotation both clarifies and fixes the initial reaction to the text, and thereby can contribute to the person’s process of interpretation. Bradley and Vetch (2007) questioned why the digital age has not produced the transformation of scholarship that had been expected. The authors claimed that the transformation has not taken place in part because the end users of the articles could not annotate them in a digital format, and thereby read the articles in a passive manner. However, in testing a prototype wherein they gave the researchers the ability to annotate the document, elements of this transformation were detected. Bradley and Vetch claim, therefore, by giving the end users the ability to digitally annotate the document; the transformation will be more probable to happen. Although the Bradley and Vetch study focuses on scholars, the same can be applied to students. It is possible that if students read and annotate an article in a digital format, new ideas would be generated and overall understanding and interpretation would increase.

Today, numerous systems exist that allow users to annotate web-based or other data via the Web or other Internet protocol for a wide variety of purposes (Shabajee & Reynolds, 2003). As social annotation technology has evolved, implementations of online annotation systems have spread to such areas as collaborative writing, online proofreading, and document management. Annotation systems are playing an increasing role in the development and dissemination of scientific knowledge and data. This trend is helping to transform the machinery of knowledge creation itself by enabling scientists on an unprecedented scale to participate in globally distributed knowledge-building efforts (Buneman & Steedman, 2002).

Whole task strategy.

The first element of the solution to helping students increase their essential academic skills relates to their motivation to engage in the learning activity, which originates from their desire to participate in a social annotation system. However, following engagement, if the activities are not aligned with an effective instructional strategy, much wasted time takes place, and most likely students lose motivation and interest, thereby not acquiring the necessary skills for learning (Van Merrienboer, 1997).
The second element of the solution is the integration of an effective instructional strategy. A plethora of instructional design models and theories currently exist, however, Merrill (2002a) conducted a study to determine the ‘first principles’ of instruction, operating under the assumption that “one or more of these first principles can be found in most instructional design theories and models.” (p. 1) His study resulted in a four-phase model including activation, demonstration, application, and integration—all centered on a real-world problem. Each of the four phases was derived from empirical research spanning the vast literature of instructional theories (Merrill, 2002a).

Activation consists of recalling relevant prior knowledge. Merrill stated that, “learning is facilitated when the instruction directs the learners to recall, relate, describe, or apply knowledge from relevant past experience that can be used as a foundation for the new knowledge” (Merrill, 2007, p. 3). This principle is derived from much of the literature regarding advanced organizers (Andre, 1997), as well as the vast research in mental models and schema acquisition (Seel, 1999).

Demonstration consists of showing what is to be learned rather than telling what is to be learned. Merrill (2002) validates the importance of consistent demonstration by citing multiple examples from literature written by major players in the field of cognition and learning—Gagne, van Merrienboer, Mayer, and Dijkstra, to name a few.

Application consists of engaging the learner through practice or application of new knowledge to a new situation. Merrill maintained, “Just as there are different components of knowledge, presentation, and learner guidance appropriate for different kinds of instructional goals, so there are different kinds of practice appropriate for different instructional goals” (2002a, p.8). Merrill pointed out the importance of consistency in practice when related to the learning goal.

An additional important aspect Merrill surfaced is the importance of making errors in the learning process. “Making errors is a natural consequence of problem solving. Most learners learn from the errors they make, especially when they are shown how to recognize the error, how to recover from the error, and how to avoid the error in the future” (2002a, p. 8). By allowing learners the opportunity to make errors in a safe environment, they are able to view their errors, see how to recover from their errors, and hopefully avoid making the same mistakes in the future.
The last phase, integration, consists of implementing the new knowledge into a real world scenario, or into the learner’s everyday activities. Merrill stated that integration plays two vital roles in learning: motivation and retention. First, if learners cannot demonstrate their newly learned skill, or they cannot transfer their new skill to the real world, they have not really learned the skill, and their motivation to continue in the same learning path will most likely decrease. However, if the learners are able to demonstrate, and/or adapt, their new skill in a real world setting, learning is facilitated and their motivation to continue learning is enhanced (Merrill, 2002a). Also, if learners apply their newly learned skills or knowledge to the real world, they will inevitably continue to apply them and retain these skills or knowledge as the repetition will serve to move these mental representations from their short-term memory to their long-term memory (Ericsson & Kintsch, 1995).

According to Merrill, “Effective instruction involves all four of these activities repeated as required for different problems or whole tasks” (Merrill, 2007, p. 3). Because of the comprehensiveness and derivation from validated instructional theories and strategies, Merrill’s First Principles of Instruction have been chosen as the main instructional strategy to go alongside the social annotation system in this research study.

Each learning activity has been separated into task parts (Van Merrienboer, 1997). The task parts are then integrated into the instruction and sequenced from simplest to most complex. As the learners progress through each instructional activity, the overall complexity of the task increases thus building from simple to complex and gradually testing students’ academic skills.

Each activity includes elements from Merrill’s First Principles of Instruction (2002a): activation, demonstration, application, and integration. Due to the constraints of the study, the integration element is the most limited and is not measured outside of the classroom. Therefore, it is less certain whether the students’ newly formed skills transfer to real world settings. As Merrill explicitly stated, these first principles are an attempt to tease out basic methods that remain constant across variable methods, such as programs, and practices. Merrill proposes two hypotheses:

1. Learning from a given instructional program will be facilitated in direct proportion to the implementation of first principles of instruction (p.2).
2. Learning from a given instructional program will be facilitated in direct proportion to the degree that first principles of instruction are explicitly implemented rather than haphazardly implemented (p.2).

In this study, these hypotheses will further be tested by explicitly integrating Merrill’s First Principles of Instruction. It is expected that the results of this implementation will reveal a significant increase in students’ learning and performance in essential academic skills of reading comprehension, critical thinking, and meta-cognition.

**Collaboration strategy.**

The final element of the SAM-LS solution herein is team-based learning. The integration of team-based learning has proven an effective learning strategy multiple times in multiple studies (Clark, Nguyen, Bray & Levine, 2008; Haberyan, 2007; Thompson, Schneider, Haidet, Levine, McMahon, Perkowski & Richards, 2007). Many educators are moving away from the typical lecture-style teaching, and on to more interactive, engaging learning methods such as team-based learning (Lightner, Bober, & Willi, 2007). Many of the benefits from the team-learning model (Michaelson, 1992) include active engagement in problem-solving, group collaboration, learning how to deal with other people, leadership skills, self-esteem, awareness of the diversity of settings, deeper learning, and better retention of course content (Lancaster & Strand, 2001 as cited in Lightner, et al., 2007).

Two features distinguish team-based learning from other forms of teaching with small groups. First, teams are distinct from, and more powerful, than groups. Once students begin to trust one another and develop a commitment to the goals and welfare of the group, they become a team. When a team comes together its members can accomplish tasks that no single individual, or a newly-formed group, could complete. Second, the whole of a team is greater than the sum of the parts. When a functional team joins intellectual power they synergize one another’s intelligence and end up creating more than if they engaged in the learning individually (Michaelson, Knight, & Fink, 2004). These characteristics of team-based learning seem ideal for implementation in this study.

Thompson et al., (2007) found that the inclusion of team-based learning principles at 10 different medical schools in medical education was favorable. Haberyan (2007), in a study with undergraduate students enrolled in an industrial/organizational psychology course found that students who participated in team-based learning reported a significant number of more correct
answers on their post-test than their pre-tests. Also, students in this study expressed that they felt they learned more when using team-based learning, and would be interested in taking another course using team-based learning. Students in this industrial/organizational psychology study, when compared to lecture-based courses, found team-based learning to be more effective for applying course information, more motivating, interesting, enjoyable, and fun. Finally, Clark et al, (2008) found that students who used team-based learning, within an undergraduate nursing course, met course objectives with fewer lectures, did not require additional faculty to function, and increased their team-building and communication skills to solve complex clinical problems.

All these studies showed a significant increase in learning and performance outcomes when students engaged in team-based learning practices. Therefore, for this study, team-based learning principles will be implemented to achieve both cognitive and motivational effects. Su (2007), in a study looking at individual abilities correlated to team-based learning preferences, found that overall, students at the lower end of individual abilities highly favored team-based learning strategies. However, students with higher levels of individual ability did not statistically differ in their preferences. This reveals a possible greater strength and purpose for implementing team-based learning principles with college freshmen that are under-prepared, lack the individual abilities to enter the rigors of the university.

According to Johnson, Johnson, and Smith (1993), groups (the authors refer to groups and teams interchangeably) usually come in three categories; informal learning, formal learning, and study groups. Informal learning groups are short term, spontaneously formed groups of students who are instructed to work together on a task of little or minor importance with no formal feedback. The formal learning groups work to complete complex tasks with a defined deliverable for which they will be assigned grades. The study groups consist of members who provide academic support to one another throughout the course, and usually last throughout the semester. The study groups may also meet as social groups outside of the academic setting, providing a support network for one another in fulfilling the requirements of the course.

For this study, teams will serve as a mixture of formal learning groups and study groups. Students will interact one with another during the instructional activity, providing support and feedback to one another throughout the process. It is expected that the groups will reap the benefits coming from engaging in team-based learning that is so prevalent in the relevant literature. Although peer feedback mechanisms are sometimes criticized for encouraging “the
blind to lead the blind,” with the appropriate scaffolding in place, the teams should be able to rise above such claims and show measurable increases in learning.

Integration of three learning solutions.

The previous paragraphs illustrate how each of the three learning solutions—social annotation technology, First Principles of Instruction (Merrill, 2002), and team-based learning principles have positive effects on student learning and performance. Therefore, in this study it is plausible to integrate these learning solutions into one overall learning solution and test the research question listed below. The practical application of all three elements would consist of a learner participating in an instructional activity (designed with First Principles of Instruction) as a team, using social annotation technology. Multiple variations of this integration will be tested to isolate those elements, which are most effective and have been further outlined in the method chapter.

Research Question

To what degree, separately and in various combinations, will the implementation of social annotation technology, First Principles of Instruction, and team-based learning result in effects on students’ reading comprehension, critical thinking, and meta-cognitive skills?
CHAPTER III.

METHOD

Three areas wherein students are lacking sufficient skills necessary for success in post-secondary education include reading comprehension, critical thinking, and meta-cognitive skills (ACT, 2005; Adelman, 1996; Mendelman, 2007; Hartman, 2002). This study was designed to look at solutions to improve students’ performance in each of these skills.

Sampling

One hundred and twenty-eight freshmen students ($M$ age = 18.16 years, $SD = 0.781$) enrolled in a university were recruited to participate in this study. Of these participants, 40% were male, 60% were female; 46% were Caucasian, 20% Black, 19% Hispanic, 13% Asian, 1% Native, and 1% were unclassified.

Instrumentation

The instruments were designed to measure three cognitive skills (reading comprehension, critical thinking, and meta-cognition) corresponding to two articles (Adult Crime, Adult Time by Linda Collier and, Education Athletics: The Odd Couple by Sally Jenkins) that were subjected to three instructional methods and an additional two articles (Article A: Lawsuits Won’t Break That Glass Ceiling by Susan E. Reed and, Article B: Why Women Are Paid Less Than Men by Lester C. Thurow) that were used as the pre and delayed-tests for the study. The three skills’ instruments were integrated within each of the instructional activities and in the pre and delayed-tests (see appendices E-1 through E-4, and D-1 through D-2).

The developmental procedures of the three skills’ instruments were similar. The questions for each of the instruments were initially written at an appropriate college level of difficulty by the main Subject Matter Expert (SME), then reviewed and edited by three additional experts in the field. The final version of each instrument’s questions consisted of items that were agreed upon by the writer and evaluators. The questions for each instrument were specific to the corresponding article, but related to reading comprehension, critical thinking, and meta-cognitive skills.

Reading comprehension skills instrument (RCSI).

The RCSI was comprised of eight questions aimed at assessing reading comprehension skills. Two sample reading comprehension questions included: “What, according to Jenkins, is
the central issue at the core of all discussions about college athletics?” and “According to Reed, what would be a major strategy that the courts use to identify possible gender discrimination?” Responses were rated as either correct or incorrect for each question. The overall score for the RCSI was comprised of the number of correct responses to all the questions divided by 8, thus ranging from 0-1.

**Critical-thinking skills instrument (CTSI).**

The CTSI was comprised of two questions aimed at assessing critical thinking skills. For each article, the students were asked to correctly identify the thesis of each article. Students were asked to chunk the article into coherent sections with appropriate labels as well as provide rationale for the thesis they identified (see appendices E-1 through E-4). The CTSI was broken into part A and part B. Thesis responses were categorized by either correct (1) or incorrect (0). Part A of the CTSI consists of the score of the thesis response, thus ranging from 0-1. Chunking responses (labels) and thesis rationale responses were categorized as 0, 1, or 2, where 0 (*did not attempt, missed the point of the questions*), 1 (*rationale, but incoherent response*), and 2 (*rationale, coherent response*). Part B of the CTSI consists of the sum of the chunking responses and thesis rationale response and dividing by 2, thus ranging from 0-2.

**Meta-cognitive skills instrument (MCSI).**

The MCSI was comprised of questions aimed at assessing meta-cognitive skills. The MCSI consisted of three questions for the pre and post-test activities, and an additional question for the instructional activities. The meta-cognitive questions employed during the pre and delayed-test activities asked students:

1. Does your thesis match the model response? Yes  No

2. On a scale of 1-5, rate how close your selection matches the model response.

   1   2   3   4   5

3. If your thesis doesn’t match the model response, is it a plausible alternative? Please explain.

Each of the meta-cognitive questions above was designed to assess the students’ ability to compare their thesis response to the model thesis response. The three questions listed above were
assessed as one overall response categorized as 0, 1, or 2, where 0 (*did not attempt, missed the point of the questions*), 1 (*rationale, but incoherent response*), and 2 (*rationale, coherent response*). The additional question, used in the instructional activities, asked students:

1. After viewing the comparison demonstration, please compare your chunking response to the model chunking response. Compare each chunking section of the article (see appendices E-1 through E-4).

Responses to the additional question were categorized as 0, 1, or 2, where 0 (*did not attempt, missed the point of the questions*), 1 (*rationale, but incoherent response*), and 2 (*rationale, coherent response*). The final score of the MCSI includes the score for the one question included in the pre and post-tests, or the sum of the total responses and dividing by 2, thus ranging from 0-2.

**Pre and delayed-tests.**

The pre and delayed-tests were designed to determine students’ abilities prior to and after engaging in the six activities. Two articles (Article A: *Lawsuits Won’t Break That Glass Ceiling* by Susan E. Reed and, Article B: *Why Women Are Paid Less Than Men* by Lester C. Thurow) were used as the content for the pre and post-tests (see appendices D-1 and D-2).

**Social annotation technology tool.**

An online annotation tool, Hylighter was employed when the methods called for social annotation technology. Hylighter integrates reading and writing, facilitates shared annotation practices, and combines annotations from multiple readers. The annotations are displayed in various ways, such as tables, for various purposes. Users can highlight important text, add comments, and share annotations with others on a network. Once group members have annotated a document, HyLighter uses color-coding to show the highlights of each user. For example, person A highlights a document. Yellow highlights indicate areas that the person A alone has highlighted. Green highlights indicate areas where both the person A and other users have highlighted. Blue highlights indicate areas where only users, other than person A, have highlighted as is illustrated in Figure 1.
Hylighter also gives users the option of G-notes, or general comments, which are remarks that are not linked to a specific section of the document but are related to the document as a whole. In Figure 1, a G-note would consist of a comment written in the right-hand column, without any links to text.

To summarize, Hylighter provides users potentially powerful tools to increase their abilities to increase reading comprehension, critical thinking, and meta-cognitive skills. The tool allows participants to view what other people see as relevant to a common task and makes the thinking of participants that is ordinarily hidden, become transparent and available for analysis, sharing, and actionable feedback. These strengths of Hylighter were hoped to reveal significant increases in students’ essential academic skills.

### Instructional Methods

The instructional methods included the instructional strategies, the instructional activities, and the variations of the activities. The instructional strategies guided the instructional activities. The specific content employed in the instructional activities is listed in the instrumentation section.

**Instructional strategies.**

The instructional strategies included in this study consist of a social annotation strategy, whole task strategy (Merrill, 2002), and collaboration strategy (Johnson, Khalil, & Spector, 2007). These three strategies make up the Social Annotation Modeling Learning System (SAM-
LS). SAM-LS is a multi-faceted approach that has been designed to help students improve their reading comprehension, critical thinking, and meta-cognitive skills. Control groups were employed in this study in order to test for effects from each of the interventions as listed in the instructional methods section. The instructional strategies included in the study are listed below.

1. Social Annotation Technology (Students did not use social annotation technology during instructional activity (control) versus students who used social annotation technology during instructional activity (condition))

2. First Principles of Instruction (Students did not engage in an instructional activity containing instructional materials currently used at Tallahassee Community College (TCC) (control) versus students who engaged in activities employing First Principles of Instruction (condition))
   a. Instructional activity without First Principles of Instruction (control)
      This activity consisted of the steps to identify a thesis without First Principles of Instruction (Merrill, 2002; See appendix E-1 and E-2).
   b. Instructional activity with First Principles of Instruction (condition)
      This activity combined steps to identify a thesis with First Principles of Instruction (Merrill, 2002) in order to help students practice each step of identifying a thesis (See appendix E-3 and E-4).

3. Team-based Learning Strategy (Students completed instructional activity individually (control) versus students who completed instructional activity as a team (condition)).

**Instructional activities.**

Although the content changed with the varying articles employed, the overall instructional activities for this study remained the same. The instructional activity parts are delineated below. The words in parentheses indicate the associated outcome variables for each.

**Instructional activity parts.**

1. Read Article (Reading comprehension): Students identify basic reading comprehension elements
2. Chunking (Critical thinking): Students identify and determine the meaning of each ‘chunk’
   2.1 Model Response Comparison (Meta-cognition): Students compare chunking response to the model chunking response

1.1 Model Response Comparison (Meta-cognition): Students assess own thesis identification response in comparison to the model thesis response

**Variations of activities.**

The combination of these instructional interventions were intended to better isolate the effect of each method on students’ learning. Table 1 illustrates the 8 variations tested in order to determine the differences for each of the interventions.

**Table 1**

**Instructional Methods used in Study**

<table>
<thead>
<tr>
<th></th>
<th>HL Group</th>
<th>Individual</th>
<th>No HL Group</th>
<th>Individual</th>
</tr>
</thead>
<tbody>
<tr>
<td>MIA/NMIA</td>
<td>Group</td>
<td>Individual</td>
<td>Group</td>
<td>Individual</td>
</tr>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td></td>
</tr>
</tbody>
</table>

**Key:**
- HL - Hylighter
- MIA- Merrill Instructional Activity
- NMIA- Non-Merrill Instructional Activity

In method 1, students read an article presented in Hylighter, as a group, and completed first the Merrill Instructional Activity (MIA) followed by the Non-Merrill Instructional Activity (NMIA). In method 2, students read an article presented in Hylighter, as a group, and completed the NMIA followed by the MIA. Students in method 3 read an article presented in Hylighter, as individuals, and completed the MIA followed by the NMIA. In method 4, students read an article presented in Hylighter, as individuals, and completed the NMIA followed by the MIA. Students who engaged in method 5 read an article on paper, as a group, and completed the MIA followed by the NMIA. Students who engaged in method 6 read an article on paper, as a group, and completed the NMIA followed by the MIA. Students in method 7 read an article on paper, as individuals, and completed the MIA followed by the NMIA. Students in method 8 read an article on paper, as individuals, and completed the NMIA followed by the MIA.

**Procedures**
Students were recruited from both Florida State University (FSU) (92% of sample) and universities in Northern Virginia (8% of sample). Students participated voluntarily in this study. Students were recruited due to convenience of location and availability.

Students were given informed consent and demographic questionnaire forms (see appendix C-1). Students were randomly assigned to one of the 8 instructional method variations as illustrated previously. They were given a pre-test and informed they had a total of 45 minutes to complete the test. Half of the students received article A for the pre-test and article B for the delayed test. The other half received article B for the pre-test and article A for the delayed test. In this way, students were tested on the same material, but were presented a new article for both the pre and delayed tests so as to control for exposure to the article before the exam. This rotation of pre and delayed tests is illustrated in table 2.

Table 2

<table>
<thead>
<tr>
<th>Method</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Pre-test A/B, Intro to HL, Group MIA, Group NMIA, 1-month delayed test A/B</td>
</tr>
<tr>
<td>2</td>
<td>Pre-test A/B, Intro to HL, Group NMIA, Group MIA, 1-month delayed test A/B</td>
</tr>
<tr>
<td>3</td>
<td>Pre-test A/B, Intro to HL, Individual MIA, Individual NMIA, 1-month delayed test A/B</td>
</tr>
<tr>
<td>4</td>
<td>Pre-test A/B, Intro to HL, Individual NMIA, Individual MIA, 1-month delayed test A/B</td>
</tr>
<tr>
<td>5</td>
<td>Pre-test A/B, Group MIA, Group NMIA, 1-month delayed test A/B</td>
</tr>
<tr>
<td>6</td>
<td>Pre-test A/B, Group NMIA, Group MIA, 1-month delayed test A/B</td>
</tr>
<tr>
<td>7</td>
<td>Pre-test A/B, Individual MIA, Individual NMIA, 1-month delayed test A/B</td>
</tr>
<tr>
<td>8</td>
<td>Pre-test A/B, Individual NMIA, Individual MIA, 1-month delayed test A/B</td>
</tr>
</tbody>
</table>

Key: HL- Hylighter  
MIA- Merrill Instructional Activity  
NMIA- Non-Merrill Instructional Activity

Following the pre-test, if students were assigned to use Hylighter, they completed an introduction to Hylighter activity (see appendix E-5) in order to help the students become familiar with the software. Students were then given an instructional activity and informed they would have a total of 60 minutes to complete the activity. Students were then provided the other instructional activity (depending on the sequence in which they were engaged) and informed they had a total of 60 minutes to complete the activity.

Figure 2 illustrates the progression through each of the activities in the study.
Finally, after approximately 30 days, students returned to complete the delayed-test. They were informed they had 45 minutes to complete the delayed-test. Once students completed the paper-based delayed-test, they completed the study.

Figure 3 further illustrates how the students proceeded through the study activities.
Figure 3. Study procession illustration.

Analysis

The data collected from each activity in the study was analyzed using analysis of variance (ANOVA) and repeated measures analysis of variance (RM ANOVA). ANOVA and RM ANOVA test the equality of means. However, RM ANOVA is used when all members of a random sample are measured under a number of different conditions (ACITS, 1997).

The specific design for this study was a two factor between subjects (social annotation technology, team-based learning) with a one factor within subjects (First Principles of Instruction) design. There were three independent variables: social annotation technology, First Principles of Instruction, and the team-based learning strategy. The two factors between subjects included the social annotation technology (Hylighter) (students use social annotation technology or students do not use social annotation technology in the instructional activity) and the team-based learning strategy (students complete the instructional activity individually or students complete the instructional activity as a team). The third variable, First Principles of Instruction, is a within subjects variable. All students engaged in an instructional activity using First Principles of Instruction and an activity not employing First Principles of Instruction; however, the order of these activities was rotated among participants to isolate the effect on the students’ performance. The dependent variables included reading comprehension scores, critical thinking...
scores, and meta-cognition scores. Scores from each activity for reading comprehension, critical thinking, and meta-cognition were compared both between and within groups.

Cohen's $d$ was used to measure the appropriate effect size for each intervention. Cohen’s $d$ is defined as the difference between two means divided by the pooled standard deviation for those means. The criteria followed for interpreting the results was where 0.2 is indicative of a small effect, 0.5 a medium and 0.8 a large effect size (Cohen, 1992).
CHAPTER IV.
RESULTS

Analysis

Analysis of Variance (ANOVA) and Repeated Measures (RM) ANOVA were employed to test the study’s hypotheses. Three cognitive components, reading comprehension (RC), critical thinking (CTI (thesis identification) and CT-TRC (thesis rationale and chunking)), and meta-cognition (MC) were used as the dependent variables. The three independent variables were: (a) social annotation technology (HL vs. no HL), (b) First Principles of Instruction (MIA vs. no MIA), and team-based learning (TEAM vs. no TEAM) used as between-subjects (BS) factors. Pre-test, immediate post-test, and delayed post-test were used as repeated within-subjects (WS) factor.

The analyses are presented in the following sequence:

1. Testing basic assumptions
2. Testing initial effects (before and after interventions)—changes in (a) reading comprehension, (b) critical thinking, and (c) meta-cognition.
3. Testing delayed effects (before intervention, after intervention, and delayed time period)—changes in (a) reading comprehension, (b) critical thinking, and (c) meta-cognition.

Testing Basic Assumptions

Prior to testing the study’s research questions, statistical tests were performed to ensure the main assumptions of mean and homogeneity of variance equality were not violated.

Equality of pre-test means.

Multiple ANOVAs using each of the cognitive components (i.e., RC, CT-TI, CT-TRC, and MC) at the outset of the study as dependent variables and instructional interventions (HL, TEAM, MIA) as grouping (BS) factors were employed. The analysis revealed non-significant ($p > .05$) instructional interventions effects. Although the TEAM effect ($p = .015$) on CT-TI, HL x MIA x TEAM interaction effect on CT-TI ($p = .042$), and MIA x TEAM effect ($p = .006$) on CT-TRC were significant, all other effects for the four outcome variables failed to reach the accepted significance level ($p > .05$). Thus, it can be assumed that the differences among means attributed to the three independent variables and their interactions were not significant before
assigning the learners to the respective interventions. Tables 3 through 6 present the ANOVA results performed for the dependent variables before applying the interventions.

Table 3

ANOVA for RC by HL, TEAM, MIA and their interactions for pre-test

<table>
<thead>
<tr>
<th>Effect</th>
<th>F</th>
<th>p</th>
<th>η²</th>
</tr>
</thead>
<tbody>
<tr>
<td>HL</td>
<td>1.783</td>
<td>.184</td>
<td>.015</td>
</tr>
<tr>
<td>MIA</td>
<td>.683</td>
<td>.410</td>
<td>.006</td>
</tr>
<tr>
<td>TEAM</td>
<td>.489</td>
<td>.486</td>
<td>.004</td>
</tr>
<tr>
<td>HL x TEAM</td>
<td>.101</td>
<td>.751</td>
<td>.001</td>
</tr>
<tr>
<td>HL x MIA</td>
<td>3.884</td>
<td>.051</td>
<td>.031</td>
</tr>
<tr>
<td>MIA x TEAM</td>
<td>.683</td>
<td>.410</td>
<td>.006</td>
</tr>
<tr>
<td>HL x MIA x TEAM</td>
<td>.327</td>
<td>.568</td>
<td>.003</td>
</tr>
</tbody>
</table>

\[df = 1, 120\]
Table 4

ANOVA for CT-TI by HL, TEAM, MIA and their interactions for pre-test

<table>
<thead>
<tr>
<th>Effect</th>
<th>F</th>
<th>p</th>
<th>η²</th>
</tr>
</thead>
<tbody>
<tr>
<td>HL</td>
<td>.674</td>
<td>.413</td>
<td>.006</td>
</tr>
<tr>
<td>TEAM</td>
<td>6.067</td>
<td>.015</td>
<td>.048</td>
</tr>
<tr>
<td>MIA</td>
<td>.169</td>
<td>.682</td>
<td>.001</td>
</tr>
<tr>
<td>HL x TEAM</td>
<td>.169</td>
<td>.682</td>
<td>.001</td>
</tr>
<tr>
<td>HL x MIA</td>
<td>2.697</td>
<td>.103</td>
<td>.022</td>
</tr>
<tr>
<td>MIA x TEAM</td>
<td>.674</td>
<td>.413</td>
<td>.006</td>
</tr>
<tr>
<td>HL x MIA x TEAM</td>
<td>4.213</td>
<td>.042</td>
<td>.034</td>
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</tbody>
</table>

*df = 1, 120*
Table 5

ANOVA for CT-TRC by HL, TEAM, MIA and their interactions for pre-test

<table>
<thead>
<tr>
<th>Effect</th>
<th>F</th>
<th>p</th>
<th>η²</th>
</tr>
</thead>
<tbody>
<tr>
<td>HL</td>
<td>.357</td>
<td>.551</td>
<td>.003</td>
</tr>
<tr>
<td>TEAM</td>
<td>.159</td>
<td>.691</td>
<td>.001</td>
</tr>
<tr>
<td>MIA</td>
<td>1.427</td>
<td>.235</td>
<td>.012</td>
</tr>
<tr>
<td>HL x TEAM</td>
<td>.991</td>
<td>.322</td>
<td>.008</td>
</tr>
<tr>
<td>HL x MIA</td>
<td>.040</td>
<td>.843</td>
<td>.000</td>
</tr>
<tr>
<td>MIA x TEAM</td>
<td>7.768</td>
<td>.006</td>
<td>.061</td>
</tr>
<tr>
<td>HL x MIA x TEAM</td>
<td>.991</td>
<td>.322</td>
<td>.008</td>
</tr>
</tbody>
</table>

*df = 1, 120*
### Table 6

**ANOVA for MC by HL, TEAM, MIA and their interactions for pre-test**

<table>
<thead>
<tr>
<th>Effect</th>
<th>F</th>
<th>p</th>
<th>(\eta^2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>HL</td>
<td>2.705</td>
<td>.103</td>
<td>.022</td>
</tr>
<tr>
<td>TEAM</td>
<td>1.937</td>
<td>.167</td>
<td>.016</td>
</tr>
<tr>
<td>MIA</td>
<td>.144</td>
<td>.705</td>
<td>.001</td>
</tr>
<tr>
<td>HL x TEAM</td>
<td>.784</td>
<td>.378</td>
<td>.006</td>
</tr>
<tr>
<td>HL x MIA</td>
<td>2.705</td>
<td>.103</td>
<td>.022</td>
</tr>
<tr>
<td>MIA x TEAM</td>
<td>2.705</td>
<td>.103</td>
<td>.022</td>
</tr>
<tr>
<td>HL x MIA x TEAM</td>
<td>1.937</td>
<td>.167</td>
<td>.016</td>
</tr>
</tbody>
</table>

\(df = 1, 120\)

**Equality of pre-test variance.**

The Levene’s test was employed to test the null hypothesis that the error variance of the dependent variables is equal across groups. Results of Levene’s test revealed homogeneity of variance was not violated for RC \((p > .05)\) and CT-TRC \((p > .05)\). However, the assumption of equal error variance of the dependent variables across groups was violated for CT-TI \((p < .05)\) and MC \((p < .05)\). Table 7 presents the Levine’s tests for each dependent variable before subjecting the learners to the respective interventions.
Table 7

*Levene’s Test of Equality of Error Variance for the study’s DVs*

<table>
<thead>
<tr>
<th>Dependent Variable</th>
<th>F</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>RC</td>
<td>1.543</td>
<td>.159</td>
</tr>
<tr>
<td>CTI</td>
<td>4.002</td>
<td>.001</td>
</tr>
<tr>
<td>CT-TRC</td>
<td>1.895</td>
<td>.076</td>
</tr>
<tr>
<td>MC</td>
<td>2.142</td>
<td>.044</td>
</tr>
</tbody>
</table>

\(df = 7, 120\)

Changes in Dependent Variables Before and After Interventions (Initial Effect)

RM ANOVA was employed to show the initial effect of the cognitive components (RC, CT-TI, CT-TRC, and MC) as WS repeated measures (pre to post) and the three instructional interventions (HL, TEAM, and MIA) as grouping (BS) factors.

**Reading comprehension (RC).**

The main research question pertained to the effects the interventions HL, MIA, and TEAM, both separately and combined would have on students’ reading comprehension skills. Results of the reading comprehension RM ANOVA are presented in Table 8. The findings revealed a statistically significant effect for TIME \( (p = .002) \) and Time x HL \( (p = .003) \). Strong tendencies for significant effects were obtained for Time x MIA \( (p = .09) \) and Time x HL x MIA \( (p = .067) \).

The time effect resulted from an overall reduction in RC scores across all interventions \( (M = .776, SD = .17 \text{ VS. } M = .722, SD = .15, ES = -.34). \)
Table 8

**RM ANOVA for RC by Time (Pre-Post Scores) HL, TEAM, MIA, and their interactions effect**

<table>
<thead>
<tr>
<th>Effect</th>
<th>Wilks’ λ</th>
<th>F</th>
<th>df</th>
<th>p</th>
<th>η²</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Within Subjects</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Time</td>
<td>.925</td>
<td>9.782</td>
<td>1,120</td>
<td>.002</td>
<td>.075</td>
</tr>
<tr>
<td>2-way, 3-way, and 4-way Int.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Time x HL</td>
<td>.927</td>
<td>9.435</td>
<td>1,120</td>
<td>.003</td>
<td>.073</td>
</tr>
<tr>
<td>Time x Team</td>
<td>.990</td>
<td>1.244</td>
<td>1,120</td>
<td>.267</td>
<td>.010</td>
</tr>
<tr>
<td>Time x MIA</td>
<td>.977</td>
<td>2.819</td>
<td>1,120</td>
<td>.096</td>
<td>.023</td>
</tr>
<tr>
<td>Time x HL x Team</td>
<td>.998</td>
<td>.255</td>
<td>1,120</td>
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<tr>
<td>Time x HL x MIA</td>
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<td>3.410</td>
<td>1,120</td>
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<td>.028</td>
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<tr>
<td>Time x MIA x TEAM</td>
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<td>1,120</td>
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<tr>
<td>Time x HL x MIA x TEAM</td>
<td>1.000</td>
<td>.003</td>
<td>1,120</td>
<td>.954</td>
<td>.000</td>
</tr>
</tbody>
</table>

The Time x HL effect ($p = .003$) is shown in more detail in the Time x HL x MIA strong tendency for significance ($p = .067$) (see Figure 4). RC scores remained almost identical (pre to post) for students who completed the activities not using HL both with and without MIA ($M = .816$, $SD = .35$ VS. $M = .813$, $SD = .28$; $ES = -.009$; $M = .777$, $SD = .35$ VS. $M = .779$, $SD = .28$; $ES = .006$). However, RC mean scores decreased (pre to post) for students using HL with and without MIA ($M = .797$, $SD = .35$ VS. $M = .627$, $SD = .28$; $ES = -.54$; $M = .715$, $SD = .35$ VS. $M = .668$, $SD = .28$; $ES = -.15$). As just shown, students who did use HL with MIA showed an even greater mean decrease than any other group at the end of the learning process. The mean difference between the MIA and NO-MIA groups that did not use HL at the post examination taking into account the differences between them at the pre period was $ES = -.35$. This reflects a small effect size of Cohen’s $d$ (Cohen, 1992). The overall differences between the MIA and NO-MIA groups that did use HL at the post examination taking into account the differences between them at the pre period was $ES = .014$, indicating no effect.
Critical thinking- thesis identification (CT-TI).

A similar question pertaining to RC was examined for CT-TI. Results of the RM ANOVA are presented in Table 9. Statistically significant effects were obtained for Time ($p = .009$) and for Time x MIA x TEAM ($p = .035$). Strong tendencies for significant effects were obtained for Time x TEAM ($p = .079$), Time x HL x MIA ($p = .067$), and Time x HL x MIA x TEAM ($p = .053$).

The Time effect resulted from an overall mean increase in CT-TI across all three interventions ($M = .266$, $SD = .25$ VS $M = .383$, $SD = .20$) with ES = .57. The significant Time x HL x MIA x TEAM effect is presented in Figure 5.
Table 9

<table>
<thead>
<tr>
<th>Effect</th>
<th>Wilks’ λ</th>
<th>F</th>
<th>df</th>
<th>p</th>
<th>η²</th>
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<td>1,120</td>
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<td>Time x Team</td>
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<tr>
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<td>.786</td>
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<tr>
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<td>3.805</td>
<td>1,120</td>
<td>.053</td>
<td>.031</td>
</tr>
</tbody>
</table>

CT-TI scores minimally increased (pre to post) for students who read the articles as teams using HL with MIA ($M = .188, SD = .22$ VS. $M = .219, SD = .93; ES = .03$). However, CT-TI scores decreased for students who read the articles as individuals using HL with MIA ($M = .438, SD = .22$ VS. $M = .375, SD = .93; ES = -.06$). The difference between these combinations (mean scores were higher for no TEAM versus TEAM when students used HL with MIA) in students’ CT-TI scores was $ES = -.20$.

CT-TI scores increased (pre to post) for students who participated both as teams and as individuals using HL without MIA ($M = .125, SD = .22$ VS. $M = .406, SD = .93; ES = .26; M = .188, SD = .22$ VS. $M = .344, SD = .93; ES = .15$). The overall difference between the TEAM (higher mean scores) and NO-TEAM (lower mean scores) groups that used HL without MIA was $ES = .05$.

CT-TI scores also increased (pre to post) for students who completed activities as teams and as individuals who did not use HL with MIA ($M = .25, SD = .22$ VS. $M = .344, SD = .93; ES = .09; M = .25, SD = .22$ VS. $M = .5, SD = .93; ES = .23$). The difference between mean
scores for these two combinations at the post-test was $ES = -.13$ (mean scores were higher for no TEAM versus TEAM when students did not use HL with MIA).

Finally, CT-TI scores dramatically increased for students who did not use HL without MIA, but as teams ($M = .125, SD = 1.22$ VS. $M = .5, SD = .93; ES = .35$). Whereas students CT-TI scores decreased (pre to post) for students who participated in activities as individuals not using HL without MIA ($M = .563, SD = 1.22$ VS. $M = .375, SD = .93; ES = -.17$). The difference between post-test mean scores for these two combinations was $ES = -.46$, which reflects a small to medium effect size (Cohen, 1992).
Figure 5. Means for critical thinking (range 0, 1) using HL (upper two graphs) and no HL (lower two graphs) by MIA (left upper and lower graphs) and no MIA (right upper and lower graphs) for pre and post-tests by TEAM and no TEAM.
**Critical thinking- thesis rationale and chunking response (CT-TRC).**

RM ANOVA results for CT-TRC are presented in Table 10. The findings revealed statistically significant effects for TIME ($p < .001$), Time x HL ($p = .023$), and Time x HL x TEAM ($p = .048$).

The time effect resulted from an overall reduction in CT-TRC across all interventions ($M = 1.266, SD = .44$ vs. $M = .871, SD = .49, ES = -.85$). The significant Time x HL x TEAM effect is presented in Figure 6.

Table 10

<table>
<thead>
<tr>
<th>Effect</th>
<th>Wilks’ $\lambda$</th>
<th>$F$</th>
<th>$df$</th>
<th>$p$</th>
<th>$\eta^2$</th>
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<tbody>
<tr>
<td><strong>Within Subjects</strong></td>
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<td></td>
</tr>
<tr>
<td>Time</td>
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<td>.318</td>
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<td></td>
</tr>
<tr>
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<td>5.282^a</td>
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<td>.023</td>
<td>.042</td>
</tr>
<tr>
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<td>.162</td>
<td>.016</td>
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<td>1.588^a</td>
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<td>.210</td>
<td>.013</td>
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<tr>
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<td>4.007^a</td>
<td>1,120</td>
<td>.048</td>
<td>.032</td>
</tr>
<tr>
<td>Time x HL x MIA</td>
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<td>.049^a</td>
<td>1,120</td>
<td>.824</td>
<td>.000</td>
</tr>
<tr>
<td>Time x MIA x TEAM</td>
<td>.999</td>
<td>.137^a</td>
<td>1,120</td>
<td>.712</td>
<td>.001</td>
</tr>
<tr>
<td>Time x HL x MIA x TEAM</td>
<td>.999</td>
<td>.137^a</td>
<td>1,120</td>
<td>.712</td>
<td>.001</td>
</tr>
</tbody>
</table>

Overall, scores for CT-TRC decreased after learning across all interventions ($p < .001$). The Time x HL x TEAM ($p = .048$) effect shows mean decreases for each interaction, however, when students engaged in HL without TEAM their scores decreased dramatically less than the other interventions.

CT-TRC scores decreased from the pre to post interventions for students who did not use HL and completed activities as teams ($M = 1.234, SD = .88$ vs. $M = .75, SD = .98; ES = -.52$).
Students who did not use HL and completed articles individually ($M = 1.344, SD = .88$ VS. $M = .797, SD = .98; ES = -.59$) also decreased in CT-TRC from pre to post interventions. CT-TRC scores slightly decreased from the pre to post interventions for students who used HL and completed activities individually ($M = 1.219, SD = .88$ VS. $M = 1.125, SD = .98; ES = -.10$). However, CT-TRC scores from the pre to post interventions declined more dramatically when students used HL and completed activities as teams ($M = 1.266, SD = .88$ VS. $M = .813, SD = .98; ES = -.49$). The overall TEAM differences between the TEAM and NO-TEAM groups that did not use HL at the post examination was $ES = .07$, a very small decrease. The overall TEAM differences between the TEAM and NO-TEAM groups that did use HL at the post examination was moderate, $ES = -.41$.

![Figure 6](image-url)  
*Figure 6.* Means for critical thinking (range 0, 1, 2) using HL (left) and not using HL (right) for pre and post-tests by TEAM and no TEAM.
Meta-cognition.

RM ANOVA results pertaining to meta-cognition are presented in Table 11. The findings revealed a statistically significant Time x HL ($p = .026$) effect. Strong tendencies for significant effects were obtained for Time x HL x MIA x TEAM ($p = .068$). The significant Time x HL x MIA x TEAM effect is presented in Figure 7.

Table 11

<table>
<thead>
<tr>
<th>Effect</th>
<th>Wilks’ λ</th>
<th>$F$</th>
<th>df</th>
<th>$p$</th>
<th>$\eta^2$</th>
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<td></td>
</tr>
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<td>Time x HL</td>
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<td>.041</td>
</tr>
<tr>
<td>Time x Team</td>
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<td>.352a</td>
<td>1,120</td>
<td>.554</td>
<td>.003</td>
</tr>
<tr>
<td>Time x MIA</td>
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<td>.007</td>
</tr>
<tr>
<td>Time x HL x Team</td>
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<td>.032a</td>
<td>1,120</td>
<td>.859</td>
<td>.000</td>
</tr>
<tr>
<td>Time x HL x MIA</td>
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<td>1.704a</td>
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<td>.194</td>
<td>.014</td>
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<td>Time x MIA x TEAM</td>
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<td>1.408a</td>
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<td>.012</td>
</tr>
<tr>
<td>Time x HL x MIA x TEAM</td>
<td>.973</td>
<td>3.383a</td>
<td>1,120</td>
<td>.068</td>
<td>.027</td>
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</tbody>
</table>

Overall, results showed both positive and negative initial effects by the interventions on students’ MC scores. Negative effects emerged when students used HL with MIA regardless of TEAM or no TEAM. However, when students used HL without MIA, their mean MC scores remained consistent from pre to post test irrespective of whether or not they engaged as teams or individuals.

MC scores decreased from the pre to post interventions for students who read the articles as teams using HL and learned with MIA both as teams ($M = .875, SD = 1.98$ VS. $M = .703, SD = .
1.29; \( ES = -.11 \) and as individuals \( (M = 1.125, SD = 1.98 \text{ VS. } M = .766, SD = 1.29; ES = -.22) \). The overall MIA differences between the TEAM and NO-TEAM groups that did use HL at the post examination was \( ES = -.10 \).

MC scores increased for students who used HL, learned the articles without MIA and completed the activities both as individuals \( (M = 1.00, SD = 1.98 \text{ VS. } M = 1.016, SD = 1.29; ES = .01) \) and as teams \( (M = .688, SD = 1.98 \text{ VS. } M = .719, SD = 1.29; ES = .02) \). The overall NO-MIA differences between the TEAM and NO-TEAM groups that did use HL at the post was \( ES = .05 \).

MC scores increased for students who did not use HL, learned the articles with MIA and completed the activities both as individuals \( (M = .438, SD = 1.98 \text{ VS. } M = .813, SD = 1.29; ES = .23) \) and as teams \( (M = .75, SD = 1.98 \text{ VS. } M = .781, SD = 1.29; ES = .02) \). The overall MIA differences between the TEAM and NO-TEAM groups that did not use HL at the post examination was \( ES = -.17 \).

Finally, MC scores decreased for students who did not use HL, learned the articles without MIA and completed the activities as individuals \( (M = 1.063, SD = 1.98 \text{ VS. } M = .984, SD = 1.29; ES = -.05) \). MC scores increased for students who did not use HL, learned the articles without MIA and completed the activities as teams \( (M = .625, SD = 1.98 \text{ VS. } M = 1.00, SD = 1.29; ES = .23) \). The overall NO-MIA differences between the TEAM and NO-TEAM groups that did not use HL at the post-test was \( ES = -.23 \).
Figure 7. Means for meta-cognition (range 0, 1, 2) using HL (upper two graphs) and no HL (bottom two graphs) by MIA (left two graphs) and no MIA (right two graphs) for pre and post-tests by TEAM and no TEAM.
Changes in Dependent Variables Before and After Intervention and Delayed Time Period (Delayed Effect)

Additional RM ANOVA was employed using the cognitive components (RC, CT-TI, CT-TRC, and MC) as repeated measures (pre to post to delayed) and three instructional interventions (HL, TEAM, and MIA) as grouping (BS) factors. This additional analysis was conducted in order to test the delayed time effect of the instructional interventions on students’ reading comprehension, critical thinking, and meta-cognition skills.

**Reading Comprehension (RC).**

The main research question for this study is whether the interventions HL, MIA, and TEAM, both separately and combined would have an effect on students’ reading comprehension skills. The results of RM ANOVA pertaining to RC are presented in Table 12. The findings revealed a statistically significant effect for TIME ($p = .005$), Time x HL ($p < .001$). Strong tendencies for significant effects were obtained for Time x HL x MIA ($p = .078$).

The time effect resulted from an overall reduction in reading comprehension across all interventions from pre to post as described previously and an increase from post to delayed ($M = .722$, $SD = .15$ VS. $M = .770$, $SD = .18$, $ES = .29$). The significant Time x HL effect is presented in Figure 8.
Table 12

**RM ANOVA for RC by Time (Pre-Post-Delayed) HL, TEAM, MIA, and their interactions**

<table>
<thead>
<tr>
<th>Effect</th>
<th>Wilks’ λ</th>
<th>F</th>
<th>df</th>
<th>p</th>
<th>η²</th>
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</tr>
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<td>a</td>
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<tr>
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<td>a</td>
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<td>.021</td>
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</tbody>
</table>

Overall, results from the pre to post to delayed RM ANOVA showed that although students’ mean RC scores were initially (pre to post) negatively affected by using HL, students’ delayed (post to delayed) mean RC scores (\(M = .668, SD = .28\) VS. \(M = .758, SD = .36; ES = .28\)) were positively affected so much so when they used HL that their RC scores actually increased above their pre-test RC scores (see Figure 8). Results also showed that HL x MIA had the greatest initial negative effect on students’ RC scores. In contrast, HL x MIA had the greatest positive delayed (post to delayed) effect on students’ RC scores (\(M = .627, SD = .28\) VS. \(M = .82, SD = .36; ES = .6\)). Finally, students who did not use HL showed negative effects on students’ RC scores whether they used MIA or no MIA (see Figure 8). The overall MIA differences between the MIA and NO-MIA groups that did use HL at the delayed examination was \(ES = .36\).

RC scores increased slightly from the pre to post interventions for students who did not use HL with MIA; however, their delayed RC scores decreased (\(M = .779, SD = .28\) VS. \(M = .779, SD = .28\) VS. \(M = .779, SD = .28\)).
Students’ RC scores initially decreased for students who did not use HL without MIA, and decreased again from the post to delayed tests \((M = .813, SD = .28 \text{ VS. } M = .793, SD = .36; ES = -.14)\). The overall MIA differences between the MIA and NO-MIA groups that did not use HL at the delayed was \(ES = -.18\).

\[
\begin{array}{c|c|c}
\text{Time} & \text{HL} & \text{No HL} \\
\hline
\text{Pre} & 0.797 & 0.816 \\
\text{Post} & 0.715 & 0.777 \\
\text{Delayed} & 0.627 & 0.779 \\
\end{array}
\]

\[
\begin{array}{c|c|c}
\text{Time} & \text{HL} & \text{No HL} \\
\hline
\text{Pre} & 0.715 & 0.777 \\
\text{Post} & 0.668 & 0.779 \\
\text{Delayed} & 0.758 & 0.797 \\
\end{array}
\]

Figure 8. Means for reading comprehension (range 0, 1) using HL (left) and not using HL (right) for pre and post-tests by MIA and no MIA.

**Critical thinking- thesis identification (CT-TI).**

RM ANOVA using CT-TI as the repeated measure factor (pre to post to delayed) was conducted. Results of the RM ANOVA are presented in Table 13. The findings revealed a statistically significant Time effect \((p = .008)\). A strong tendency for significant effect was obtained for Time x MIA x TEAM \((p = .086)\).

The time effect \((p = .008)\) resulted from an overall increase in CT-TI across all interventions from pre to post \((M = .266, SD = .43 \text{ VS. } M = .383, SD = .33, ES = .31)\) and an increase from post to delayed \((M = .383, SD = .33 \text{ VS. } M = .414, SD = .5, ES = .08)\). The strong tendency for significant effect for Time x MIA x TEAM \((p = .086)\) is presented in Figure 9.
Results showed a positive delayed (post to delayed) trend in mean CT-TI scores when students used both MIA and TEAM ($M = .281, SD = .66$ VS $M = .375, SD = .1; ES = .12$), and when students did not engage in either intervention (MIA or TEAM) ($M = .359, SD = .66$ VS $M = .5, SD = .1; ES = .43$).

However, when students engaged in activities using only one of the interventions, either MIA ($M = .438, SD = .66$ VS $M = .375, SD = .1; ES = -.08$) or TEAM ($M = .453, SD = .66$ VS $M = .406, SD = 1; ES = -.06$) results did not show this positive trend.

The overall differences between the MIA and NO-MIA groups that engaged in activities as teams at the delayed examination was $ES = .21$. The overall differences between the MIA and NO-MIA groups that engaged in activities as individuals at the delayed examination was $ES = -.31$. 

---

Table 13

*RM ANOVA for CT-TI by Time (Pre-Post-Delayed) HL, TEAM, MIA, and interactions*

<table>
<thead>
<tr>
<th>Effect</th>
<th>Wilks’ λ</th>
<th>F</th>
<th>df</th>
<th>p</th>
<th>$\eta^2$</th>
</tr>
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<td><strong>Within Subjects</strong></td>
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<tr>
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<tr>
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<td>Time x HL x MIA x TEAM</td>
<td>.967</td>
<td>2.035*</td>
<td>2,119</td>
<td>.135</td>
<td>.033</td>
</tr>
</tbody>
</table>
Critical thinking- thesis rationale and chunking (CT-TRC).

Results of the RM ANOVA for CT-TRC are presented in Table 14. The findings showed statistically significant effects for Time ($p < .001$) and Time x HL ($p = .026$).

The time effect resulted from an overall increase in critical thinking scores across all interventions from pre to post ($M=1.266$, $SD=.7$ VS. $M=.871$, $SD=.45$, $ES=-.04$) and an increase from post to delayed ($M=.871$, $SD=.45$ VS. $M=1.180$, $SD=.77$, $ES=.07$). The significant Time x HL effect is presented in Figure 10.
Table 14

*RM ANOVA for CT-TRC by Time (Pre-Post-Delayed) HL, TEAM, MIA, and interactions*

<table>
<thead>
<tr>
<th>Effect</th>
<th>Wilks’ λ</th>
<th>F</th>
<th>df</th>
<th>p</th>
<th>η²</th>
</tr>
</thead>
<tbody>
<tr>
<td>Within Subjects</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Time</td>
<td>.681</td>
<td>27.862a</td>
<td>2,119</td>
<td>.000</td>
<td>.319</td>
</tr>
<tr>
<td>2-way, 3-way, and 4-way Int.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Time x HL</td>
<td>.932</td>
<td>4.348a</td>
<td>2,119</td>
<td>.015</td>
<td>.068</td>
</tr>
<tr>
<td>Time x Team</td>
<td>.982</td>
<td>1.098a</td>
<td>2,119</td>
<td>.337</td>
<td>.018</td>
</tr>
<tr>
<td>Time x MIA</td>
<td>.987</td>
<td>.811a</td>
<td>2,119</td>
<td>.447</td>
<td>.013</td>
</tr>
<tr>
<td>Time x HL x Team</td>
<td>.968</td>
<td>1.992a</td>
<td>2,119</td>
<td>.141</td>
<td>.032</td>
</tr>
<tr>
<td>Time x HL x MIA</td>
<td>.998</td>
<td>.122a</td>
<td>2,119</td>
<td>.885</td>
<td>.002</td>
</tr>
<tr>
<td>Time x MIA x TEAM</td>
<td>.979</td>
<td>1.266a</td>
<td>2,119</td>
<td>.286</td>
<td>.021</td>
</tr>
<tr>
<td>Time x HL x MIA x TEAM</td>
<td>.996</td>
<td>.262a</td>
<td>2,119</td>
<td>.770</td>
<td>.004</td>
</tr>
</tbody>
</table>

Results from the pre to post to delayed RM ANOVA for CT-TRC scores reflected similar results as the effect of HL on students’ RC scores. Although students’ mean CT-TRC scores were initially (pre to post) negatively affected by using HL as pointed out earlier with the initial effects, students’ delayed test mean CT-TRC scores (M = .969, SD = .69 VS. M = 1.266, SD = .62; ES = .45) were positively affected so much so when they used HL that their RC scores actually increased above their pre-test RC scores (see Figure 10). Students’ CT-TRC scores also increased (post to delayed) for students who learned the articles without HL (M = .773, SD = .69 VS. M = 1.094, SD = .62; ES = .49). The overall CT-TRC difference between the HL and no HL groups at the delayed examination was very minor (ES = -.03) with HL mean scores slightly higher than no HL scores.
Results of the RM ANOVA for MC are presented in Table 15. The findings revealed a statistically significant effect for Time x HL ($p = .03$). The significant Time x HL effect is presented in Figure 11.
Table 15

\[ \begin{array}{cccccc}
\text{Effect} & \text{Wilks’ } \lambda & F & df & p & \eta^2 \\
\hline
\text{Within Subjects} & & & & & \\
\text{Time} & .995 & .314^a & 2,119 & .731 & .005 \\
\text{2-way, 3-way, and 4-way Int.} & & & & & \\
\text{Time x HL} & .943 & 3.602^a & 2,119 & .030 & .057 \\
\text{Time x Team} & .995 & .326^a & 2,119 & .722 & .005 \\
\text{Time x MIA} & .992 & .452^a & 2,119 & .638 & .008 \\
\text{Time x HL x Team} & .982 & 1.120^a & 2,119 & .330 & .018 \\
\text{Time x HL x MIA} & .985 & .881^a & 2,119 & .417 & .015 \\
\text{Time x MIA x TEAM} & .986 & .858^a & 2,119 & .427 & .014 \\
\text{Time x HL x MIA x TEAM} & .972 & 1.729^a & 2,119 & .182 & .028 \\
\end{array} \]

Results from the pre to post to delayed RM ANOVA on MC scores reflected similar results as the effect of HL on students’ RC and CT-TRC scores. Although students’ mean MC scores were initially (pre to post) negatively affected by using HL as was mentioned earlier, students’ delayed (post to delayed) test mean MC scores (\( M = .801, SD = .64 \) VS. \( M = .984, SD = 1.09; ES = .57 \)) were positively affected so much so when they used HL that their RC scores actually increased above their pre-test RC scores (see Figure 11). Results also showed that although students’ mean MC scores were initially (pre to post) positively affected when not using HL, their delayed test mean MC scores (\( M = .895, SD = .64 \) VS. \( M = .797, SD = 1.09; ES = -.3 \)) showed negative affects for those students who did not use HL during the instructional activities.

The overall MC difference between the HL and NO-HL groups at the delayed test was moderate (\( ES = .32 \)) with HL mean scores higher at the delayed test than no HL mean scores.
Figure 11. Mean MC scores (range 0, 1, 2) for (a) HL (n=64) and (b) no HL (n=64) for pre, post, and delayed tests.
CHAPTER V.

DISCUSSION

Scientific evidence indicates that freshmen students, regardless of the cause, are coming to colleges and universities under-prepared. Three areas wherein students are lacking sufficient skills necessary for success in post-secondary education include reading comprehension, critical thinking, and meta-cognitive skills (ACT, 2005; Adelman, 1996; Mendelman, 2007; Hartman, 2002). The study presented here was designed to examine some instructional methods aimed at improving students’ performance for these skills (reading comprehension (RC), critical thinking-thesis identification (CT-TI) and critical thinking-thesis rationale and chunking (CT-TRC), and meta-cognition (MC)). Specifically, this study explored the effect of the Social Annotation Modeling- Learning System (SAM-LS; social annotation technology (HL), Merrill’s First Principles of Instruction (MIA), and team-based learning (TEAM)) on students’ acquisition of RC, CT-TI, CT-TRC, and MC skills.

This study examined the variations of tools and strategies that students used to read articles, answer questions, and reflect upon and compare their responses to model responses.

Review of Results

Significant initial effects.

One of the key research questions was to look at the initial effects (from pre test to post test) of the instructional technology and strategies (HL, MIA, TEAM) on the outcome measures (RC, CT-TI, CT-TRC, MC). Overall, the results showed that most treatments and combinations of treatments had initial negative effects (pre to post) on students’ RC, CT-TI, CT-TRC, and MC skills. Students’ mean RC scores decreased as a result of using the HL instructional intervention. Students who engaged in activities using both HL and MIA showed an even greater initial (pre to post) mean decrease.

The initial effects on CT-TI scores were both positive and negative for the three instructional methods. For CT-TRC, there was a negative initial effect on scores with the presence and absence of the HL and TEAM interventions. For MIA, there was no significant effect on CT-TRC scores.
Initial intervention effects on students’ meta-cognition (MC) scores varied. Students who engaged in activities using HL showed negative initial effects whereas students who engaged in activities integrating MIA and TEAM showed positive initial effects on meta-cognitive scores.

**Significant delayed effects.**

One of the key research questions was to look at the delayed effects (post test to delayed test) of the technology and instructional methods (HL, MIA, TEAM) on the outcome measures (RC, CT-TI, CT-TRC, MC). Results showed positive delayed (post to delayed) effects by interventions on the majority of students’ academic skills. Positive delayed effects by HL on students’ reading comprehension skills emerged. Even with a negative initial effect, students’ delayed test RC scores superseded pre-test RC scores. Students’ reading comprehension scores increased even higher on the delayed test when they engaged in both HL and MIA.

For CT-TI scores, combinations of HL and TEAM interventions showed both positive and negative delayed effects. Positive delayed effects emerged for MIA by TEAM. However, negative delayed effects emerged when students engaged solely in either MIA or TEAM. For the CT-TRC scores, the initial effects were negative but were followed by a positive delayed effect with HL. Students’ CT-TRC mean scores for those who used HL superseded pre-test CT-TRC scores.

Whereas HL had a negative initial effect on students’ meta-cognitive scores, from post to delayed tests HL showed a positive effect on students’ MC scores, even higher than students’ pre-test mean scores. This is similar to the effect that was shown for RC, CT-TRC, and MC (see Figure 12).
The design of the SAM-LS was based on a theoretical framework comprised of social annotation technology, First Principles of Instruction, and team-based learning. Except for First Principles of Instruction, the other factors include the interaction of multiple learners on learning tasks. The results of the study support three key points: (1) The initial technological (HL) solutions are not necessarily better than non-technical (no HL) solutions for immediate learning effects, (2) Initial learning outcome decreases are greatest when technological solutions are combined with instructional interventions (MIA, TEAM) as compared to non-technological solutions not combined with instructional interventions, (3) Technological solutions yield greater increases than non-technical solutions for delayed learning effects.

**Explanation of Significant Effects.**

**Initial effects.**

*Reading Comprehension (RC).*
Social annotation technology (HL) resulted in a decrease in students’ RC scores. When students engaged in both HL and MIA combined, their mean scores dropped even lower than the score with just HL. Students using the HL condition were expected to carry out the same instructional tasks, but with the use of an unfamiliar technology. This new technology may have created an extraneous cognitive load on the learners. Extraneous cognitive load is the unnecessary cognitive load experienced by learners as they interact with instructional materials. Sweller’s (1994) cognitive load theory postulates that extraneous cognitive load is generated by the method (s) in which information is presented to learners. Due to limited cognitive working memory, if students are using resources to process extraneous load (i.e., learning a new social annotation tool such as Hylighter) then the amount of cognitive working memory available to process the learning will be reduced. Thus, when intrinsic load, or the inherent level of difficulty associated with learning task, is high (i.e., when a problem is difficult), learning materials should be designed so as to reduce the extraneous load thereby allowing adequate cognitive resources for the learning process. Sweller argues that instruction should be designed, or tools implemented in such a way as to reduce extraneous cognitive load in order to avoid negative effects on learning. Learners in this study may have been experiencing extraneous cognitive load when figuring out how to use the unfamiliar tool (Hylighter) while at the same time focusing on the specific learning tasks. Students who did not engage in social annotation technology used paper-based methods in which they were already familiar and would not likely have experienced this same level of extraneous cognitive load as the student in the HL treatment condition. Since the HL technology posed a high extraneous load on the students, limited working memory that would have been available for the learning the task (reading comprehension) was directed to mastering the HL technology. Whereas HL resulted in a negative effect on students’ reading comprehension performance, the addition of MIA to HL causes even greater extraneous cognitive load and thereby resulted in a further reduction in students’ reading comprehension performance.

**Critical thinking- thesis identification (CT-TI).**

In contrast to initial negative effects on students’ RC scores, treatments showed both positive and negative effects on students’ CT-TI mean scores. Overall, the initial effects on CT-TI skills by the treatments were positive. Specifically, the greatest mean increases were realized in three cases: 1) when students used HL both with and without TEAM, 2) when students
engaged in activities as teams without HL or MIA, and 3) when students engaged in activities integrating MIA without HL or MIA.

These results suggest that HL alone positively affects students’ critical thinking abilities; in this case to specifically identify a thesis. Students who used HL were exposed to other students’ thesis identification responses. This exposure to and comparison of responses due to students’ engagement in HL, a benefit of computer-supported collaborative learning (CSCL), may have positively affected students’ critical thinking performance. CSCL states that information and communication technology in education more or less explicitly considers technology’s possibilities to facilitate social interaction (Koschmann, Hall, & Miyake, 2002; Kumpulainen & Wray, 2002). The purpose of CSCL is to support students in effective collaborative learning. The features of the technology are meant to facilitate students in managing their collaboration goals including any requirements of a particular collaborative task (Lehtinen, 2003), and more generally to promote reflection and inquiry that assist in-depth learning (Dillenbourg, 2002). Students who used HL were able to view other students’ responses as they worked on their own, thereby providing them the opportunity to reflect upon and compare their responses to others’ responses. Students were likely better able to further refine their responses to align with the other students’ thesis responses (Collins, et al., 1989).

It also appears that HL has an even greater positive effect on students’ critical thinking abilities when it is coupled with TEAM. This additional increase is expected as teams have been shown to facilitate group collaboration, interchange of ideas, and deeper learning (Lancaster & Strand, 2001 as cited in Lightner, et al., 2007). Engagement in both HL and TEAM would further enable students’ abilities to review, compare, and reflect upon other students’ thesis identification responses in order to submit more refined and accurate thesis responses.

The TEAM effect showing significant mean increases on students’ CT-TI scores when students engaged in activities as teams separately (pre to post) suggests that many of the benefits from the team-learning model (Michaelson, 1992) were confirmed. Some of these benefits of team learning include active engagement in problem-solving, group collaboration, learning how to deal with other people, leadership skills, self-esteem, awareness of the diversity of settings, deeper learning, and better retention of course content (Lancaster & Strand, 2001 as cited in Lightner, et al., 2007). From the team-based learning framework, the interaction and engagement as described by Lightner et al. (2007) would lead to greater learning (Clark et al., 2008;
This greater learning by engaging in team activities seemed to be supported as TEAM showed positive initial effects on students’ CT-TI skills. The TEAM mean score increase may be due to what has been previously explained as teams engaging with one another in the exchange and comparison of ideas. There is a certain amount of feedback that may be provided naturally in a team setting. If the teams have interdependence (Johnson & Johnson, 1998) then the teammates will have a personal interest in helping each other to improve their performance on the learning task. The ability to work together as a team would allow for more minds to come together and create a more refined and accurate answer to the questions (Michaelson, Knight, & Fink, 2004).

The MIA effect showing significant mean increases on students’ CT-TI scores when students engaged in activities integrating MIA separately (pre to post) seem to confirm that students successfully learn when engaged in effective instructional strategies (Van Merrienboer, 1997). Students who engage in instruction that incorporates effective instructional principles (activation, demonstration, application, and integration; Merrill, 2002) are more likely to learn more effectively and reap the benefits of increased learning. One such benefit could include the increase of students’ academic performance. In this specific instance, the integration of MIA helped students to engage in higher levels of CT-TI skills than students who did not use MIA. Because CT-TI skills are complex and require higher order thinking skills, it could be assumed that effective instructional strategies have more positive impacts on more complex skills.

The combinations of interventions that had a negative initial effect on students’ CT-TI scores included two cases: 1) when students participated in activities individually using both HL and MIA and 2) when students engaged in activities as individuals not using HL without MIA (no intervention condition). Students who worked as individuals and used both HL and MIA appeared to experience higher levels of extraneous cognitive load (Sweller, 1994) than students who used only one intervention (such as only HL, or only MIA) as explained previously. Students would have been using the majority of the cognitive working memory to focus on learning HL and figuring out MIA instead of focusing on the learning task. The result of reduced mean CT-TI scores by students who did not use any of the instructional interventions (no TEAM, no HL, and no MIA) was unexpected. It was assumed that students’ CT-TI scores would have remained the same for those who did not use any of the interventions. Because the post-test was conducted immediately following instructional activity that followed the pre-test, students may
have been tired from their previous engagement in cognitively taxing learning activities, and subsequently, their performance decreased.

**Critical thinking- thesis rationale and chunking (CT-TRC).**

Two interventions (HL and TEAM) in all combinations showed negative initial effects on students’ CT-TRC scores. Specifically, HL (TEAM and no TEAM) and no HL (TEAM and no TEAM) showed decreases in students CT-TRC scores. Students who participated in the activities using HL as individuals (HL and no TEAM) showed less mean CT-TRC score decrease than the other combinations of HL and TEAM. As critical thinking is not a simple skill to develop, but depends on complex processes and adequate time to fully develop, it appears HL provided affordances to students in order to interact with such complex skills. These affordances provided by HL may be attributed to CSCL as previously explained for the effect of HL on students’ CT-TI skills.

HL appeared to provide affordances to students as individuals, however, when students used HL as teams their CT-TRC scores decreased as much as students who did not use HL. This result is in contrast to results showing HL and TEAM collectively had greater positive effects on students’ CT-TI scores. Results from HL on CT-TRC scores suggest that participation as teams outweighed any affordances provided by HL. Students’ CT-TRC scores decreased without HL whether they engaged in activities as teams or as individuals. Although unexplained, this suggests that the benefits of engaging as teams were not confirmed for this complex task at the level of use found in this study.

The varied effects (positive and negative) which the interventions had on CT-TI and CT-TRC were unexpected. However, it appears the effects may be due to differences in each of the critical thinking skills’ activities. CT-TI activities require the students to compare and contrast their ideas against an objective thesis contained within the text (Petress, 2004; Mendelman, 2007). Students may have been better able to work with a defined thesis rather than deal with the ambiguities contained in identifying a thesis rationale or chunking sections of an article, both activities which may be more subjective activities. During CT-TRC, students identify rationale for the thesis and specify sections of an article, as chunks, based on their interpretation of how the article was organized. Because CT-TRC activities may be more subjective activities than identifying an article thesis, they may have been more difficult for students to synthesize the associated ambiguities. Further research would be required to validate this assumption.
Meta-cognition (MC).

For MC, similar effects were found as for RC and CT-TRC skills. Negative initial Time x HL, and Time x HL x MIA effects were seen on students’ meta-cognitive skills. These negative effects by HL alone and HL combined with MIA are most likely due to students experiencing higher levels of extraneous cognitive load, focusing more on the acquisition of how to use the tool and instructional strategy, versus focusing on the learning task. However, both MIA alone and TEAM alone showed positive initial effects on students’ meta-cognitive scores.

MIA had a positive initial effect on students’ MC scores. It is assumed that students successfully learn when engaged in effective instructional strategies (Van Merrienboer, 1997). In this specific instance, the integration of MIA appeared to help students to develop higher levels of meta-cognitive skills than students who did not use MIA. Because meta-cognitive skills are complex and require higher order thinking skills, it could be assumed that effective instructional strategies may have more positive impacts on more complex skills. An additional explanation as to why MIA alone positively affected students’ CT-TRC scores is due to the demonstration of novel meta-cognitive skills. Whereas students would have had prior experience answering reading comprehension questions and thesis identification and rationale questions in their education curriculum, they were most likely unfamiliar with the meta-cognitive questions. Results from the pilot study showed that students struggled with the concept of meta-cognitive analysis. The only instructional intervention that provided explicit demonstrations of meta-cognitive activities was MIA. MIA provided demonstrations of meta-cognitive skills for comparing contrived responses to model responses. Students may have gravitated toward these demonstrations almost analogous to answers in the back of a mathematics text book. Because MIA includes specific demonstrations of meta-cognitive skills, these demonstrations may have been influential in increasing students’ MC scores.

TEAM also had a positive initial effect on students’ MC scores. A possible rationale for the positive initial effect by TEAM on students’ MC scores is explained previously regarding the effect of TEAM on students’ CT-TI scores. There is a certain amount of feedback that may be provided naturally in a team setting. Also, various meta-cognitive tasks can be carried out as one thinks aloud to their team. Teams participate in active engagement in problem-solving, group collaboration, deeper learning, and better retention of course content (Lancaster & Strand, 2001 as cited in Lightner, et al., 2007). From the team-based learning framework, if the teams have
interdependence (Johnson & Johnson, 1998) then the teammates will have a personal interest in helping each other to improve their performance on the learning task. Even though students have not likely experienced prior practice in meta-cognitive tasks, the ability to work together as a team would allow for greater problem solving abilities and creation of more accurate comparisons of their responses (Michaelson, Knight, & Fink, 2004).

**Delayed effects.**

Although multiple initial effects from the treatments were negative on students’ reading comprehension, critical thinking, and meta-cognitive skills, there were multiple positive delayed (post to delayed) effects results from treatments on the majority of students’ reading comprehension, critical thinking, and meta-cognitive skills (see Figure 11).

**Reading Comprehension (RC).**

Whereas initial results showed a negative trend of HL effects on RC, delayed results showed positive HL effects on RC. Not only were delayed effects positive for students who engaged in HL, but their delayed-test scores superseded their pre-test scores. This delayed increase suggests that following an extended time period (in this instance 30 days), HL positively affects cognitive functioning related to reading comprehension to the extent that students performed better than those who did not engage in HL for the instructional activities. The positive change in delayed comprehension performance for students engaging in HL could be caused by a refining of mental models over the delayed time period; which refinement allows students to more effectively engage in the academic activities presented as part of the delayed test. Further research would be required to validate this explanation. These results can be supported with the extraneous cognitive load explanation as described previously. During both the pre and delayed tests, students may not have experienced levels of extraneous cognitive load as high as students during the instructional interventions due to the students’ familiarity with the paper and pencil methods that were used; thus showing similar scores on the pre and delayed tests.

An additional important finding showed that delayed test RC scores were highest for students who had engaged in activities integrating both HL and MIA. This result suggests that when MIA is coupled with HL, MIA supplements the affordances provided by HL. In other words, the explicit instructional demonstrations provided by MIA may have helped students better identify answers to RC questions. While HL and MIA appeared to cause a greater
cognitive load on the learners at the time of learning showing low scores for RC right after the learning activity (initial effect), the benefit of this extraneous load did not materialize until the subsequent testing period—30 days later. The benefit was a general RC increase that can be applied across content as evident in the study design where the content for the instructional activity preceding the post-test was different from the content for the delayed-test (see Figure 11).

*Critical thinking- thesis identification (CT-TI).*

Delayed results showed that interventions had one significant Time effect on students’ CT-TI scores. This effect resulted from an overall increase in CT-TI scores across all interventions and non-interventions from post to delayed-tests. Delayed results also showed a strong tendency for effect for Time x MIA x TEAM, with both positive and negative delayed effects on students’ CT-TI scores.

Students who engaged in activities as teams with MIA showed an increase in their delayed CT-TI mean scores. This result suggests that the delayed effect from MIA coupled with team-based learning has positive effects on students’ academic performance. When a team joins together, they work together, often in an effort to synergize one another’s cognitive abilities, and many times end up creating more than if they had engaged in the learning individually (Michaelson Knight, & Fink, 2004).

Students who engaged in activities as individuals without MIA (or no interventions) also showed delayed mean CT-TI increases. In the absence of interventions, a common component within each of the activities included the repetition and practice of identifying the thesis of an article. This repetition (students reading an article, identifying the thesis, and then comparing their response to a model thesis response) may have also had a significant effect, in the absence of MIA and TEAM treatments, on students’ CT-TI scores. The consistent exposure to and comparison of a model thesis to the students’ own could have had a general positive effect on students’ CT-TI scores. This assumption is not sufficiently supported by the data and would require further research to validate.

Students who engaged in activities as individuals with MIA showed decreased delayed CT-TI mean score. Whereas MIA had a positive initial effect on students’ mean CT-TI scores, from post to delayed-tests the same benefit was not retained. Students may have not fully
developed or may have forgotten some of the skills learned during the MIA instructional activity following the 30-day delayed time period.

Students who engaged in activities as teams without MIA also showed a decrease in their CT-TI delayed mean scores. However, these mean decreases were small. Although students’ CT-TI scores as teams were highest in post-test scores, delayed CT-TI scores were very similar and were much higher than students’ pre-test scores. It appears the immediate positive initial effect of TEAM on students’ CT-TI scores was higher; however, students who completed the delayed test activity as individuals seemed to retain many of the benefits gained from prior participation in activities as teams.

**Critical thinking- thesis rationale and chunking (CT-TRC).**

Whereas the initial HL effect on MC was negative, results showed positive delayed HL effects on MC. Not only were delayed effects positive for students who engaged in HL, but their delayed-test scores even superseded their pre-test scores. This delayed increase suggests that following an extended time period (in this instance 30 days), HL positively affects cognitive functioning related to CT-TRC. This delayed increase by HL on CT-TRC also supports the extraneous cognitive load explanation as described for the initial HL effect on CT-TRC. During both the pre and delayed tests, students may not have experienced levels of extraneous cognitive load as high as students during the instructional interventions due to the students’ familiarity with the paper and pencil methods that were used in the pre and delayed tests; thus showing similar scores on the pre and delayed tests.

**Meta-cognition (MC).**

Students’ delayed-test MC scores showed the same pattern for HL as the effects of HL on RC and CT-TRC. Where HL had negative initial effects on students’ MC mean scores, HL showed positive delayed effects on students’ MC mean scores, even above pre-test mean scores. This result was unexpected. Although, meta-cognition is a complex skill that requires sufficient time to adequately develop, it appears that the benefits of HL helped to minimally increase students’ MC scores after a delayed time period. HL provides students with consistent exposure to and the opportunity to compare their responses to other students’ responses. This consistent exposure and opportunity for comparison may have helped increase students’ MC abilities, however, further research would be required to validate this explanation.

**Limitations**
Several limitations need to be considered when interpreting the findings of this study. One limitation includes the motivation level students might have possessed throughout the study. Students’ motivation most likely played a key role in their performance. Students received a small stipend for their participation in the study and may have been motivated to complete the study more than a desire to perform well. If the study was conducted as part of a course, the students might have been more motivated to exert more effort toward the activities in order to perform well. According to the end of activity survey 67% of students said they gave full effort to the activity, 22% of students chose not to respond, and the additional 10% of students said they did not give full effort to this activity. However, 57% of students stated that these activities would have been more important if they were a part of the students’ grade. Therefore, students may not have been as motivated to do well on the learning activities. This possible lack of motivation may also have negatively affected students’ efforts in becoming a true functional team. If there is no interdependence within a group, then the group has likely not become a true team. This lack of a real team effect was surprising, but understandable given the short amount of time for the students to become a real team. In essence, this study did not effectively measure the true effects of a functional team. In Johnson et al. (2010) results showed a notable team effect when students engaged in a variation of the SAM-LS (social annotation technology and team-based learning without First Principles of Instruction). In this study, students spent an entire semester working together wherein most likely they would have experienced some level of interdependence. These students would have been more motivated to help each other as their grade depended upon their performance as well.

Another minor limitation could have been the students’ level of technology skills. It was assumed students would possess sufficient technological skills to be successful in their transition to using Hylighter. Sufficient technological skills include competence with online software, passwords, login names, and basic typing skills. In a post-activity survey, students said they were comfortable using computers (91%), access the Internet everyday (90%), and did not feel anxious when they worked on computers (86%). Therefore, most students felt comfortable using computers and associated software. However, almost 10% seemed to struggle with the technological skills required to successfully use the social annotation technology. These students lacking technological skills would have experienced abnormally high levels of extraneous cognitive load as they struggled with using HL which would have negatively affected the results
specifically regarding the effect of HL on students’ reading comprehension, critical thinking, and meta-cognitive skills.

An additional limitation was the invalidated assumption that the students would be motivated to use HL as it mirrors some aspects found in the popular online forums such as MySpace and FaceBook. In response to the post-activity survey, 21% of students said HL mirrored MySpace and FaceBook, 38% said it did not mirror MySpace and FaceBook, and 41% chose not to answer. It seems that HL may not have provided the same level of aspects for students to engage as other popular social technology tools.

Although students’ participation in each intervention condition was monitored, students’ highlighting and annotating was not directly observed. It is possible that students could have made poor choices in selecting information to highlight which possibly led them to make errors in their analyses regarding critical thinking and meta-cognitive skills thereby causing low scores on the initial measures. However, if students did not perform well or effectively in their highlighting and annotating, this effect was most likely randomly distributed among the participants.

Another limitation included the short duration of this study. This study produced immediate results and did not measure long-term (> 30 days) implementations of the interventions. In total, students spent up to four hours engaging in the study materials (including the pre-test, instructional activities, and delayed test). Most likely students would need more time to engage in the instructional interventions in order to more accurately produce and validate long-term effects of these instructional interventions. Results from Johnson, et al., (2010) showed similar effects wherein students engaged with instructional interventions for a total of about eight hours.

Despite these limitations, results of this study showed valuable insights into the use of the SAM-LS on students’ reading comprehension, critical thinking, and meta-cognitive skills. The results of this study can be used to inform future research.

**Instructional Implications**

Multiple instructional implications can be derived from the results of this study. While some effects were confirmed, others were not. The unconfirmed effects may have been due to the lack of an appropriately designed environment to support the effects in the study setting. The
following describes what can be done to ensure successful implementation of various instructional methods.

**Adequate time for tool familiarization.**

First, if learners are going to use new tools as part of an instructional strategy, then adequate time should be scheduled in order for students to become sufficiently competent using the tools. The amount of time required for student familiarization with tools will depend on the complexity of the tool and the student’s prior familiarity/experience with the type of tool. Learners require greater amounts of cognitive processing in order to learn a new tool. This greater cognitive processing can become extraneous cognitive load if learners are required to learn a new tool while completing a learning task. However, extraneous cognitive load can be lessened by altering instructional interventions (Van Merrienboer & Ayres, 1995). A pilot test may be necessary in order to gauge at what point learners become less concerned with the tool and more focused on the task. At what point does the use of the technology become automatic for the learner? It would be beneficial for the learner if the instructional methods used tools that closely mirrored tools that were already familiar to the learner.

**Adequate time and incentives for team forming, storming, norming, and performing.**

Second, if an instructional strategy includes the formation of teams then ample time and proper incentives should be planned for in order to allow for proper team forming, storming, norming and performing (Tuckman, 1965; Leone & O’Hare, 1995). Without the proper incentives, groups will not have sufficient motivation to move through the forming, storming, norming stages until ultimately they arrive at and become a performing team. Forming is characterized by uncertainty about the group’s tasks, structure, and leadership. Storming consists of intragroup conflict wherein learners accept the existence of their group, but they test the boundaries of control on their individuality. The storming phase is complete when all team members have a clear understanding of the group’s leadership and hierarchy. Finally, norming takes place when members of a team develop close relationships with one another and form a strong sense of group identity. Although no standard guidelines exist as to the amount of time required for team forming, storming, and norming, new teams will need to pass through each of the phases prior to becoming a competent functioning team. Some instruments can be employed in order to help speed up team’s shared mental models, but most likely the amount of time
required for teams to properly develop will depend on each situation. Recommendations for how to get teams to the performing phase are described in the future research section of this paper.

**More time engaged in instructional strategy.**

Third, in order for learners to reap the intended benefits of the instructional strategy, they should be provided ample time engaging with the materials integrating the instructional strategy. Learners require sufficient time to allow the concepts to settle and move from their short-term to long-term memory (Van Merrienboer & Ayres, 2005). If learners are not sufficiently exposed to and do not spend enough time with the instructional strategy they will most likely not adequately understand the principles and reap the benefits of the strategy. Specific recommendations regarding how to better harness the benefits of MIA are contained within the next section of this paper.

**Recommendations for Future Research**

Results from this study provided valuable insights for future research recommendations. The first of these recommendations would be to conduct additional studies to more accurately assess the instructional interventions. Specific revisions to this study design include greater fidelity of instructional strategies to be reflected in the instructional materials, the observation of instructional conditions over prolonged periods of time, specific measurement of process outcomes, and provision of mechanisms to assist groups to become functional teams.

This study integrated MIA in one instructional activity; however, the specific implementation of MIA in this study may not have accurately represented the instructional strategy. The instructional activity that integrated MIA was highly textual and contained almost ten pages of material. Although the ten pages were intended to apply MIA to thesis identification activities, they may have caused unnecessary high levels of extraneous cognitive load (Sweller, 1994), thus distracting students from obtaining the true benefits of MIA. A more accurate integration of MIA could include less text with more visual and aural aspects included in the instruction. For example, demonstrations of how to identify a thesis could have included a short video illustrating how best to break up sections of a document (i.e., zooming in on specific sentences in a document, showing those sentences compiled together, and finally showing a coherent thesis response).

In addition to more accurate representations of instructional strategies, the brevity of this study may not have allowed for students to reap the full benefits of the instructional
interventions. This study was short-term and provided students with only minimal exposure to HL, MIA, and TEAM. However, if a replicated version of this study in greater duration (i.e., six months) were designed wherein students spent longer, more consistent sessions engaging with HL, MIA, and TEAM results might show greater effects on student performance.

Along with a replication of this study longer in duration, design-based research could be employed to measure the intermediate or process outcomes (Johnson & O’Connor, 2008; Sandoval, 2004). Within the context of the SAM-LS approach, intermediate outcomes could include highlighting and annotating by the student during the learning process. This could include evaluation of frequency of students’ annotations within a specific learning task. This could also include the interpretation of students’ annotations in an effort to better identify possible areas of comprehension and logic failures. The results of such studies could inform and shape future implementations of SAM-LS approaches and technologies, thereby possibly increase the positive effect on students’ academic abilities.

The last element that could be included in further replications of this study includes providing mechanisms to help groups become functional teams. The current study may not have provided appropriate motivation, scaffolding, and time for students participating in groups to become fully functional teams. Research shows that educators, organizations, and institutions are realizing the benefits of team training in both educational and non-educational settings (Lightner, Bober, & Willi, 2007). However, if groups of learners have not properly formed, stormed, and normed around common goals, most likely the benefits of teams will not be as apparent. Thus, proper mechanisms should be put in place in order to both speed up and ensure a team successfully passes through the forming, storming, and norming stages of team creation (Leone & O’Hare, 1995). If learners are expected to perform at high levels, but are still mulling around in the storming stages of team creation, or lack the motivation to come together as a functional team, their performance will be sub-optimal as they will not be fully focused at the learning task. Both exploratory research and validation of existing mechanisms for team creation could provide great insight to educators and institutions that wish to employ team-based learning.

Another area of future research includes further investigation into learners’ acquisition of meta-cognitive skills. The results of both this and the pilot study showed that students struggle with meta-cognitive skills acquisition and performance. Students struggled in reflecting on their own experiences and comparing their performance to that of model performers. This may be due
to fact that students are not as familiar with meta-cognitive analysis as the educational system provides external versus internal feedback in most educational endeavors. Research shows that students who are better able to identify their weaknesses in educational settings are better able to learn new skills, predict future scores, and achieve higher academic performance (Everson & Tobias, 1998). However, it is uncertain as to how much explicit meta-cognitive instruction is provided to students throughout their educational journey. It can be assumed that students would greatly benefit from more explicit meta-cognitive instruction.

Finally, an additional direction of research is the investigation of extraneous cognitive load placed on learners by the introduction of new technological tools. Associated with this topic is the time required for students to become sufficiently competent using various technological tools. By introducing new technological tools to learners, an increase on their extraneous cognitive load (Van Merrienboer & Ayres, 2005; Sweller, 1994) is realized which could inhibit learners’ acquisition of essential academic skills. If this extraneous cognitive load is not sufficiently understood by designers of instruction, then as new technological tools (intended to increase learner performance) are introduced to learners, the tools may have a negative effect. Research on extraneous cognitive load could be linked to specific technological tools and their effects on learner’s performance. Technological tools could be categorized according to similarities so as to provide appropriate time frames for the successful acquisition of these tools.

**Conclusion**

The purpose of this study was to explore to what degree, separately and in various combinations, the implementation of social annotation technology, First Principles of Instruction, and team-based learning would result in effects on students’ reading comprehension, critical thinking, and meta-cognitive skills. Although results of this study are not fully conclusive, and future studies are needed to improve our understanding of the effect of the SAM-LS, current results suggest possible positive benefits in employing SAM-LS in order to help under-prepared college students increase their reading comprehension, critical thinking, and meta-cognitive skills.

Given the conditions of this study, there are several recommendations for practice. Based on this study with these specific instructional activities, if an instructor desires to increase students’ reading comprehension skills, it is recommended HL and MIA be integrated into the instructional activities. Sufficient time should be scheduled to adequately prepare learners to use
HL. Also, activities integrating MIA should be designed in such a manner as to present instructional content clearly and concisely. Instructors should expect initial decreases in learner performance but increases above previous performance following sufficient engagement (at least 4 hours) in the instructional activities.

If an instructor desires to increase students’ critical thinking-thesis identification skills, it is recommended that various combinations of interventions be integrated (including sufficient time) with the instructional activities. The combinations include HL alone, HL x TEAM, TEAM alone, and MIA alone. Instructors should expect to see both initial and delayed increases in students’ CT-TI scores if the above-mentioned combinations of instructional interventions are applied.

If the goal were to increase students’ critical thinking-thesis rationale and chunking skills, then the instructor should integrate HL with the instructional activities. Instructors should expect an initial decrease in performance followed by an overall increase in students’ CT-TRC skills given adequate time (at least 4 hours) students are engaged with the intervention.

Finally, if instructors desire to increase students’ meta-cognitive skills, it is recommended that HL be integrated into the instructional activities. Similar to the results on CT-TRC, instructors should expect an initial decrease in performance followed by an overall increase in students’ MC skills given adequate time (at least 4 hours) students are engaged with the intervention.

With the use of HL, MIA, and TEAM interventions, we see various benefits and constraints. As educational designers consider the practical application of these instructional strategies, they will be better able to employ some of the best practices for supporting development in reading comprehension, critical thinking, and meta-cognition. As students develop these skills, they will be better prepared to function in their respective jobs and ultimately provide greater value to society.
APPENDIX A

PILOT STUDY RESULTS

The full results and analysis of the pilot study can be obtained by contacting the author. Results will be provided in PDF format. Preliminary results showed minimal increases in reading comprehension and critical thinking skills of students. Critical thinking skills alone increased at a level that was statistically significant. Meta-cognitive skills received no significant mean increase.
APPENDIX B

APPROVAL OF HUMAN SUBJECTS

Appendix B-1: Approval of Human Subjects

Office of the Vice President For Research
Human Subjects Committee
Tallahassee, Florida 32306-2742
(850) 644-8673 · FAX (850) 644-4392

APPROVAL MEMORANDUM

Date: 5/16/2008

To: Tristan Johnson [tjohnson@lsi.fsu.edu]

Address: C4600 University Center C
Dept.: LEARNING SYSTEMS INSTITUTE

From: Thomas L. Jacobson, Chair

Re: Use of Human Subjects in Research
Highlighting: A New Method of Interactive Annotation and Collaborative Study

The application that you submitted to this office in regard to the use of human subjects in the proposal referenced above have been reviewed by the Secretary, the Chair, and two members of the Human Subjects Committee. Your project is determined to be Expedited per 45 CFR § 46.110(7) and has been approved by an expedited review process.

The Human Subjects Committee has not evaluated your proposal for scientific merit, except to weigh the risk to the human participants and the aspects of the proposal related to potential risk and benefit. This approval does not replace any departmental or other approvals, which may be required.

If you submitted a proposed consent form with your application, the approved stamped consent form is attached to this approval notice. Only the stamped version of the consent form may be used in recruiting research subjects.

If the project has not been completed by 5/15/2009 you must request a renewal of approval for continuation of the project. As a courtesy, a renewal notice will be sent to you prior to your expiration date; however, it is your responsibility as the Principal Investigator to timely request renewal of your approval from the Committee.

You are advised that any change in protocol for this project must be reviewed and approved by the Committee prior to implementation of the proposed change in the protocol. A protocol
change/amendment form is required to be submitted for approval by the Committee. In addition, federal regulations require that the Principal Investigator promptly report, in writing any unanticipated problems or adverse events involving risks to research subjects or others.

By copy of this memorandum, the Chair of your department and/or your major professor is reminded that he/she is responsible for being informed concerning research projects involving human subjects in the department, and should review protocols as often as needed to insure that the project is being conducted in compliance with our institution and with DHHS regulations.

This institution has an Assurance on file with the Office for Human Research Protection. The Assurance Number is IRB00000446.

Cc: Laura Lang, Chair [llang@lsi.fsu.edu]
HSC No. 2008.1332
RE-APPROVAL MEMORANDUM

Date: 6/3/2010

To: Tristan Johnson

Address: 4600 UCC
Dept.: LEARNING SYSTEMS INSTITUTE

From: Thomas L. Jacobson, Chair

Re: Re-approval of Use of Human subjects in Research
Highlighting: A New Method of Interactive Annotation and Collaborative Study

Your request to continue the research project listed above involving human subjects has been approved by the Human Subjects Committee. If your project has not been completed by 6/2/2011, you must request a renewal of approval for continuation of the project. As a courtesy, a renewal notice will be sent to you prior to your expiration date; however, it is your responsibility as the Principal Investigator to timely request renewal of your approval from the committee.

If you submitted a proposed consent form with your renewal request, the approved stamped consent form is attached to this re-approval notice. Only the stamped version of the consent form may be used in recruiting of research subjects. You are reminded that any change in protocol for this project must be reviewed and approved by the Committee prior to implementation of the proposed change in the protocol. A protocol change/amendment form is required to be submitted for approval by the Committee. In addition, federal regulations require that the Principal Investigator promptly report in writing, any unanticipated problems or adverse events involving risks to research subjects or others.

By copy of this memorandum, the Chair of your department and/or your major professor are reminded of their responsibility for being informed concerning research projects involving
human subjects in their department. They are advised to review the protocols as often as necessary to insure that the project is being conducted in compliance with our institution and with DHHS regulations.

Cc:
HSC No. 2010.4140
APPENDIX C

INSTRUMENTS

This appendix contains the demographic questionnaire instrument and the end of activity surveys used in this study.
Appendix C-1: Informed Consent and Demographic Instrument

SAM-LS Study Data Collection Instruments  v.070826

Informed Consent

PARTICIPANT CONSENT FORM
Principal Investigators: Dr. Tristan Johnson
Learning Systems Institute, Florida State University

I freely and voluntarily consent to be a participant in the study entitled “Social Annotation Modeling Learning System: Improving Student Learning and Performance In College Freshmen English Courses.”

This project is being conducted by Dr. Tristan Johnson of the Florida State University Learning Systems Institute. I understand the purpose of the study is to investigate how different instructional methods impact critical thinking, writing, and meta-cognitive performance. I understand that if I participate in the study I will be asked to engage in multiple critical thinking activities designed with the use of Hylighter software.

I understand I will be asked to fill out a demographic survey, answer questionnaires, and complete achievement assessments during various stages of the study. The total time commitment for the entire study will be between 480 minutes spread over an entire semester. I also understand that I may be observed and videotaped during the study activities.

I understand my participation is voluntary and I may withdraw at any time. If I decide to stop participation, I will not be penalized. All my responses to the demographic survey, questionnaires, and achievement tests will be kept confidential and identified by a coding system. My name will not appear on any of the results.

I understand there is a possibility of a minimal level of risk involved if I agree to participate in this study. I understand that the unlikely event of accidental identification carries the potential of embarrassment. I understand there are benefits for participating in this study in terms of personal reflection on my performance.

I understand that this consent may be withdrawn at any time without prejudice, penalty or loss of benefits to which I am otherwise entitled. I have been given the right to ask and have answered any inquiry concerning the study. Questions, if any, have been answered to my satisfaction.

I understand that I may contact Chair of the Human Subjects Committee, Florida State University at (850) 644-8673 or (850) 644-8633, for answers to questions about this study or my rights. I understand that general questions about the study can be directed to Tristan Johnson, Florida State University Learning Systems Institute by phone at (850) 644-8770 or by email at tjohnson@lsi.fsu.edu. Results will be sent to me upon my request.

I HAVE HAD THE OPPORTUNITY TO READ THIS CONSENT FORM AND ASK QUESTIONS ABOUT THE STUDY. I AM PREPARED TO PARTICIPATE IN THIS STUDY ENTITLED “Social Annotation Modeling Learning System: Improving Student Learning and Performance In College Freshmen English Courses.”

____________________________________________
Participant’s Name (Please print)

___________________________________________             _______ Participant’s
Signature     Date
**Demographics**

| Name (Last, First): | ____________________________________________ |
| SSN (Last 4 digits): | ______ |

**Instructions**—Please complete the following survey by filling in the blanks or circling the correct response.

**1. Background**

1.1 Age: ____

1.2 Gender: a) Female, b) Male

1.3 Race: a) Asian, b) Black, c) Caucasian, d) Hispanic, e) Native American, f) Other __________________

1.4 Year in School: a) Freshman, b) Sophomore, c) Junior, d) Senior, e) Graduate Student

1.5 Major: ______________________________________

1.6 GPA: a) 0 - 1.5 b) 1.5 - 2.5 c) 2.5 - 3.0 d) 3.0 - 3.5 e) 3.5 - 4.0

1.7 Do you have experience working in the field of English Composition? a) Yes, b) No
  If so, for how long? _______ months

**Self-Efficacy Trait Instrument**

**Instructions**—Read each statement and decide to what extent it describes you. Circle the number that best represents how much you agree or disagree with each statement below. There are no right or wrong answers.

<table>
<thead>
<tr>
<th>Statement</th>
<th>Strongly Disagree</th>
<th>Disagree</th>
<th>Not Sure</th>
<th>Agree</th>
<th>Strongly Agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 When I make plans, I am certain I can make them work.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>2 One of my problems is that I cannot get down to work when I should.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>3 If I can't do a job the first time, I keep trying until I can.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>4 When I set important goals for myself, I rarely achieve them.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>5 I give up on things before completing them.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>6 I avoid facing difficulties.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>7 If a task looks too complicated, I will not even bother to try it.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>Statement</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>---</td>
<td>---------------------------------------------------------------------------</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>8</td>
<td>When I have something unpleasant to do, I stick with it until I finish it.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>9</td>
<td>When I decide to do something, I go right to work on it.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>10</td>
<td>When trying to learn something new, I soon give up if I am not initially successful.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>11</td>
<td>When unexpected problems occur, I don’t handle them well.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>12</td>
<td>I avoid trying to learn new things when they look too difficult to me.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>13</td>
<td>Failure just makes me try harder.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>14</td>
<td>I feel insecure about my ability to do things.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>15</td>
<td>I am a self-reliant person.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>16</td>
<td>I give up easily.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>17</td>
<td>I do not seem capable of dealing with most problems that come up in my life.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
</tbody>
</table>
## Prior Task Experience

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Prior Task Experiences</strong></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Do you have prior experience with these types of tasks for this study? a) Yes, b) No</td>
</tr>
<tr>
<td>2</td>
<td>If, yes, for how long? _____ months</td>
</tr>
<tr>
<td>3</td>
<td>What is your skill level related to the specific tasks associated with this study? Very Low</td>
</tr>
</tbody>
</table>

## Technological Skills

Do you feel comfortable using a computer? Yes No
Do you consider yourself a computer nerd? Yes No
Do you access the internet almost everyday? Yes No
It is easy for me to use most anything on a computer? Yes No
I don’t like using computers and feel anxious when I work on them? Yes No

## Whole Task Difficulty Rating (student)

Given the tasks for this study, please answer the following question.

How difficult do you think the tasks are?

<table>
<thead>
<tr>
<th>Very Easy</th>
<th>Easy</th>
<th>Neither Easy nor Difficult</th>
<th>Difficult</th>
<th>Very Difficult</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>
Whole Task Motivation

Instructions—Please circle the number that best describes your feelings related to the specific tasks for this study. There are no right or wrong answers.

<table>
<thead>
<tr>
<th></th>
<th></th>
<th>Not True</th>
<th>Slightly True</th>
<th>Moderately True</th>
<th>Mostly True</th>
<th>Very True</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>The things I am learning from performing these tasks will be useful for me.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>2</td>
<td>I do NOT see how these tasks relates to anything I already know.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>3</td>
<td>These tasks relate to my expectations and professional goals.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>4</td>
<td>To accomplish my goals, it is important that I do well performing these tasks.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>5</td>
<td>I do NOT think I will benefit from performing these tasks.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>6</td>
<td>The personal benefits of these tasks are clear to me.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>7</td>
<td>These tasks are relevant to my current or future job.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>

Whole Task Self-Efficacy

Given the specific tasks for this study, please answer the following questions.

How confident are you to successfully perform these tasks?

<table>
<thead>
<tr>
<th></th>
<th>Not at All Confident</th>
<th>Not Very Confident</th>
<th>Moderately Confident</th>
<th>Very Confident</th>
<th>Extremely Confident</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>
Appendix C-2A: End of Activity Survey with Hylighter

End of Activity Survey

1. Did you give full effort to this activity? Yes No
   a. If not, please explain.

2. Do you think the monetary compensation ($60) was worthy of the amount of time spent on the activities? Yes No

3. Did you feel sufficiently motivated to engage in the activities? Yes No

4. Would these activities have mattered more if it were part of your grade? Yes No

5. Rate Hylighter on a scale of 1-5 in comparison to MySpace and FaceBook.
   
   1   2   3   4   5

6. Do you think Hylighter mirrors MySpace and FaceBook? Why?

7. Is there anything else you would like to tell us about Hylighter? Or your experience?
Appendix C-2B: End of Activity Survey Without Hylighter

End of Activity Survey

1. Did you give full effort to this activity? Yes No
   a. If not, please explain.

2. Do you think the monetary compensation ($60) was worthy of the amount of time spent on the activities? Yes No

3. Did you feel sufficiently motivated to engage in the activities? Yes No

4. Would these activities have mattered more if it were part of your grade? Yes No

5. Is there anything else you would like to tell us about this study?
APPENDIX D

PRE AND DELAYED TESTS
Appendix D-1: Pre and Delayed Test A

Social Annotation Modeling Learning System (SAM-LS) Pre-Test Questions
Reed, Susan E. “Lawsuits Won’t Break that Glass Ceiling.” 587-590.

I. Reading Comprehension Questions:
What percentage of the workforce is female? What percentage of corporate officers are female?

What two strategies have women traditionally used order to ensure greater gender equity in the workforce?

In what ways, according to Hydie Sumner, were women victimized at Merrill Lynch?

How, according to Reed, do the courts evaluate the extent to which organizations exhibit gender discrimination?

Why is it difficult for reporters to know the full extent to which companies are either sued or threatened with gender discrimination lawsuits?

In what ways did Nancy Hopkins benefit from complaining about gender discrimination in her workplace?

Why, according to Reed, are organizations likely to hire senior women externally rather than promote internally?

According to Reed, in what way do activist women seem less loyal to the company than their male counterparts?
II. Chunking: Complete the following steps.

1. Review the article again and divide the article into content sections. (You may mark up the printed copy of the article)
2. Label each section as to the main idea of each section of the article. (A section may consist of one or more paragraphs)

   Ex. Since the agreement was signed, however, there have been reports of wide-spread violence throughout the region. A new rebel group has emerged called the "National Redemption Front" (which is made up of the 4 main rebel groups who refused to sign the May peace agreement).[13] Recently, both the Sudanese government and government-sponsored Muslim militias have launched large offensives against the rebel groups, resulting in more deaths and more displacements. Clashes among the rebel groups have also contributed to the violence.[14] Recent fighting along the Chad border has left hundreds of soldiers and rebel forces dead and nearly a quarter of a million refugees cut from aid.[15] In addition, villages have been bombed and more civilians have been killed.

(Only use the number of sections you see as appropriate. You may add more sections on the following page if needed.)

Section 1.

Section 2.

Section 3.

Section 4.

Section 5.

Space for more sections if needed.
III. Thesis Identification:

1) What was the author trying to say when she wrote this piece? (Thesis)

2) Why? (Rationale) This may require you to write several sentences.

IV. Thesis Comparison: When you have completed writing your answer, please ask the faculty support member to give you a copy of the model response. Complete the following steps.

Look at your response and the model response.

1. Does your thesis match the model response?  Yes  No
2. On a scale of 1-5, rate how close your selection matches the model response.
   1  2  3  4  5
3. If your thesis doesn’t match the model response, is it a plausible alternative? Please explain.
Model Response
Susan Reed argues that, although gender discrimination may indeed be present in many workplaces, an overtly adversarial and litigious approach to the problem on the part of women is ultimately self-defeating; although individual complainants may benefit, the larger cause is damaged by the perception that women are not “team-players.” Reed proposes instead that women and men both should work to ensure that the promotion structure within companies is transparent, equitable, and free from favoritism.
Appendix D-2: Pre and Delayed Test B

Social Annotation Modeling Learning System (SAM-LS) Test Questions
Thurow, Lester C. “Why Women Are Paid Less Than Men.” 242-244

I. Reading Comprehension Questions:
At the time this article was written, what was the percentage difference between the earnings of white men and white women?

For how long had this disparity existed? How much had the disparity changed?

Over the same time period, what happened to the earnings of other groups when compared with white males?

Although income disparities in these other groups may be leveling, what does George Gilder believe to be “Mother Nature’s constant” in wage disparity?

What explanation does Gilder offer to explain this disparity in incomes? Does Gilder offer any proof for this?

Why, according to Thurow, is simple “discrimination” not a sufficient explanation for the wage gap?

Identify two other possible explanations that Thurow discusses—and dismisses—as causes for the disparity in incomes?

What, according to Thurow, is economically important about the years 25-35?
II. Chunking: Complete the following steps.

3. Review the article again and divide the article into content sections. (You may mark up the printed copy of the article)
4. Label each section as to the main idea of each section of the article. (A section may consist of one or more paragraphs)

Ex. Since the agreement was signed, however, there have been reports of widespread violence throughout the region. A new rebel group has emerged called the "National Redemption Front" (which is made up of the 4 main rebel groups who refused to sign the May peace agreement). [13] Recently, both the Sudanese government and government-sponsored Muslim militias have launched large offensives against the rebel groups, resulting in more deaths and more displacements. Clashes among the rebel groups have also contributed to the violence. [14] Recent fighting along the Chad border has left hundreds of soldiers and rebel forces dead and nearly a quarter of a million refugees cut from aid. [15] In addition, villages have been bombed and more civilians have been killed.

(Only use the number of sections you see as appropriate. You may add more sections on the following page if needed.)

Section 1:

Section 2:

Section 3:

Section 4:

Section 5:
Space for more sections if needed.

III. Thesis Identification:
3) What was the author trying to say when she wrote this piece? (Thesis)

4) Why? (Rationale) This may require you to write several sentences.

IV. Thesis Comparison: When you have completed writing your answer, please ask the faculty support member to give you a copy of the model response. Complete the following steps.

Look at your response and the model response.

Selection:
1. Does your thesis match the model response?  Yes  No
2. On a scale of 1-5, rate how close your selection matches the model response.
   1  2  3  4  5
3. If your thesis doesn’t match the model response, is it a plausible alternative? Please explain.
Model Response
Thurow confronts the question of why, after forty years of relatively full integration of women into the workforce, there still remains a perplexing disparity between the incomes of men and women. He argues that conventional explanations of blanket discrimination are inadequate. Thurow proposes, instead, that one’s lifetime earnings are determined primarily upon the extent to which one succeeds or fails in the decade between the ages of 25 and 35. This decade, of course, is the time during which many women have children and, consequently, women during these years are more likely to be focused on the family rather than the workplace. Thurow offers two possible resolutions to this problem: women must either have children earlier or later; society itself must fundamentally reconstruct existing trajectories of career advancement.
APPENDIX E
ADDITIONAL EFFECTS

Figure E-1. Mean RC scores by presence or absence of HL before and after the intervention.

RC scores remained similar at the pre and post intervention in students who completed the learning activities without HL ($M = .797, SD = .25$ VS. $M = .796, SD = .20; ES = -.004$). In contrast, students who completed the learning activities with HL showed a substantial decrease at the end of the learning process ($M = .756, SD = .25$ VS. $M = .648, SD = .20; ES = -.47$). The overall RC differences between the HL and NO-HL groups at the post examination taking into account the differences between them at the pre period was $ES = -.43$. This reflects a small to medium effect size according to Cohen’s $d$ (Cohen, 1992).

The Time x MIA effect, which tended toward significance, is presented in Figure 6. RC scores minimally decreased from the pre to post interventions for students who completed the learning activities without MIA ($M = .766, SD = .25$ VS. $M = .74, SD = .20; ES = -.11$). Students who completed the learning activities with MIA showed a greater decrease than NO-MIA groups at the end of the learning process ($M = .787, SD = .25$ VS. $M = .703, SD = .20; ES = -.37$). The overall MIA differences between the MIA and NO-MIA groups at the post examination taking
into account the differences between them at the pre period was $ES = -.23$. This reflects a small effect size according to Cohen’s $d$ (Cohen, 1992).

Figure E-2. Mean RC scores by presence or absence of MIA before and after intervention.

CTI scores decreased slightly from the pre to post interventions for students who identified the article thesis individually without MIA ($M = .375$, $SD = .86$ VS. $M = .36$, $SD = .66$; $ES = -.02$). Students who identified the article thesis as individuals but with MIA ($M = .344$, $SD = .86$ VS. $M = .438$, $SD = .66$; $ES = .12$) increased their CT-TI scores. CT-TI scores increased dramatically from the pre to post interventions for students who identified the article thesis as teams without MIA ($M = .125$, $SD = .86$ VS. $M = .453$, $SD = .66$; $ES = .43$). Students who identified the article thesis as teams with MIA also increased CT-TI scores ($M = .219$, $SD = .86$ VS. $M = .281$, $SD = .66$; $ES = .08$). The overall MIA differences between the MIA and NO-MIA groups that worked both as teams and individually at the post examination taking into account the differences between them at the pre period was $ES = .12$. This does not qualify as a small effect size according to Cohen’s $d$ (Cohen, 1992). The overall MIA differences between the MIA and NO-MIA groups that worked as teams at the post examination taking into account the differences between them at the pre period was $ES = -.31$. This result qualifies as a small effect size according to Cohen’s $d$ (Cohen, 1992).
Figure E-3. Means for critical thinking (range 0, 1) using TEAM (left) and not using TEAM (right) for pre and post-tests by MIA and no MIA.

The Time x TEAM effect, which tended toward significance, is presented in Figure E-4. CT-TI scores minimally increased from the pre to post interventions for students who completed the learning activities as individuals ($M = .359$, $SD = .61$ VS. $M = .398$, $SD = .46$; $ES = .07$). Students who completed the learning activities as teams showed a greater increase than individuals at the end of the learning process ($M = .172$, $SD = .61$ VS. $M = .367$, $SD = .46$; $ES = .36$). The overall MIA differences between the TEAM and NO-TEAM groups at the post examination taking into account the differences between them at the pre period was $ES = .26$. This reflects a small effect size according to Cohen’s $d$ (Cohen, 1992).
CTI scores decreased slightly from the pre to post interventions for students who used HL during the activities and learned with MIA \((M = .313, SD = .86 \text{ VS. } M = .297, SD = .66; ES = -.02)\). Students who completed the activities using HL without MIA \((M = .156, SD = .86 \text{ VS. } M = .375, SD = .66; ES = .29)\) increased their CT-TI scores. CT-TI scores increased from the pre to post interventions for students who completed the activities not using HL but with MIA \((M = .25, SD = .86 \text{ VS. } M = .422, SD = .66; ES = .23)\) and without MIA \((M = .344, SD = .86 \text{ VS. } M = .438, SD = .66; ES = .12)\). The overall MIA differences between the MIA and NO-MIA groups that worked using HL at the post examination taking into account the differences between them at the pre period was \(ES = -.29\). This is a small effect size according to Cohen’s \(d\) (Cohen, 1992). The overall MIA differences between the MIA and NO-MIA groups that did not use HL at the post examination taking into account the differences between them at the pre period was \(ES = .09\). This result does not qualify as a small effect size according to Cohen’s \(d\) (Cohen, 1992).

Figure E-4. Mean CT-TI scores by presence or absence of TEAM before and after intervention.
Figure E-5. Means for critical thinking (range 0, 1, 2) using HL (left) and not using HL (right) for pre and post-tests by MIA and no MIA.

Figure E-6. Mean CT-TRC scores (range 0, 1, 2) by presence or absence of HL before and after intervention.
CT-TRC scores decreased from the pre to post interventions for students who read the articles and learned them without HL ($M = .1.289$, $SD = .62$ VS. $M = .773$, $SD = .69$; $ES = -.79$). Students who learned the articles with HL ($M = 1.242$, $SD = .62$ VS. $M = .969$, $SD = .69$; $ES = -.71$) showed less of a decrease than NO-HL groups at the end of the learning process. The overall MIA differences between the MIA and NO-MIA groups at the post examination taking into account the differences between them at the pre period was $ES = .08$. This result does not qualify for a small effect size according to Cohen’s $d$ (Cohen, 1992). The significant MIA x TEAM effect is presented in Figure 13.

![Figure E-7](image)

**Figure E-7.** Mean CT-TRC scores (range 0, 1, 2) for TEAM vs. No-TEAM by MIA vs. No-MIA.

CT-TRC scores were lower for MIA when students engaged in articles as individuals ($M = .1.008$, $SD = .72$) compared to when they engaged in activities as teams ($M = 1.102$, $SD = .72$) with $ES = .31$. CT-TRC scores were higher for NO-MIA when students engaged in articles as individuals ($M = 1.234$, $SD = .72$) compared to when they engaged in activities as teams ($M = .93$, $SD = .72$) with $ES = -.24$. The overall differences between the MIA vs. NO-MIA groups taking into account the differences between them with TEAM and with NO-TEAM was $ES = -.55$. This shows a medium effect size according to Cohen’s $d$ (Cohen, 1992).

The significant ($p = .026$) HL by MIA effect is presented in Figure E-8. The time data was pooled in order to achieve this effect. Students who completed activities using HL revealed lower RC scores when they learned without MIA ($M = .714$, $SD = .21$) versus students who learned with MIA ($M = .748$, $SD = .21$) with $ES = -.16$. Students who completed activities not
using HL revealed lower scores when they learned with MIA ($M = .755, SD = .21$) versus students who learned without MIA ($M = .807, SD = .21$) with $ES = .24$. The overall HL differences between the HL vs. NO-HL groups taking into account the differences between them with TEAM and with NO-TEAM was $ES = -.4$. This shows a medium effect size according to Cohen’s $d$ (Cohen, 1992).

Figure E-8. Mean RC scores of HL and NO-HL by MIA and NO-MIA.
Students who completed activities using HL and learned with MIA revealed lower RC scores when they participated as teams versus students who participated individually ($M = .727$, $SD = .31$ VS $M = .77$, $SD = .31$; $ES = .14$). Students who completed activities using HL and who did not learn with MIA revealed higher scores when they participated as teams versus participating individually ($M = .727$, $SD = .31$ VS $M = .701$, $SD = .31$; $ES = .09$). The overall MIA differences between the MIA vs. NO-MIA groups that used HL taking into account the differences between TEAM and with NO-TEAM was $ES = .22$. This shows a small effect size according to Cohen’s $d$ (Cohen, 1992).

Students who completed activities not using HL and learned with MIA revealed higher RC scores when they participated as teams versus students who participated individually ($M = .768$, $SD = .31$ VS $M = .741$, $SD = .11$; $ES = .09$). Students who completed activities not using HL and who did not learn with MIA revealed lower scores when they participated as teams versus participating individually ($M = .784$, $SD = .31$ VS $M = .831$, $SD = .31$; $ES = .15$). The overall MIA differences between the MIA vs. NO-MIA groups that did not use HL taking into account the differences between TEAM and with NO-TEAM was $ES = -.02$. This shows a medium effect size according to Cohen’s $d$ (Cohen, 1992).

The significant ($p = .004$) TEAM by MIA effect is presented in Figure E-10.
Students revealed lower CT-TRC scores who learned articles without MIA and completed activities as teams ($M = .995, SD = .62$) versus students who learned articles with MIA and completed activities individually ($M = 1.26, SD = .62$) with $ES = .42$. Students revealed higher CT-TRC scores who learned articles with MIA and completed activities as teams ($M = 1.109, SD = .62$) versus students who learned articles with MIA and completed activities as individuals ($M = 1.057, SD = .62$) with $ES = -.08$. The overall MIA differences between the MIA vs. NO-MIA groups taking into account the differences between them with TEAM and with NO-TEAM was $ES = -.51$. This shows a medium effect size according to Cohen’s $d$ (Cohen, 1992). The HL x MIA x TEAM significant effect is presented in Figure 24.
Figure E-11. Means for CT-TRC (range 0, 1, 2) using HL (left) and not using HL (right) for TEAM and no TEAM by MIA and no MIA.

Students who completed activities using HL and learned with MIA revealed lower CT-TRC scores when they participated as teams versus students who participated individually ($M = 1.094, SD = .87$ VS $M = .1167, SD = .87; ES = .08$). Students who completed activities using HL and who did not learn with MIA revealed lower scores when they participated as teams versus participating individually ($M = .1104, SD = .87$ VS $M = 1.271, SD = .87; ES = .19$). The overall MIA differences between the MIA vs. NO-MIA groups that used HL taking into account the differences between TEAM and with NO-TEAM was $ES = -.11$. This result does not qualify as a small effect size according to Cohen’s $d$ (Cohen, 1992).

Students who completed activities not using HL and learned with MIA revealed higher CT-TRC scores when they participated as teams versus students who participated individually ($M = 1.125, SD = .87$ VS $M = .948, SD = .87; ES = -.2$). Students who completed activities not using HL and who did not learn with MIA revealed lower scores when they participated as teams versus participating individually ($M = .885, SD = .87$ VS $M = 1.25, SD = .87; ES = .41$). The overall MIA differences between the MIA vs. NO-MIA groups that did not use HL taking into
account the differences between TEAM and with NO-TEAM was $ES = -.62$. This shows a medium effect size according to Cohen’s $d$ (Cohen, 1992).

![Figure E-12. Mean RC scores by presence or absence of HL for pre, post, and delayed measures.](image)

RC scores remained similar at the pre and post intervention in students who read the articles and learned them without HL ($M = .797$, $SD = .25$ VS. $M = .796$, $SD = .20$; $ES = -.004$). In contrast, students who learned the articles with HL showed a substantial decrease at the end of the learning process ($M = .756$, $SD = .25$ VS. $M = .648$, $SD = .20$; $ES = -.47$). The overall RC differences between the HL and NO-HL groups at the post examination taking into account the differences between them at the pre period was $ES = -.43$. This reflects a small to medium effect size according to Cohen’s $d$ (Cohen, 1992).

RC scores remained similar in students who read the articles and learned them without HL ($M = .796$, $SD = .2$ VS. $M = .789$, $SD = .2$; $ES = -.03$) at the post intervention and delayed tests. In contrast, students who learned the articles with HL showed a substantial increase from the post intervention to the delayed test ($M = .648$, $SD = .2$ VS. $M = .75$, $SD = .26$; $ES = .44$). The overall RC differences between the HL and NO-HL groups at the delayed examination taking into account the differences between them at the post intervention period was $ES = .11$.  

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Appendix F: Instructional Interventions

This appendix includes the following intervention documents—the non-Merrill Instructional Activity using Hylighter, non-Merrill Instructional Activity not using Hylighter, Merrill Instructional Activity using Hylighter, Merrill Instructional Activity not using Hylighter, and the introduction to Hylighter booklet.
Appendix F-1: Instructional Activity Without First Principles of Instruction With Hylighter

How to Identify a Thesis

Introduction
One of the core competencies you will be required to demonstrate in your college career is the ability to identify the central argument of an essay—the author’s thesis. The following steps will guide you through this process. You will be answering questions for the Adult Crime, Adult Time article using Hylighter.
1) Read, read, and read again; it may easily take up to three readings of an essay before you are able to begin to identify the thesis. The more familiar you are with the text, the better you will be able to accomplish this task. Read the article multiple times.
2) Distinguish between two key components of the essay: the topic and thesis.
   a. The **topic** is the subject of an article: “Reed’s topic is gender discrimination in the workplace.”
   b. The **thesis** of an article is what the essay argues about this topic: see below for this part.

After reading the essay several times, you should be able easily to identify the topic, though not necessarily the thesis.
3) In order to identify the thesis you will need to focus your reading in the following ways:
   Deal with the details.
   a. Are there any words with which you are unfamiliar? Look them up.
   b. Are there any references with which you are unfamiliar? Look them up.
   c. If there is editorial apparatus attached to the essay (i.e. the introductory head notes or review questions that often accompany essays in a textbook), spend some time thinking or pre-writing about the questions you are being asked.

By the end of this stage, you should be able to answer all reading comprehension questions. Now answer all of the reading comprehension questions in Hylighter. Once you have completed answering the reading comprehension questions, compare your questions to the model responses by answering the questions found in the g-note area in Hylighter.
4) Chunk the essay. Just as an author organizes an essay by using paragraphs, you can separate an essay into its various component parts by “chunking.” In this process, you select single or multiple paragraphs and identify the roles these chunks play in presenting the ideas discussed in the essay as a whole. Although it is far from being an exact science, chunks normally break down into the following types:

a. Introduction: this could be a personal anecdote, a statistic, a news story, a quotation, etc.
b. Background information: in these sections, the author provides a necessary historical/social context for the essay.
c. Thesis/Potential Thesis: an author may be direct in stating a thesis, or, alternatively, may spread the thesis thinly across an essay.
d. Supporting arguments: in these sections an author explains the various points that have led her to adopt her position on the topic.
e. Rebuttal: in this section the author acknowledges contrary positions to his own but explains why his position remains valid.
f. Conclusion: this chunk closes the essay, frequently by returning to some of the issues raised in the introduction.

Now chunk the article using the hylight function in Hylighter. Once you have completed chunking the article, compare your response to the model chunking response by answering the questions outlined in the g-note section of Hylighter.
5) Synthesis. Once you have chunked the essay, you can begin the process of synthesizing the thesis. Go back over your chunks, and read the parts that you have labeled as thesis/potential thesis. With those sections running through your mind, attempt to construct a single statement that captures the entire “thought-thread” of the argument. So, for example:

Susan Reed argues that, although gender discrimination may indeed be present in many workplaces, an overtly adversarial and litigious approach to the problem on the part of women is ultimately self-defeating. Although individual complainants may benefit, such suits create the perception that women are not “team-players,” thereby damaging the larger cause. Reed proposes instead that women and men should work together to ensure that the promotion structure within companies is transparent, equitable, and free from favoritism.

Although Reed never precisely states her argument this way, this is her thesis.

Now identify the thesis and write the thesis in the g-note section in Hylighter. Once you have identified the thesis, compare your thesis response to the model thesis response by answering the questions outlined in the g-note section of Hylighter.
How to Identify a Thesis

Introduction
One of the core competencies you will be required to demonstrate in your college career is the ability to identify the central argument of an essay—the author’s thesis. The following steps will guide you through this process. You will be answering questions for the Adult Crime, Adult Time article using Hylighter. The Society is Dead: We Have Retreated into the iWorld article will be referenced as an example throughout this instruction.
6) Read, read, and read again; it may easily take up to three readings of an essay before you are able to begin to identify the thesis. The more familiar you are with the text, the better you will be able to accomplish this task. Read the article multiple times.
7) Distinguish between two key components of the essay: the topic and thesis.
   a. The **topic** is the subject of an article: “Reed’s topic is gender discrimination in the workplace.”
   b. The **thesis** of an article is what the essay argues about this topic: see below for this part.

After reading the essay several times, you should be able easily to identify the topic, though not necessarily the thesis.
8) In order to identify the thesis you will need to focus your reading in the following ways:
   Deal with the details.
   a. Are there any words with which you are unfamiliar? Look them up.
   b. Are there any references with which you are unfamiliar? Look them up.
   c. If there is editorial apparatus attached to the essay (i.e. the introductory head notes
      or review questions that often accompany essays in a textbook), spend some time
      thinking or pre-writing about the questions you are being asked.

   By the end of this stage, you should be able to answer all reading comprehension
   questions. Now answer all of the reading comprehension questions in the answer booklet.
   Once you have completed answering the reading comprehension questions, compare your
   questions to the model responses by answering the questions in the answer booklet.
9) Chunk the essay. Just as an author organizes an essay by using paragraphs, you can separate an essay into its various component parts by “chunking.” In this process, you select single or multiple paragraphs and identify the roles these chunks play in presenting the ideas discussed in the essay as a whole. Although it is far from being an exact science, chunks normally break down into the following types:

a. Introduction: this could be a personal anecdote, a statistic, a news story, a quotation, etc.

b. Background information: in these sections, the author provides a necessary historical/social context for the essay.

c. Thesis/Potential Thesis: an author may be direct in stating a thesis, or, alternatively, may spread the thesis thinly across an essay.

d. Supporting arguments: in these sections an author explains the various points that have led her to adopt her position on the topic.

e. Rebuttal: in this section the author acknowledges contrary positions to his own but explains why his position remains valid.

f. Conclusion: this chunk closes the essay, frequently by returning to some of the issues raised in the introduction.

Now chunk the article. Once you have completed chunking the article, compare your response to the model chunking response by answering the questions outlined in the answer booklet.
10) Synthesis. Once you have chunked the essay, you can begin the process of synthesizing the thesis. Go back over your chunks, and read the parts that you have labeled as thesis/potential thesis. With those sections running through your mind, attempt to construct a single statement that captures the entire “thought-thread” of the argument.

So, for example:

Susan Reed argues that, although gender discrimination may indeed be present in many workplaces, an overtly adversarial and litigious approach to the problem on the part of women is ultimately self-defeating. Although individual complainants may benefit, such suits create the perception that women are not “team-players,” thereby damaging the larger cause. Reed proposes instead that women and men should work together to ensure that the promotion structure within companies is transparent, equitable, and free from favoritism.

Although Reed never precisely states her argument this way, this is her thesis.

Now identify the thesis and write the thesis in the answer booklet. Once you have identified the thesis, compare your thesis response to the model thesis response by answering the questions outlined in the answer booklet.
Appendix F-3: Instructional Activity With First Principles With Hylighter

How to Identify a Thesis Instructional Booklet

Introduction
This instructional activity has been designed to help you become better able to identify a thesis within an article. Please follow each step as closely as possible. You will be answering questions for the *Education, Athletics: The Odd Couple* article and you will be referring to the *Society is Dead: We Have Retreated Into the iWorld* article as an example.

Instructional Activity Outline

1. Reading Strategies
   a. Learn specific reading strategies
   b. Read the article using specific identification strategies

2. Reading Comprehension
   a. Learn how to answer reading comprehension questions
   b. Answer reading comprehension questions
   c. Learn how to compare your reading comprehension responses to the model responses
   d. Compare your reading comprehension responses to the model responses

3. Chunking
   a. Learn how to chunk an article
   b. Chunk the article
   c. Learn how to compare your chunking response to the model response
   d. Compare your chunking response to the model response

4. Thesis Identification
   a. Learn how to identify a thesis
   b. Identify the thesis
   c. Learn how to compare your thesis response to the model response
   d. Compare your thesis response to the model response
Step 1: Read the Article
Please begin by reading the *Education, Athletics: The Odd Couple* article. The more familiar you are with the text, the better you will be able to accomplish this task. When you are reading you want to distinguish between two key components of the essay: the topic and thesis.

a. The **topic** is the subject of an article. For example, in the iWorld article the topic is how the iPod has become so commonplace and its effects upon contemporary society.

b. The **thesis** of an article is what the essay argues about this topic. The thesis will be identified later in this activity.

After reading the essay several times, you should be able easily to identify the topic, though not necessarily the thesis.
Step 2: Reading Comprehension

In order to become better able to answer reading comprehension questions and ultimately identify the thesis, you will need to use specific reading strategies to focus your reading. Please click on this link and view a video clip that illustrates the importance of paying attention to as many elements in an article as possible. Try to keep track of how many times the white team passes the ball.

http://viscog.beckman.uiuc.edu/grafs/demos/15.html

Once you have viewed the video once, how many times did the ball get passed between members of the white team? This time watch the video without focusing on the ball being passed. What do you see? This illustration is similar to reading an article, if you are too focused on a specific area, you may miss other important elements. At the same time, if you are skimming an article too quickly, you will also miss important elements.

In order to be able to answer the reading comprehension questions, you will need to focus your reading in the following ways:

- Are there any words with which you are unfamiliar? Look them up.
- Are there any references with which you are unfamiliar? Look them up.
- If there is information in the introductory head notes or review questions that often accompany essays in a textbook, spend some time thinking or pre-writing about the questions you are being asked.

See the demonstration below:

Example Paragraphs: Every now and again I go to church — those huge, luminous Apple stores, pews in the rear, the clerics in their monastic uniforms all bustling around or sitting behind the “Genius Bars”, like priests waiting to hear confessions.

Others began, as I did, with a Walkman — and then a kind of clunkier MP3 player. But the sleekness of the iPod won me over. Unlike other models it gave me my entire music collection to rearrange as I saw fit — on the fly, in my pocket.

What was once an occasional musical diversion became a compulsive obsession. Now I have my iTunes in my iMac for my iPod in my iWorld. It’s Narcissus heaven: we’ve finally put the “i” into Me.

- Unfamiliar words?
  - Monastic- relating to monks, nuns, or their way of life or the buildings in which they live; characteristic of the life of a monk, especially in being reclusive, self-denying, or austere
  - Compulsive-driven by an irresistible inner force to do something

- Unfamiliar references?
  - Narcissus- Narcissus lived in the city of Thespiae. A young man, Ameinias, was in love with Narcissus, but he rejected Ameinias' love. He grew tired of Ameinias' affections and sent him a present of a sword. Ameinias killed himself with the sword in front of Narcissus' door and as he died, he called curses upon Narcissus. One day Narcissus fell in love with his own reflection in a spring and, in desperation, killed himself.
  - I into Me?- This is referring to the Narcissus Heaven comment earlier in the sentence meaning we have become so inward looking we are like Narcissus and forget those around us.

- Is there additional information in the introductory head notes, etc?
  - None
Example reading comprehension questions:

What type of church is the author referring to that he attends?
Answer: The Apple store with ‘Genius bars.’

What does the author compare the use of the iPods to?
Answer: The Narcissus Heaven.

By the end of this stage, you should be able to answer the reading comprehension questions.
Now, answer the reading comprehension questions for the *Education, Athletics: The Odd Couple* article using Hylighter.

In order to help you refine your abilities to answer reading comprehension questions, you will now compare your answers to the model answers. The comparison of your answers to the model responses will help you see areas where you may be able to improve and help you identify elements of the article you may have missed. Please click on the link below to view a video illustrating the principle of comparison.

http://www.youtube.com/watch?v=6JzcqALk1Rs&feature=related

In this video, a child simultaneously compares his performance to the model performance through the ‘perfect’ and ‘good’ scores that come up. Although for this activity, you will not be comparing answers simultaneously, the principle of comparison still applies. The boy is able to determine how well he is performing, similar to you comparing your performance to that of the model response.

Demonstration of comparison of RC responses to model responses

What type of church is the author referring to that he attends?
My Answer: The large apple store
Model Answer: The Apple store with ‘Genius bars.’

Comparison: My answer is not as thorough as the model response, but is similar.

What does the author compare the use of the iPods to?
My Answer: A compulsive obsession.
Model Answer: The Narcissus Heaven.

Comparison: My answer is similar to the model response, but I guess the author is comparing the use of the iPod to Narcissus heaven, and not a compulsive obsession. I guess the author is saying it is a compulsive obsession.

Now compare your reading comprehension responses on the *Education, Athletics: The Odd Couple* article to the model reading comprehension responses. Ask the facilitator for a copy of the model responses. Look at each question individually, and then respond to the questions in the g-note section in Hylighter.
Step 3: Chunk the Article
Just as an author organizes an essay by using paragraphs, you can separate an essay into its various component parts by “chunking.” In this process, you differentiate between different ideas presented in each section of the article. A section could consist of only one or multiple paragraphs.

Click on the link below to view a video illustrating the importance of differentiating between different ideas and concepts.

http://www.youtube.com/watch?v=tZIvgQ9ik48

When you chunk an article, you also identify the roles these chunks play in presenting the ideas discussed in the essay as a whole. Although it is far from being an exact science, chunks normally break down into the following types:

1. **Introduction**: this could be a personal anecdote, a statistic, a news story, a quotation, etc.
2. **Background information**: in these sections, the author provides a necessary historical/social context for the essay.
3. **Thesis/Potential Thesis**: an author may be direct in stating a thesis, or, alternatively, may spread the thesis thinly across an essay.
4. **Supporting arguments**: in these sections an author explains the various points that have led her to adopt her position on the topic.
5. **Opposing arguments**: in this section the author acknowledges contrary positions to his own but explains why his position remains valid.
6. **Conclusion**: this chunk closes the essay, frequently by returning to some of the issues raised in the introduction.

Example chunked article

Society is dead, we have retreated into the iWorld by Andrew Sullivan

I was visiting New York last week and noticed something I’d never thought I’d say about the city. Yes, nightlife is pretty much dead (and I’m in no way the first to notice that). But daylife — that insane mishmash of yells, chatter, clatter, hustle and chutzpah that makes New York the urban equivalent of methamphetamine — was also a little different. It was quieter.

Manhattan’s downtown is now a Disney-like string of malls, riverside parks and pretty upper-middle-class villages. But there was something else. And as I looked across the throngs on the pavements, I began to see why.

There were little white wires hanging down from their ears, or tucked into pockets, purses or jackets. The eyes were a little vacant. Each was in his or her own musical world, walking to their soundtrack, stars in their own music video, almost oblivious to the world around them. These are the iPod people.

**Chunk: Introduction** - Sullivan begins his essay with a standard mechanism. A personal anecdote.

Even without the white wires you can tell who they are. They walk down the street in their own MP3 cocoon, bumping into others, deaf to small social cues, shutting out anyone not in their bubble.

Every now and again some start unconsciously emitting strange tuneless squawks, like a badly tuned radio, and their fingers snap or their arms twitch to some strange soundless rhythm. When others say “Excuse me” there’s no
response. “Hi”, ditto. It’s strange to be among so many people and hear so little. Except that each one is hearing so much.

Chunk: Introduction- This is quite an extended anecdote—but moving more into description here.

Yes, I might as well own up. I’m one of them. I witnessed the glazed New York looks through my own glazed pupils, my white wires peeping out of my ears. I joined the cult a few years ago: the sect of the little white box worshippers.

Every now and again I go to church — those huge, luminous Apple stores, pews in the rear, the clerics in their monastic uniforms all bustling around or sitting behind the “Genius Bars”, like priests waiting to hear confessions.

Chunk: Background Information- Sullivan makes the analogy about how the iPod trend is a bit like some strange religious cult, that going to an Apple store is just like going to church.

Others began, as I did, with a Walkman — and then a kind of clunkier MP3 player. But the sleekness of the iPod won me over. Unlike other models it gave me my entire music collection to rearrange as I saw fit — on the fly, in my pocket.

What was once an occasional musical diversion became a compulsive obsession. Now I have my iTunes in my iMac for my iPod in my iWorld. It’s Narcissus heaven: we’ve finally put the “i” into Me.

And, like all addictive cults, it’s spreading. There are now 22m iPod owners in the United States and Apple is becoming a mass-market company for the first time.

Chunk: History and background. Sony invented the “walkman”—a portable tape player with earphones back in the 1980s. That could only play one tape, though, and was a lot bigger than the existing iPod.

Walk through any airport in the United States these days and you will see person after person gliding through the social ether as if on autopilot. Get on a subway and you’re surrounded by a bunch of Stepford commuters staring into mid-space as if anaesthetised by technology. Don’t ask, don’t tell, don’t overhear, don’t observe. Just tune in and tune out.

It wouldn’t be so worrying if it weren’t part of something even bigger. Americans are beginning to narrow their lives.

Chunk: Thesis- This strikes me as the thesis—or thesis potential.

You get your news from your favourite blogs, the ones that won’t challenge your view of the world. You tune into a satellite radio service that also aims directly at a small market — for new age fanatics, liberal talk or Christian rock. Television is all cable. Culture is all subculture. Your cell phones can receive e-mail feeds of your favourite blogger’s latest thoughts — seconds after he has posted them — get sports scores for your team or stock quotes of your portfolio.

Technology has given us a universe entirely for ourselves — where the serendipity of meeting a new stranger, hearing a piece of music we would never choose for ourselves or an opinion that might force us to change our mind about something are all effectively banished.

Chunk: Supporting argument- Sullivan moves beyond the iPod itself here to discuss other technological developments that allow people to isolate themselves from society. The big change here is that “culture”—the thing that connects all of us—has been replaced by “subculture”—the thing that connects a few of us.

Atomisation by little white boxes and cell phones. Society without the social. Others who are chosen — not met at random. Human beings have never lived like this before. Yes, we have always had homes, retreats or places where we went to relax, unwind or shut out the world.
But we didn’t walk around the world like hermit crabs with our isolation surgically attached. Music was once the preserve of the living room or the concert hall. It was sometimes solitary but it was primarily a shared experience, something that brought people together, gave them the comfort of knowing that others too understood the pleasure of a Brahms symphony or that Beatles album.

**Chunk: Supporting argument - Music used to be a community activity—you went to a concert, neighbor’s houses, a bar, to hear music. Now, we do it on our own.**

But music is as atomised now as living is. And it’s secret. That bloke next to you on the bus could be listening to heavy metal or a Gregorian chant. You’ll never know. And so, bit by bit, you’ll never really know him. And by his white wires, he is indicating he doesn’t really want to know you.

**Chunk: Supporting argument - Not only do we not know what the other guy is listening to, but by wearing the headphones he is communicating the fact that he doesn’t really want to know us.**

What do we get from this? The awareness of more music, more often. The chance to slip away for a while from everydayness, to give our lives its own soundtrack, to still the monotony of the commute, to listen more closely and carefully to music that can lift you up and keep you going.

**Chunk: Opposing argument - Sullivan acknowledges that there are obviously advantages to this ability to provide constant occupation and entertainment.**

We become masters of our own interests, more connected to people like us over the internet, more instantly in touch with anything we want, need or think we want and think we need. Ever tried a Stairmaster in silence? But what are we missing? That hilarious shard of an overheard conversation that stays with you all day; the child whose chatter on the pavement takes you back to your early memories; birdsong; weather; accents; the laughter of others. And those thoughts that come not by filling your head with selected diversion, but by allowing your mind to wander aimlessly through the regular background noise of human and mechanical life.

External stimulation can crowd out the interior mind. Even the boredom that we flee has its uses. We are forced to find our own means to overcome it.

**Chunk: Thesis, or thesis potential.**

And so we enrich our life from within, rather than from white wires. It’s hard to give up, though, isn’t it.

Not so long ago I was on a trip and realized I had left my iPod behind. Panic. But then something else. I noticed the rhythms of others again, the sound of the airplane, the opinions of the taxi driver, the small social cues that had been obscured before. I noticed how others related to each other. And I felt just a little bit connected again and a little more aware.

Try it. There’s a world out there. And it has a soundtrack all its own.

**Chunk: Conclusion - Sullivan returns to the personal experience/anecdote identified at the start.**

Now that you have seen an example of a chunked article, please chunk the *Education, Athletics: The Odd Couple* article. Chunk the article by highlighting sections of the article in Hylighter.

After you have completed chunking the article, you are ready to compare your chunking response to the model response. Again, referring back to the previous section, comparing your response to the model response is vital in helping you refine your skills, expanding your understanding, and increasing your abilities to identify sections of an article.

**Demonstration: Comparison of chunking to model chunking**
I was visiting New York last week and noticed something I’d never thought I’d say about the city. Yes, nightlife is pretty much dead (and I’m in no way the first to notice that). But daylife — that insane mishmash of yells, chatter, clatter, hustle and chutzpah that makes New York the urban equivalent of methamphetamine — was also a little different. It was quieter.

Manhattan’s downtown is now a Disney-like string of malls, riverside parks and pretty upper-middle-class villages. But there was something else. And as I looked across the throngs on the pavements, I began to see why.

There were little white wires hanging down from their ears, or tucked into pockets, purses or jackets. The eyes were a little vacant. Each was in his or her own musical world, walking to their soundtrack, stars in their own music video, almost oblivious to the world around them. These are the iPod people.

My Chunking Response: Introduction and Thesis- Sullivan introduces the theme, but also starts into his thesis that people wearing iPod headphones are in their own worlds. Society is changing because of it.


Comparison: Although the model response states the highlighted section of the article is only the introduction and a personal anecdote, I believe my response is appropriate as well. I think the author is stating his thesis in a subtle way upfront. I think my response is similar to the model response.

But music is as atomised now as living is. And it’s secret. That bloke next to you on the bus could be listening to heavy metal or a Gregorian chant. You’ll never know. And so, bit by bit, you’ll never really know him. And by his white wires, he is indicating he doesn’t really want to know you.

My Chunking Response: I believe this is a supporting argument to the author’s argument. He is saying people who wear the headphones are doing so on purpose and want to avoid getting to know other people in those specific situations.

Model Chunking Response: Supporting argument- Not only do we not know what the other guy is listening to, but by wearing the headphones he is communicating the fact that he doesn’t want to know us.

Comparison: My response is basically identical to the model response.

After viewing the comparison demonstration, please compare your chunking response to the model chunking response. Ask the facilitator for a copy of the model chunking response. Compare each chunking section of the article, and then provide an overall evaluation as a g-note in Hylighter.
Step 4: Identify the Thesis

Synthesis. Once you have chunked the essay, you can begin the process of synthesizing the thesis. Just as a lawyer preparing to present an argument searches through all of the information available before presenting his position, you should search the article for all relevant information before deciding on the thesis. This includes reviewing the reading comprehension questions and your chunking, specifically the sections you labeled as thesis/potential thesis. With those sections running through your mind, attempt to construct a single statement that captures the entire “thought-thread” of the argument.

Demonstration of thesis identification

Walk through any airport in the United States these days and you will see person after person gliding through the social ether as if on autopilot. Get on a subway and you’re surrounded by a bunch of Stepford commuters staring into mid-space as if anaesthetised by technology. Don’t ask, don’t tell, don’t overhear, don’t observe. Just tune in and tune out.

It wouldn’t be so worrying if it weren’t part of something even bigger. Americans are beginning to narrow their lives.

Chunk: Thesis- This strikes me as the thesis—or thesis potential.

We become masters of our own interests, more connected to people like us over the internet, more instantly in touch with anything we want, need or think we want and think we need. Ever tried a Stairmaster in silence? But what are we missing? That hilarious shard of an overheard conversation that stays with you all day; the child whose chatter on the pavement takes you back to your early memories; birdsong; weather; accents; the laughter of others. And those thoughts that come not by filling your head with selected diversion, but by allowing your mind to wander aimlessly through the regular background noise of human and mechanical life.

External stimulation can crowd out the interior mind. Even the boredom that we flee has its uses. We are forced to find our own means to overcome it.


Thesis: In this essay, Sullivan argues that modern technology allows Americans to shield themselves against unwanted experiences by pre-filtering the stimuli (ie music, conversation, etc) they allow into their minds. The negative effect of this, however, is that Americans also insulate ourselves against other ideas, other experiences, and, ultimately, other people. For Sullivan, this is perhaps too steep a price to pay. Although Sullivan never precisely states his argument this way, this is his thesis.

Now identify the thesis of the Education, Athletics: The Odd Couple article. Add your thesis as a g-note in Hylighter.

Once you have identified the thesis, the last activity is to compare your thesis with the model thesis. Again, by comparing your thesis response to the model thesis response, you will be able to refine your skills and see areas where you may be able to improve.

Demonstration: Comparison of thesis with model thesis

My Thesis: I think the thesis of this article is that Americans are letting the iPod take over their chances for social interactions in society. The author believes this is hindering people from experiencing the richer society that is available to them and narrowing their lives. Although people having the freedom and ability to listen to whatever
they want is a good thing, people need to listen in moderation and quit missing out on all the other experiences waiting for them.

Model Thesis: In this essay, Sullivan argues that modern technology allows Americans to shield themselves against unwanted experiences by pre-filtering the stimuli (i.e., music, conversation, etc.) they allow into their minds. The negative effect of this, however, is that Americans also insulate themselves against other ideas, other experiences, and, ultimately, other people. For Sullivan, this is perhaps too steep a price to pay. Although Sullivan never precisely states his argument this way, this is his thesis.

Comparison: When I read the model thesis, I think I am pretty close. I believe we are both saying the same thing, but with different examples. I think the model thesis is better than mine because it shows more detailed responses such as the ‘negative effect of this is…insulate themselves against other ideas, other experiences, and ultimately, other people.’

Finally, compare your thesis of the Education, Athletics: The Odd Couple article with the model thesis. Ask the facilitator for a copy of the model response. Use the g-note section of Hylighter to compare your thesis.

By completing this activity, you are stepping closer to arming yourself with the skills and knowledge needed to be able to appropriately identify the thesis in multiple articles. With more and more practice, you should be able to perform in a manner similar to the persons in this video.

http://www.youtube.com/watch?v=ult-sv6zQZY&feature=related
Appendix F-4: Instructional Activity With First Principles Without Hylighter

How to Identify a Thesis Instructional Booklet

Introduction
This instructional activity has been designed to help you become better able to identify a thesis within an article. Please follow each step as closely as possible. You will be answering questions for the Education, Athletics: The Odd Couple article and you will be referring to the Society is Dead: We Have Retreated Into the iWorld article as an example.

Instructional Activity Outline

5. Reading Strategies
   a. Learn specific reading strategies
   b. Read the article using specific identification strategies

6. Reading Comprehension
   a. Learn how to answer reading comprehension questions
   b. Answer reading comprehension questions
   c. Learn how to compare your reading comprehension responses to the model responses
   d. Compare your reading comprehension responses to the model responses

7. Chunking
   a. Learn how to chunk an article
   b. Chunk the article
   c. Learn how to compare your chunking response to the model response
   d. Compare your chunking response to the model response

8. Thesis Identification
   a. Learn how to identify a thesis
   b. Identify the thesis
   c. Learn how to compare your thesis response to the model response
   d. Compare your thesis response to the model response
Step 1: Read the Article
Please begin by reading the *Education, Athletics: The Odd Couple* article. The more familiar you are with the text, the better you will be able to accomplish this task. When you are reading you want to distinguish between two key components of the essay: the topic and thesis.

c. The **topic** is the subject of an article. For example, in the *iWorld* article the topic is how the iPod has become so commonplace and its effects upon contemporary society.
d. The **thesis** of an article is what the essay argues about this topic. The thesis will be identified later in this activity.

After reading the essay several times, you should be able easily to identify the topic, though not necessarily the thesis.
**Step 2: Reading Comprehension**

In order to become better able to answer reading comprehension questions and ultimately identify the thesis, you will need to use specific reading strategies to focus your reading. Please click on this link and view a video clip that illustrates the importance of paying attention to as many elements in an article as possible. Try to keep track of how many times the white team passes the ball.

http://viscog.beckman.uiuc.edu/grafs/demos/15.html

Once you have viewed the video once, how many times did the ball get passed between members of the white team? This time watch the video without focusing on the ball being passed. What do you see? This illustration is similar to reading an article, if you are too focused on a specific area, you may miss other important elements. At the same time, if you are skimming an article too quickly, you will also miss important elements.

In order to be able to answer the reading comprehension questions, you will need to focus your reading in the following ways:

- Are there any words with which you are unfamiliar? Look them up.
- Are there any references with which you are unfamiliar? Look them up.
- If there is information in the introductory head notes or review questions that often accompany essays in a textbook, spend some time thinking or pre-writing about the questions you are being asked.

See the demonstration below:

**Example Paragraphs:** Every now and again I go to church — those huge, luminous Apple stores, pews in the rear, the clerics in their monastic uniforms all bustling around or sitting behind the “Genius Bars”, like priests waiting to hear confessions.

Others began, as I did, with a Walkman — and then a kind of clunker MP3 player. But the sleekness of the iPod won me over. Unlike other models it gave me my entire music collection to rearrange as I saw fit — on the fly, in my pocket.

What was once an occasional musical diversion became a compulsive obsession. Now I have my iTunes in my iMac for my iPod in my iWorld. It’s Narcissus heaven: we’ve finally put the “i” into Me.

- **Unfamiliar words?**
  - Monastic- relating to monks, nuns, or their way of life or the buildings in which they live; characteristic of the life of a monk, especially in being reclusive, self-denying, or austere
  - Compulsive-driven by an irresistible inner force to do something

- **Unfamiliar references?**
  - Narcissus-Narcissus lived in the city of Thespiae. A young man, Ameinias, was in love with Narcissus, but he rejected Ameinias' love. He grew tired of Ameinias' affections and sent him a present of a sword. Ameinias killed himself with the sword in front of Narcissus' door and as he died, he called curses upon Narcissus. One day Narcissus fell in love with his own reflection in a spring and, in desperation, killed himself.
  - I into Me?- This is referring to the Narcissus Heaven comment earlier in the sentence meaning we have become so inward looking we are like Narcissus and forget those around us.

- **Is there additional information in the introductory head notes, etc?**
  - None
Example reading comprehension questions:

What type of church is the author referring to that he attends?
Answer: The Apple store with ‘Genius bars.’

What does the author compare the use of the iPods to?
Answer: The Narcissus Heaven.

By the end of this stage, you should be able to answer the reading comprehension questions.
Now, answer the reading comprehension questions for the *Education, Athletics: The Odd Couple* article.

In order to help you refine your abilities to answer reading comprehension questions, you will now compare your answers to the model answers. The comparison of your answers to the model responses will help you see areas where you may be able to improve and help you identify elements of the article you may have missed. Please click on the link below to view a video illustrating the principle of comparison.

http://www.youtube.com/watch?v=6JzcqALk1Rs&feature=related

In this video, a child simultaneously compares his performance to the model performance through the ‘perfect’ and ‘good’ scores that come up. Although for this activity, you will not be comparing answers simultaneously, the principle of comparison still applies. The boy is able to determine how well he is performing, similar to you comparing your performance to that of the model response.

Demonstration of comparison of RC responses to model responses

What type of church is the author referring to that he attends?
*My Answer:* The large apple store
*Model Answer:* The Apple store with ‘Genius bars.’

Comparison: My answer is not as thorough as the model response, but is similar.

What does the author compare the use of the iPods to?
*My Answer:* A compulsive obsession.
*Model Answer:* The Narcissus Heaven.

Comparison: My answer is similar to the model response, but I guess the author is comparing the use of the iPod to Narcissus heaven, and not a compulsive obsession. I guess the author is saying it is a compulsive obsession.

Now compare your reading comprehension responses on the *Education, Athletics: The Odd Couple* article to the model reading comprehension responses. Ask the facilitator for a copy of the model responses. Look at each question individually, and then respond to the questions in the activity booklet.
Step 3: Chunk the Article

Just as an author organizes an essay by using paragraphs, you can separate an essay into its various component parts by “chunking.” In this process, you differentiate between different ideas presented in each section of the article. A section could consist of only one or multiple paragraphs.

Click on the link below to view a video illustrating the importance of differentiating between different ideas and concepts.

http://www.youtube.com/watch?v=tZIvgQ9ik48

When you chunk an article, you also identify the roles these chunks play in presenting the ideas discussed in the essay as a whole. Although it is far from being an exact science, chunks normally break down into the following types:

7. Introduction: this could be a personal anecdote, a statistic, a news story, a quotation, etc.
8. Background information: in these sections, the author provides a necessary historical/social context for the essay.
10. Supporting arguments: in these sections an author explains the various points that have led her to adopt her position on the topic.
11. Opposing arguments: in this section the author acknowledges contrary positions to his own but explains why his position remains valid.
12. Conclusion: this chunk closes the essay, frequently by returning to some of the issues raised in the introduction.

Example chunked article

Society is dead, we have retreated into the iWorld by Andrew Sullivan

I was visiting New York last week and noticed something I’d never thought I’d say about the city. Yes, nightlife is pretty much dead (and I’m in no way the first to notice that). But daylife — that insane mishmash of yells, chatter, clatter, hustle and chutzpah that makes New York the urban equivalent of methamphetamine — was also a little different. It was quieter.

Manhattan’s downtown is now a Disney-like string of malls, riverside parks and pretty upper-middle-class villages. But there was something else. And as I looked across the throngs on the pavements, I began to see why.

There were little white wires hanging down from their ears, or tucked into pockets, purses or jackets. The eyes were a little vacant. Each was in his or her own musical world, walking to their soundtrack, stars in their own music video, almost oblivious to the world around them. These are the iPod people.


Even without the white wires you can tell who they are. They walk down the street in their own MP3 cocoon, bumping into others, deaf to small social cues, shutting out anyone not in their bubble.

Every now and again some start unconsciously emitting strange tuneless squawks, like a badly tuned radio, and their fingers snap or their arms twitch to some strange soundless rhythm. When others say “Excuse me” there’s no
response. “Hi”, ditto. It’s strange to be among so many people and hear so little. Except that each one is hearing so much.

Chunk: Introduction- This is quite an extended anecdote—but moving more into description here.

Yes, I might as well own up. I’m one of them. I witnessed the glazed New York looks through my own glazed pupils, my white wires peeping out of my ears. I joined the cult a few years ago: the sect of the little white box worshippers.

Every now and again I go to church — those huge, luminous Apple stores, pews in the rear, the clerics in their monastic uniforms all bustling around or sitting behind the “Genius Bars”, like priests waiting to hear confessions.

Chunk: Background Information- Sullivan makes the analogy about how the iPod trend is a bit like some strange religious cult, that going to an Apple store is just like going to church.

Others began, as I did, with a Walkman — and then a kind of clunkier MP3 player. But the sleekness of the iPod won me over. Unlike other models it gave me my entire music collection to rearrange as I saw fit — on the fly, in my pocket.

What was once an occasional musical diversion became a compulsive obsession. Now I have my iTunes in my iMac for my iPod in my iWorld. It’s Narcissus heaven: we’ve finally put the “i” into Me.

And, like all addictive cults, it’s spreading. There are now 22m iPod owners in the United States and Apple is becoming a mass-market company for the first time.

Chunk: History and background. Sony invented the “walkman”—a portable tape player with earphones back in the 1980s. That could only play one tape, though, and was a lot bigger than the existing iPod.

Walk through any airport in the United States these days and you will see person after person gliding through the social ether as if on autopilot. Get on a subway and you’re surrounded by a bunch of Stepford commuters staring into mid-space as if anaesthetised by technology. Don’t ask, don’t tell, don’t overhear, don’t observe. Just tune in and tune out.

It wouldn’t be so worrying if it weren’t part of something even bigger. Americans are beginning to narrow their lives.

Chunk: Thesis- This strikes me as the thesis—or thesis potential.

You get your news from your favourite blogs, the ones that won’t challenge your view of the world. You tune into a satellite radio service that also aims directly at a small market — for new age fanatics, liberal talk or Christian rock. Television is all cable. Culture is all subculture. Your cell phones can receive e-mail feeds of your favourite blogger’s latest thoughts — seconds after he has posted them — get sports scores for your team or stock quotes of your portfolio.

Technology has given us a universe entirely for ourselves — where the serendipity of meeting a new stranger, hearing a piece of music we would never choose for ourselves or an opinion that might force us to change our mind about something are all effectively banished.

Chunk: Supporting argument- Sullivan moves beyond the iPod itself here to discuss other technological developments that allow people to isolate themselves from society. The big change here is that “culture”—the thing that connects all of us—has been replaced by “subculture”—the thing that connects a few of us.

Atomisation by little white boxes and cell phones. Society without the social. Others who are chosen — not met at random. Human beings have never lived like this before. Yes, we have always had homes, retreats or places where we went to relax, unwind or shut out the world.
But we didn’t walk around the world like hermit crabs with our isolation surgically attached. Music was once the preserve of the living room or the concert hall. It was sometimes solitary but it was primarily a shared experience, something that brought people together, gave them the comfort of knowing that others too understood the pleasure of a Brahms symphony or that Beatles album.

Chunk: Supporting argument- Music used to be a community activity—you went to a concert, neighbor’s houses, a bar, to hear music. Now, we do it on our own.

But music is as atomised now as living is. And it’s secret. That bloke next to you on the bus could be listening to heavy metal or a Gregorian chant. You’ll never know. And so, bit by bit, you’ll never really know him. And by his white wires, he is indicating he doesn’t really want to know you.

Chunk: Supporting argument- Not only do we not know what the other guy is listening to, but by wearing the headphones he is communicating the fact that he doesn’t want to know you.

What do we get from this? The awareness of more music, more often. The chance to slip away for a while from everydayness, to give our lives its own soundtrack, to still the monotony of the commute, to listen more closely and carefully to music that can lift you up and keep you going.

Chunk: Opposing argument- Sullivan acknowledges that there are obviously advantages to this ability to provide constant occupation and entertainment.

We become masters of our own interests, more connected to people like us over the internet, more instantly in touch with anything we want, need or think we want and think we need. Ever tried a Stairmaster in silence? But what are we missing? That hilarious shard of an overheard conversation that stays with you all day; the child whose chatter on the pavement takes you back to your early memories; birdsong; weather; accents; the laughter of others. And those thoughts that come not by filling your head with selected diversion, but by allowing your mind to wander aimlessly through the regular background noise of human and mechanical life.

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And so we enrich our life from within, rather than from white wires. It’s hard to give up, though, isn’t it.

Not so long ago I was on a trip and realized I had left my iPod behind. Panic. But then something else. I noticed the rhythms of others again, the sound of the airplane, the opinions of the taxi driver, the small social cues that had been obscured before. I noticed how others related to each other. And I felt just a little bit connected again and a little more aware.

Try it. There’s a world out there. And it has a soundtrack all its own.

Chunk: Conclusion- Sullivan returns to the personal experience/anecdote identified at the start.

Now that you have seen an example of a chunked article, please chunk the Education, Athletics: The Odd Couple article. Chunk the article.

After you have completed chunking the article, you are ready to compare your chunking response to the model response. Again, referring back to the previous section, comparing your response to the model response is vital in helping you refine your skills, expanding your understanding, and increasing your abilities to identify sections of an article.

Demonstration: Comparison of chunking to model chunking
I was visiting New York last week and noticed something I’d never thought I’d say about the city. Yes, nightlife is pretty much dead (and I’m in no way the first to notice that). But daylife — that insane mishmash of yells, chatter, clatter, hustle and chutzpah that makes New York the urban equivalent of methamphetamine — was also a little different. It was quieter.

Manhattan’s downtown is now a Disney-like string of malls, riverside parks and pretty upper-middle-class villages. But there was something else. And as I looked across the throngs on the pavements, I began to see why.

There were little white wires hanging down from their ears, or tucked into pockets, purses or jackets. The eyes were a little vacant. Each was in his or her own musical world, walking to their soundtrack, stars in their own music video, almost oblivious to the world around them. These are the iPod people.

My Chunking Response: Introduction and Thesis- Sullivan introduces the theme, but also starts into his thesis that people wearing iPod headphones are in their own worlds. Society is changing because of it.


Comparison: Although the model response states the highlighted section of the article is only the introduction and a personal anecdote, I believe my response is appropriate as well. I think the author is stating his thesis in a subtle way upfront. I think my response is similar to the model response.

But music is as atomised now as living is. And it’s secret. That bloke next to you on the bus could be listening to heavy metal or a Gregorian chant. You’ll never know. And so, bit by bit, you’ll never really know him. And by his white wires, he is indicating he doesn’t really want to know you.

My Chunking Response: I believe this is a supporting argument to the author’s argument. He is saying people who wear the headphones are doing so on purpose and want to avoid getting to know other people in those specific situations.

Model Chunking Response: Supporting argument- Not only do we not know what the other guy is listening to, but by wearing the headphones he is communicating the fact that he doesn’t want to know us.

Comparison: My response is basically identical to the model response.

After viewing the comparison demonstration, please compare your chunking response to the model chunking response. Ask the facilitator for a copy of the model chunking response. Compare each chunking section of the article, and then provide an overall evaluation in the booklet.
**Step 4: Identify the Thesis**

Synthesis. Once you have chunked the essay, you can begin the process of synthesizing the thesis. Just as a lawyer preparing to present an argument searches through all of the information available before presenting his position, you should search the article for all relevant information before deciding on the thesis. This includes reviewing the reading comprehension questions and your chunking, specifically the sections you labeled as thesis/potential thesis. With those sections running through your mind, attempt to construct a single statement that captures the entire “thought-thread” of the argument.

Demonstration of thesis identification

Walk through any airport in the United States these days and you will see person after person gliding through the social ether as if on autopilot. Get on a subway and you’re surrounded by a bunch of Stepford commuters staring into mid-space as if anaesthetised by technology. Don’t ask, don’t tell, don’t overhear, don’t observe. Just tune in and tune out.

It wouldn’t be so worrying if it weren’t part of something even bigger. Americans are beginning to narrow their lives.

Chunk: Thesis- This strikes me as the thesis—or thesis potential.

We become masters of our own interests, more connected to people like us over the internet, more instantly in touch with anything we want, need or think we want and think we need. Ever tried a Stairmaster in silence? But what are we missing? That hilarious shard of an overheard conversation that stays with you all day; the child whose chatter on the pavement takes you back to your early memories; birdsong; weather; accents; the laughter of others. And those thoughts that come not by filling your head with selected diversion, but by allowing your mind to wander aimlessly through the regular background noise of human and mechanical life.

External stimulation can crowd out the interior mind. Even the boredom that we flee has its uses. We are forced to find our own means to overcome it.


**Thesis:** In this essay, Sullivan argues that modern technology allows Americans to shield themselves against unwanted experiences by pre-filtering the stimuli (ie music, conversation, etc) they allow into their minds. The negative effect of this, however, is that Americans also insulate ourselves against other ideas, other experiences, and, ultimately, other people. For Sullivan, this is perhaps too steep a price to pay. Although Sullivan never precisely states his argument this way, this is his thesis.

Now identify the thesis of the *Education, Athletics: The Odd Couple* article. Add your thesis in the booklet.

Once you have identified the thesis, the last activity is to compare your thesis with the model thesis. Again, by comparing your thesis response to the model thesis response, you will be able to refine your skills and see areas where you may be able to improve.

**Demonstration: Comparison of thesis with model thesis**

My Thesis: I think the thesis of this article is that Americans are letting the iPod take over their chances for social interactions in society. The author believes this is hindering people from experiencing the richer society that is available to them and narrowing their lives. Although people having the freedom and ability to listen to whatever
they want is a good thing, people need to listen in moderation and quit missing out on all the other experiences waiting for them.

Model Thesis: In this essay, Sullivan argues that modern technology allows Americans to shield themselves against unwanted experiences by pre-filtering the stimuli (i.e., music, conversation, etc.) they allow into their minds. The negative effect of this, however, is that Americans also insulate themselves against other ideas, other experiences, and, ultimately, other people. For Sullivan, this is perhaps too steep a price to pay. Although Sullivan never precisely states his argument this way, this is his thesis.

Comparison: When I read the model thesis, I think I am pretty close. I believe we are both saying the same thing, but with different examples. I think the model thesis is better than mine because it shows more detailed responses such as the 'negative effect of this is...insulate themselves against other ideas, other experiences, and ultimately, other people.'

Finally, compare your thesis of the Education, Athletics: The Odd Couple article with the model thesis. Ask the facilitator for a copy of the model response. Use the questions in the booklet to compare your thesis.

By completing this activity, you are stepping closer to arming yourself with the skills and knowledge needed to be able to appropriately identify the thesis in multiple articles. With more and more practice, you should be able to perform in a manner similar to the persons in this video.

http://www.youtube.com/watch?v=ult-sv6zQZY&feature=related
Social Annotation Software

Instructional Booklet

FSU Learning Systems Institute

2008
Introduction

The purpose of this booklet is to introduce you to Hylighter, a program that we will be using extensively in this class. Hylighter is a newly-developed tool designed specifically to help you become a better reader. This is achieved by allowing students to engage in dynamic collaborative reading exercises. Ultimately, the program hopes to bring to the classroom some of the interactivity that you are already familiar with in websites such as Facebook and MySpace.

Although the software is relatively simple to use, there are just a few key steps that you need to learn, and this booklet provides you with some early guidance. For each of the following five steps, there is an instruction section and then a practice exercise.

System Requirements
Open an approved browser with Java Script and Cookies enabled.

Internet Explorer 5.5 and above (available on Windows only)
Netscape 6.0 and above (available on Windows, Linux, Mac OS X)
Mozilla 1.4 and above (available on Windows, Linux, Mac OS X)
Firefox 0.8 (available on Windows, Linux, Mac OS X)

Mac users: HyLighter does not currently support the Safari browser.
I. Five Familiarization Tasks

Task 1. How Do I Login?

**Step 1.** Locate navigation address bar
(HINT: In your web browser, in the NAVIGATION ADDRESS BAR (1)

**Step 2.** Type in the Hylighter URL
(HINT: type [www.hylighter.com/edu](http://www.hylighter.com/edu))

**Step 3.** Click ‘Enter’ on your keyboard

RESULT: You should be taken to the Hylighter login page.
Once at the login site, enter your username. Your username will be the first letter of your first name, followed by your last name.

For example:

1) If your name was **Tom Archibald**, then
2) Your username would be **tarchibald**.

Enter your password (default password is password) and click submit.
Practice:

(1) Login to Hylighter (www.hylighter.com/edu) using your username and password.
Task 2: How Do I Open A Document?

Once you are logged in, you are automatically taken to your home screen view. In this view, you see your documents (1) and your invites (2). Your documents are the documents you have uploaded. Your invites are documents others have uploaded but have invited you to view. On the right, you can view the list of invitees (the people you have invited to view the document), view the document properties, archive or delete a document (5), update your user profile (6), or import a new document (7).

To open a document, click on the name of the document. Once you open a document, the review and comment fields appear.
Practice:

(1) Once logged in, click on the test document.
Task 3. Highlighting and commenting on sections of a document
To highlight a selection of text, drag your cursor over the appropriate text while clicking and dragging (1). Once you have highlighted a specific section of the document, click on the white Hylight button (2) after which an annotation box (3) will appear. Enter your text (4) and click submit (5).

Your comment (6) then appears with your name (7) in the right hand field. A time and date stamp (8) also appears to the right of your comment. Click the pencil to update/revise a comment (9). Click the red X (10) to delete a comment.
Practice:
(1) Read the test document. Hylight a section of the document and add a comment. Repeat three times (hylight three sections and add a comment to each).
Task 4. How Do I Add A Markover?
A markover is a comment on someone else’s comment. In order to add a markover, you click on the green circle button (1), enter your comment (the same as a hylight) and click submit. Your comment will then show up as an indented markover (2) to the comment with which it is linked.

Once you have submitted your comments, you can view the responses of your peers. Yellow highlighting indicates text fragments (or image sections) highlighted by you, but not highlighted by others. Shades of blue highlighting indicate sections highlighted by one or more contributors but not by you. Shades of green highlighting indicate sections highlighted by you and one or more others. The instructor has the option to restrict you access to the comments in the system.
Practice:

(1) Once you have submitted your highlights, look at the comments of others and submit three markovers.
Task 5. How Do I Add A General Comment?
General comments (G-Notes) differ from highlights because they are statements regarding the overall document vice statements directed at a selected portion of highlighted text. In order to add a G-Note, click on the G-Note menu item (1) in the upper right hand corner, enter your comment (2), and click submit (3). In order to view all G-Notes, click on the orange G-Note tab menu item (4). You will then be able to view all other general comments (5) in the right hand field.
Practice:

(1) Write a general comment as to what you hope to gain from this training. Also, include what you think might be your greatest challenge in the training.
REFERENCES


Sullivan, A. (2005, February 20) Society is Dead: We Have Retreated into the iWorld *Times Online*, Retrieved on February 18, 2008 from http://www.timesonline.co.uk/tol/comment/article516577.ece


BIOGRAPHICAL SKETCH

Thomas Nielsen Archibald is the Advanced Distributed Learning (ADL) Co-Lab Hub Director of Operations under the Office of the Secretary of Defense, Personnel and Readiness. In this position, Mr. Archibald is responsible for the management and execution of the ADL Co-Laboratory Hub and partnership lab projects. Mr. Archibald assists in providing direction for the development and refinement of the Sharable Content Object Reference Model (SCORM®) and for the continued expansion of the ADL Initiative.

Mr. Archibald has also worked in private industry where he served with MTS Technologies as a Program Manager for Human Performance Technologies. Prior to his work in private industry, Mr. Archibald held various positions in academia as an Assistant Faculty Member in Research at the Florida State University (FSU) Learning Systems Institute (LSI), a Blackboard System Administrator at the Brigham Young University Hawaii (BYUH), Instructional Designer/Project Manager at Utah State University (USU), and Spanish Teaching Supervisor at the Brigham Young University (BYU) Missionary Training Center (MTC). Mr. Archibald also completed 8 years as a U.S. Navy Reserve Intelligence Analyst. Mr. Archibald has more than 10 years of experience in the educational technology and human performance technology field working on variety of training, education, modeling, and simulation projects at the U.S. State, Federal, and International levels.