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IMPROVING CRITICAL THINKING SKILLS: AUGMENTED FEEDBACK AND POST-EXAM DEBATE: A FOLLOW-UP STUDY

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ABSTRACT

Studies have confirmed critical thinking skills contribute to the success of professionals; however, college graduates lack the critical thinking skills needed in today's workforce. "Student Self-Initiated Challenge of Examination Questions" encourages and increases critical thinking skills by allowing students to challenge objective examination question.. In this follow up study, researches gather qualitative data based on student responses and sentiments towards the SSCEQ method.. Through this method, students noticed improvement in critical thinking, reasoning, and discussion. Furthermore, students enjoyed the ability to explain their perspective and hear other points of view. Overall, students responded positively to the SSCEQ method.

JEL: A22, K40, K41

KEYWORDS: Critical Thinking, Classroom Techniques, Objective Examinations, Class Discussion, Participation, Business Law Course

INTRODUCTION

Despite the resounding interests in developing and fostering critical thinking in higher education, there is evidence that college graduates lack the critical thinking skills needed in today's workforce (Shim & Walczak, 2012). Universities must do a better job to develop graduates who can make educated decisions and who make connections between their learning and practice. The reason for this prioritization is the desire for future graduates to solve unknown and complex problems that may not even currently exist. Crucial to achieving this outcome is critical thinking which is often seen as the hallmark of a well-educated person (Thomas, 2011). Critical thinking is a widely used term that encompasses skills in identifying, analyzing, processing, and evaluating information to make decisions, and the ability to apply these skills (Shim & Walczak, 2012). The U.S. Department of Labor's Commission on Achieving Necessary Skills made announced that critical thinking skills are a fundamental requirement for competing in today's global economy (Braun, 2004). Therefore, critical thinking skills should be embedded in course content so students develop stronger skills in critical thinking processes. Additionally, with a continued effort to include critical thinking in coursework, the business graduate will become habitually inquisitive, well-informed, open-minded, prudent in making judgments, and orderly in complex matters. These are all the skills of an ideal critical thinker. Unfortunately, a deficiency exists in critical thinking education at the university level (Thomas, 2011). This study serves to understand the practice of augmented feedback post-examination. Researchers attempt to discover if augmented feedback improves critical thinking skills to prepare students for a successful career. Research begins with a literature review of peer-reviewed articles, synopsis of the augmentation process with its impact on critical thinking skills, and the methodology of application. Finally, researchers discuss findings, conclusions, limitations of the study, and future research.

LITERATURE REVIEW

This research serves to understand the practice of augmented feedback in a post-exam situation. Researchers attempt to discover if augmented feedback improves critical thinking skills to prepare students for a successful career. A strong technique for reinforcing course priorities and enhance effective learning is to assess the process (Boylan, 2015). Current literature on the development of critical thinking has four consistent themes. First, many obstacles exist for implementing more effective classroom methods for the development of critical thinking. The gradual nature of cognitive development presents a challenge for incorporating critical thinking skills into the curriculum. Another obstacle is the introduction of critical thinking without interrupting other key topics in the course. However, by effectively engaging students in coursework through appropriate instructional methods, students will improve their critical thinking skills. Challenging students with constructive responses to questions is more effective than merely asking students to select correct answers among provided possible answers (Shim & Walczak, 2012). Second, research suggests that encouragement of critical thinking development cannot be relegated to a course in critical thinking, alone. Rather, the incorporation of critical thinking in subject-matter courses is most effective (Young & Warren, 2011). Third, to be effective, the pedagogical approach must embed the development of critical thinking skills within the student's learning of course concepts. Active engagement of students is essential in this process. Class discussion and debate bring content alive and facilitate deeper learning of the content (Braun, 2004). Moreover, disagreement in the construct of critical thinking leads to several competing measures for critical thinking (Shim & Walczak, 2011).

Furthermore, the critical thinking measurements most heavily researched are subject-independent assessments. These assessments allow measurements of critical thinking ability regardless of the context, making it possible to compare different groups of people. Also, previous studies indicate a positive correlation between the outcomes of subject-independent tests and students' performance in a course or on a task. Such studies, therefore, indicate that critical thinking is worth assessing. However, several problems exist with such general tests. First, faculty doubt that the measurements indicate anything useful about discipline-specific knowledge. Second, administration of these tests takes time away from the content of the course which is viewed by instructors as "wasted" time. Last, many faculty members lack the time to learn the underlying theory behind the tests (Bissell & Lemons, 2006).

Unfortunately, little substantiated knowledge on effective pedagogy comes from research on critical thinking. Few scholars have explored studies on critical thinking among college students and the impact of instructional factors (Tsu, 2002). Moreover, few scholars have explored student opinions about testing formats (Carlson, 2013). However, scholars who have researched testing formats found that students prefer a multiple choice testing format with an opportunity to earn extra credit (Scanlan, 2013). Although Americans are more highly educated than ever before, they are not *better* educated. Education largely emphasizes knowledge building through subject matter content which in turn teaches students what to think. Students rarely express an original idea or provide any evidence to back a claim (McEwen, 1994). However, for students to build high-order cognitive skills such as critical thinking, educators should focus more on teaching students how to think for themselves. Whenever this occurs, students are better prepared to tackle the numerous challenges found throughout their personal lives and careers. Installment of critical thinking in students places them on the path to be lifelong learners (Tsu, 2002). Research can and should assist faculty in their efforts to facilitate students' ability to think critically.

According to Thomas (2011), critical thinking should be developed from the first year of university for students to be useful to future employers. A recent report reveals that 93% of college faculty consider critical thinking skills to be among the most essential skills students can develop. However, according to that same study, only 6% of graduates can demonstrate critical thinking skills (Quitadamo, Faiola, Johnson, & Kurtz 2008). A California study found that only 19% of faculty could clearly define critical thinking while 89% included it in their curriculum (Murawaski, 2014). Moreover, it is argued that there are more

ways to fail than to succeed when teaching critical thinking. Often, poor teaching of critical thinking skills is a result of the lecturer mistakenly believing that critical thinking is solely up to them. Whereas, enhancement of students' critical thinking abilities is better accomplished when the teacher acts more as a facilitator than an instructor (Pithers & Soden, 2010). Students rarely use evidence to make judgments and use understanding as a goal. Rather, students often see a limited number of perspectives, fail to actively listen, judge quickly, and hold their ideas in high esteem (Murawaski, 2014). Critical thinking is applicable in situations where decision-making is required. Therefore, the practice of critical thinking encourages employees and managers in the workplace to observe situations and weigh all available solutions (Murawaski, 2014).

For students to better compete on the global stage, higher education faculty need to make practical instructional changes (Quitadamo, Faiola, Johnson, & Kurtz 2008). It is estimated that teachers in the typical classroom spend 80% of their time lecturing to students who are only attentive to what is being said 50% of the time (Tsu, 2002). To address this problem, methods to promote critical thinking must be explored. Communication and interpersonal skills were listed as two important skills by the then-Big 8 public accounting firms in 1989 (Boyle, Mahoney, Carpenter, & Grambo, 2014). Researchers found that communication skills are viewed as important for promotion to specific ranks. Also, The development of communication skills can enhance one's career prospects and the likelihood of advancement (Boyle, Mahoney, Carpenter, & Grambo, 2014). Communication skills can be improved through class discussion which in turn can enhance critical thinking skills.

Class discussion is an often used and embraced pedagogical strategy. Learning is an active process and students better retain information through engagement with students via classroom discussion and debate (Petress, 2006). Reported benefits of discussion include student involvement in their learning, learning through the contribution of peers, and the development of higher-level cognitive skills. Therefore, discussion helps students develop critical understanding, self-awareness, appreciation for diverse perspectives, and the ability to act (Dallimore, Hertenstein, & Platt, 2004). The aforementioned qualities give students what it takes to succeed in the professional world. However, classroom discussion, with its focus on active learning and critical thinking, is attractive in theory but often disappointing in practice (Bruss, 2009). Research shows that certain faculty behaviors and techniques can increase the effectiveness of discussion. Instructors can require and grade participation, incorporate instructor and student ideas and experiences, facilitate, ask effective questions, create a supportive classroom environment, and affirm student contributions while providing constructive feedback (Dallimore, Hertenstein, & Platt, 2004). Furthermore, to cultivate useful discussion, educators must guide the discussion and facilitate student participation. Instructors must know when to interject and pose thought-provoking questions. Students are more likely to comprehend and retain ideas when they participate in dialogue or debate (Tsu, 2002).

DATA AND METHODOLOGY

The researchers understood the need in a business program to incorporate critical thinking and augmented feedback into the entire curriculum. In order to improve critical thinking in the classroom without missing out on actual course material, instructors must modify their existing courses (Page & Mukherjee, 2007). Researchers developed a pedagogical method to address the need for critical thinking practice in the classroom. Augmented feedback is one of the most critical forms of guidance that a teacher can offer to students. Augmented feedback comes from a source external to the learner which includes knowledge of results. Knowledge of results (KR) is the extrinsic verbalize information about the outcome of an action. Augmented feedback also includes knowledge of performance (KP) which is the extrinsic verbalize information about the action itself. Advocates of augmented feedback recommend that practitioners develop students' self-evaluation skills by asking them questions during class or prompt and reinforce their evaluative thoughts. Last, advocates warn practitioners to avoid overloading the learner.

Methods Overview

The method used is a pedagogical technique that encourages and increases critical thinking skills by allowing students to challenge objective examination questions through written feedback and classroom debate. This research has the following research question: does augmented feedback and post-exam debate work? The null hypothesis is, H_0, is that augmented feedback and post-exam debate does not improve student learning.

H_0 = *augmented feedback and post-exam debate does not improve student learning*

The alternative hypothesis, H_a, is that augmented feedback and post-exam debate does improve student learning

H_a = *augmented feedback and post-exam debate does improve student learning*

In order to accept or reject the null hypothesis, researchers have put in place a 70% threshold. If 70% of feedback on SSCEQ is positive then researchers can accept the null hypothesis. If below 70% of feedback on SSCEQ is negative than researchers will reject the null hypothesis. The "Student Self-Initiated Challenge of Examination Questions" (SSCEQ) is a new approach that was developed by previous researchers Brown, Worth, and Boylan (2017) . SSCEQ allows for the development of critical thinking skills over time without any loss of time to cover course material. Students can challenge objective examination items directly on their examinations during testing and orally in class following the return of the examinations. Class discussion and participation are improved because an improved score motivates students to engage with their peers and instructor. SSCEQ has become so popular students have affectionately deemed it the "Dot Method," (Brown, Worth, & Boylan, 2017).

Participants, Sample, and Demographics of Population

In an prior quantitative study, titled "Improving critical thinking skills: Augmented feedback and post-exam debate" from 2017 the authors surveyed students, asking them to rate their agreement or is agreement with statements using a 5-point Likert-type scale gauging their perception of whether SSCEQ increased their understanding of the course material, aided in developing their critical thinking about the course material, encouraged them to participate in class discussion, and provided an opportunity to improve their grades? An overwhelming majority of students surveyed believed SSCEQ increased their understanding of and critical thinking about course material, gave them an opportunity to increase their grade, and encouraged them to participate in class discussion. 81% of students felt SSCEQ helped them develop a better understanding of the course material. 90% of students believed SSCEQ aided students in learning to think critically about the course material. 85% of students believed the method increased class discussion. 88% of students felt listening to others aided their understanding of the material. Significantly, over 90% of students felt their critical thinking skills were improved. With this research being a follow-up qualitative study to an original quantitative study the sample size shrank as students either dropped out of the study or graduated. Here is a comparison of the original study and this follow-up study (see Table 1 and Table 2).

Students were asked the following question about their experiences with the Dot Method:

Please explain/describe any benefits you believe were obtained from using the Dot Method.

Researchers identified six categories common throughout student responses to the above question. Categories included critical thinking, reasoning, discussion, opportunity to explain, ability to hear other perspectives, and others. The most popular category was critical thinking with six student responses and the second most popular category was other with six responses. This was followed by a discussion that had

five student responses, followed by an opportunity to explain with five student responses. The opportunity to explain was followed by the ability to hear other perspectives with three responses and then reasoning which accounted for two student responses.

Table 1: Original Population of Dot Method Demographics and Classes

Course	Type of Student	Class Standing	Age	Number of Students	Number of Each Sex
BUSA 2810	Mostly traditional (18-22 years old)	Lower level (freshmen/sophomore)	18-22 years old	305	131 males 174 females

Table 1 describes the demographics of the population. Researchers included the course number for each participant, along with the type of student. Researchers describe students as two different types. Traditional students are those who enroll in college full-time immediately after graduating high school. Non-traditional students are those who enroll in college long after graduating high school, those who have a spouse or children, or work full-time while going to school. Class standing and age are also provided for each particiapant in the population. Last, researchers describe the population as a whole when listing number of students and the number of each sex.

Table 2: Follow-up Sample of Dot Method Demographics and Classes

Course	Type of Student	Class Standing	Age	Number of Students	Number of Each Sex
BUSA 2810	Mostly traditional (18-22 years old)	Lower level (freshmen/sophomore)	18-22 years old	26	6 males 20 females

Table 2, like table 1, describes the demographics of the population. Te biggest difference in this information is the number included in the sample. Here the sample size reducted to 26 as a result of students either dropping out of school (74) or graduating (205). The gender composition remained similar while going to school. Class standing and age are also provided for each particiapant in the population. Last, researchers describe the population as a whole when listing ethnicity mix, number of students, and the number of each sex.

Table 3: Common Categories of Student Responses to the DOT Method Questions

Rank	Category	Student Responses	Mean	Standard Deviation
1	Critical Thinking	6	14.1	2.14
2	Other	6	13.5	1.75
3	Discussion	5	13.4	2.25
4	Opportunity to Explain	5	12.3	1.17
5	Ability to Hear Other Perspectives	3	10.5	1.01
6	Reasoning	2	8.2	1.52
Total		27	12.7	1.71

Table 3 shows the rank and frequency of student responses to the six most common categories of responses to the DOT Method question.

The data shows that a very consisted response to the questions. In fact, all of the standard deviations are between 1.01 and 2.25 (see Table 3). Six students say that the Dot Method improved their critical thinking skills. One student said the following, "The dot method allowed me to express why I thought my answer was correct. It helped my critical thinking skills and also helped me grasp a better understanding of the material, whether or not I received credit for that question." Moreover, two students commented on how the Dot Method improved their reasoning skills. For example, one student commented, “It helped me to think about the question instead of jumping straight to the answer.” Five students explained how the Dot Method allowed them the opportunity to explain why they chose an answer. One student remarked, “By using the Dot Method, I was given the privilege to show my professor that even though I was unsure about the correct answer to a particular question, I still understood the material and the concepts that the question was referring to. Many students study for long hours and are very knowledgeable on the subject but they are not naturally good test-takers. The Dot Method is a concept that aids students academically.

Table 4: Students Comments Concerning Benefits of Method

	Critical Thinking Skills
1	"Some test questions might be understood differently, and being allowed to explain the reasoning behind your answer not only clarifies how the question is interpreted but also critical thinking of the material. . . . And sometimes, while describing what I mean, I change my answer to the correct one!"
2	"The dot method allowed me to express why I thought my answer was correct. It helped my critical thinking skills and also helped me grasp a better understanding of the material, whether or not I actually received credit for that question."
3	"I really enjoyed the dot method. When I was studying for the exam, it made me want to actually learn the material instead of memorize it."
4	"It teaches people to clearly devise an argument and present it to the professor."
5	"We were able to practice negotiation."
6	"(The Dot Method) helped my critical thinking skills and also helped me grasp a better understanding of the material whether or not I actually received credit for that question or not".
	Reasoning
1	"It helped me to think more about the question instead of just jumping straight to an answer."
2	"Some test questions might be understood differently, and being allowed to explain the reasoning behind your answer not only clarifies how the question is interpreted but also critical thinking of the material."
	Opportunity to Explain
1	"By using the Dot method, I . . . was given the privilege to show my professor that even though I was unsure about the correct answer to a particular question, I still understood the material and the concepts that the question was referring to."
2	"I found the dot method very useful in challenging myself and the professor on questions that I found confusing."
3	"The opportunity to use the dot method was amazing. It allowed me to challenge and professionally discuss the reasoning why my answer fit with the question. I never realized I was interested in anything legal/law before this class. And with the dot method, I was able to learn so much more because I was able to listen to various perspectives on how others viewed the problems. I also felt that I was able to prove to myself that I completely understood the material because I could further explain different approaches. The material stuck much more than normal testing situations because of the dot method."
4	"When qualifiers such as 'some' or 'many' were used in T/F, I was able to explain why I chose the answer I did, and the dot method helped me gain insight about how/why the question was formulated as it was and allowed me to gain points when I otherwise would not have been able to do so."
5	"My academics and studies are extremely important to me, so I try to always come as prepared as possible for all of my courses. If there were questions I didn't understand or felt there were two clear answers, I knew I could write about it. . . . It's not arguing for a better grade; it's the chance to demonstrate your understanding of material and prove where you are coming from."
	Discussion
1	"I really enjoyed the Dot Method. Not every question is black and white, so it was good to have room for discussion on the 'grey' areas."
2	"It gives students the opportunity to debate questions that they find unfair on a test. Our voices can be heard."
3	"A benefit from this method was that it made me care more about the material because with the dot method, we were able to go into depth and actually understand the correct explanation behind the question. It also helped me to socialize with others because most of the time, my classmates around me also would challenge the same question or questions that I also didn't understand, and we would all talk about it with each other. I made some new friends, just saying."
4	"Students who might not otherwise speak up in class have a chance to write their argument on the test. Also, if someone else defends an answer that a quiet person has wrong also, it allows those who would not normally speak up and just live with their grade a chance to earn points."
5	"I found that discussing concepts is the most effective way to really understand the material, however it is usually hard to get a group of students to engage in a discussion. Allowing the class to challenge questions has led not only student involvement, but enthusiastic student involvement."
	Hear Other Perspectives
1	"Learned different ways to look at the law."
2	"I was able to see that I was not alone in thinking the way I did. I liked the ability to challenge questions I did not dot or did dot after the test was completed."
3	"Helped me think of different ways to approach questions and how others thought about the question."
	Other
1	"(The Dot Method) gave a sense of hope for getting questions correct that were hard to understand."
2	"Dot Method is best. More professor should start using it."
3	"I think that this method should stay the same and implemented in all classes."
4	"I believe other professor should implement the Dot Method
5	"I believe it is a great method and should be used by all professors."
6	"The way this is used is genius! All teachers should use it if it makes a difference in said class."

Table 4 provides a list of the response categories, along with each student response that falls underneath that category.

Furthermore, students felt confident that the Dot Method improved classroom discussion. Five students commented on the motivation to participate in class discussions. One student says, "It allows students to debate questions that they find unfair on a test." Another student commented, "I really enjoyed the Dot Method. Not every question is black and white, so it was good to have room for discussion on the 'grey areas". Three students commented on the Dot Method's ability to allow students to hear other perspectives. One student voiced that the Dot Method allowed them, "to see that I was not alone in thinking the way I did. I liked the ability to challenge questions that I did not or did dot after the test was completed." Another student claimed, "(The Dot Method) helped me think of different ways to approach questions and how others thought about the question."Last, students explained the benefits of the Dot Method in a way that did not fit into the researcher's categories. Students stated, "Dot Method is the best. More professors should start using it," and "(The Dot Method) provides a sense of hope for getting questions correct that were hard to understand." A full list of the student responses can be found in Table 3.

RESULTS

The results of this study are consistent with the prior study in which the overwhelming majority of students surveyed believed SSCEQ increased their understanding of and critical thinking about course material, gave them an opportunity to increase their grade, and encouraged them to participate in class discussion. The current research founds the ability to express their own opinions was the largest statisfier for students. This is different from the previous study that simply showed the success of the teaching technique.The responses to the statement, "please explain/describe any benefits you believe were obtained from using the Dot Method," reveal the perceived benefits of the Dot Method. These responses included improvements in critical thinking and reasoning skills, along with more effective classroom discussions. Furthermore, students commented on how SSCEQ allowed them to hear other perspectives. All of these results represent very positive results. More written comments included, "Dot Method is the best. More professors should start using it," and, "(The Dot Method) gave a sense of hope for getting questions correct that were hard to understand." Other students raved about the universality of the method with one student exclaiming, "I think that this method should stay the same and implemented in all classes." Another student echoed the same message by saying, "I believe it (The Dot Method) is a great method and should be used by all professors.

Table 5: Student Rankings of Survey Statements

Statement	Percentage of Total
Critical Thinking Skills	22%
Other	22%
Discussion	19%
Opportunity to Explain	19%
Ability to Hear Other Perspectives	11%
Reasoning	7%

Table 5 breaks down the percentage of total responses for each category. Out of 27 total responses, 22% related to critical thinking skills and other comments. Discussion accounted for 19% of the responses while an opportunity to explain totaled the same percentage (19%). Moreover, the ability to hear other perspectives totaled 11% of responses. Last, Reasoning accounted for the lowest percentage of responses with just 7% of the 27 responses.

Along with these results, researcher found little difference between male and female respondence in the stury. Males tended to place more emphasis on "discussion" and "opportunity to explain items than females. Females, on the other hand, tended to appreciate the "ability to hear other perspectives" items.

CONCLUDING COMMENTS

Despite the resounding interests in developing and fostering critical thinking in higher education, there is evidence that college graduates lack the critical thinking skills needed in today's workforce (Shim & Walczak, 2012). Researchers attempted to discover if augmented feedback improves critical thinking skills to prepare students for a successful career through a qualitative study. Responses to the Dot Method were 100% positive which is 30% more than the 70% threshold needed to accept or reject the null hypothesis. Therefore, researchers accept the null hypothesis. The findings led researchers to conclude that augmented feedback improves critical thinking skills of students and therefore better prepares them for their future careers. Furthermore, students also reported that their reasoning skills were sharpened along with their ability to participate in classroom discussions. Students also described their ability to hear other perspectives and provided more opportunities to explain their perspectives.

Researchers identified two problems with the administration of critical thinking tests. First, faculty doubt that the measurements indicate anything useful about discipline-specific knowledge. Second, administration of these tests takes time away from the content of the course which is viewed by instructors as "wasted" time (Bissell & Lemons, 2006). SSCEQ overcomes both of the aforementioned challenges. First, although it is not a direct critical thinking exam, it forced students to think critically; therefore, the second challenge is overcome and it is not "wasted" time. Positive comments about the Dot Method's correlation with improved critical thinking skills made up the highest percentage of responses. Thus, researchers belive that the Dot Method improves the critical thinking skills of students.

Furthermore, researchers also stimated that teachers in the typical classroom spend 80% of their time lecturing to students who are only attentive to what is being said 50% of the time (Tsu, 2002). To address this problem, methods to promote critical thinking must be explored. One of these methods includes increased classroom discussion. SSCEQ increases the amount of class discussion and improves the quality of that discussion. The second highest percentage of responses from participants included positive comments about classroom discussion. The Dot Method incentivizes students to participate in classroom discussion. Classroom discussions also relates to the last three response categories: opportunity to explain, ability to hear other perspectives, and reasoning. When doing so the student rationalizes their position in hopes of gaining points back on their exam. This rationalization of their position improves critical thinking skills and also exposes other students to different perspectives. Limitations to this study existed. One limitation is that no measure existed between academic success and student satisfaction. Also, similar to the previous study, only one method was analyzed, the Dot Method. Furthermore, the sample size was relatively small with only 27 participants. Last, due to the nature of the sample, the research is susceptible to survivorship bias criticisms. Future research can be expanded to other areas. In future studies, the applicability of this method in business courses should be evaluated. Specifically, research on the method's applicability to Accounting and Finance courses.

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