Critical Thinking: More Than Test Scores

This manuscript has been peer-reviewed, accepted, and endorsed by the National Council of Professors of Educational Administration (NCPEA) as a significant contribution to the scholarship and practice of school administration and K-12 education.

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This article is for practicing or aspiring school administrators. The demand for excellence in public education has lead to an emphasis on standardized test scores. This article explores the development of a professional enhancement program designed to prepare teachers to teach higher order thinking skills. Higher order thinking is the primary focus of many state and national tests that are mandated. Teachers play a crucial role in preparing students to be thinkers. Institutions of higher learning must evaluate their instructional practices to ensure that teachers are prepared to meet the new challenges of standardized testing. Additionally, principals, as instructional leaders, need to understand higher order thinking skills and how to assist teachers in their development of this teaching practice. The Gallagher Aschner model of questioning students is explored as a preliminary means to begin the development of higher order thinking skills. Suggestions for professional development around the use of this method are presented.

Problem

State standardized testing has been part of the effort to reform schools for over several decades (Airasian, 1987; Louis, Febey & Schroeder, 2005). Standards-based reform, including testing, has gained increasing support as a strategy to improve schooling among legislators, educators and the general public (Hanushek & Raymond, 2005; McNeil, 2000; Neal & Schanzenbach, 2010). The Center for Public Education (2006) noted that a

high stakes test has consequences attached to the results. The test results often determine whether a student will be promoted to the next grade, graduates from high school or whether a student is admitted to college. Nearly every state has a high stakes testing program to evaluate instruction and student performance. While the approaches of states vary, all identify standards, align standards to the tests to gauge student progress, and hold schools accountable for the results. The cry for excellence has transformed state standardized testing into high stakes testing. The No Child Left Behind Act of 2001 increased the pressure on schools by extending federal accountability measures to all schools and districts that accept Title I dollars, which are intended to supplement the educational program for students from low-income families. Many warn of the pitfalls of high stakes testing (Cavanagh, 2012; Gerson, 2007; McNeil, 2000; Sawchuk, 2010).

The No Child Left Behind Act of 2001, Reading First Act and many state and federal education laws require teachers to use evidenced based research to guide instructional practice (Twyman & Sota, 2008). These requirements exist to reduce the tendency to follow fads or whims in educational strategies. It is sad irony that teachers relying on rote memorization and basic fact recall to improve student achievement on standardized tests are actually practicing the opposite of what research shows is good teaching. When educators and students spend an inordinate amount of time preparing for high stakes testing it leaves little time for focusing on the research based methods of teaching. As McComas and Abraham (2004) noted:

> Study after study reveals that although educators know that the higher-order divergent questions hold significantly more power to engage the learner and ensure transfer of knowledge, we consistently retreat to using lower-order convergent style questions when teaching and testing students" (p.6)

State tests are increasingly emphasizing thinking and problem solving skills (Moore & Stanley, 2010). There are various labels for these new goals – creative thinking, reasoning, critical thinking, infusion, metacognition, and transfer, among others. Although there has long been a focus on higher order thinking skills (HOTS), few teachers have been prepared to teach and apply higher level thinking skills (Moore & Stanley, 2010). Hummel and Huitt (1994) note that many assumed that critical thinking would automatically develop as specific disciplines were taught.

Many teachers struggle with harnessing intelligence to master the increasingly complex standards with which students are challenged (Louis, Febey & Schroeder, 2005). In their nationwide survey Kiuhara, Graham, and Havekn (2009) found that 47% of teachers did not assign higher level writing assignments monthly. Instead these teachers, like most, focused on lower level short answer questions or worksheets. Kiuhara et al (2009) argued that writing five paragraph essays, persuasive essays, research papers, short stories, biographies, an autobiographies provided students with experience in higher order thinking about the content being studied. Rather than rely on research-based evidence, teachers fall back on their personal beliefs (Szymanski & Schaff, 2013). It is a simple but sad fact that too many public school districts in the United States have been stuck in the doldrums for many years. Despite some improvements in recent years, achievement levels, especially in urban districts, remain relatively low (Marsh, Kerr, Ikemoto, Darilek, Suttorp, Zimmer, & Barney, 2005). In addition, pressure is escalating

for districts and schools to meet the federal goal of academic proficiency for all students as mandated by the federal No Child Left Behind Act (Marsh, et.al, 2005).

In assessing the quality of education in post-secondary institutions, Renaud and Murray (2007) found that a valid process indicator as it relates to gains in students' critical thinking skills is frequency of higher-order questions. They note that their findings demonstrate the need to include training in preparing higher-order questions as a part of faculty development. This may be the case also for teachers at the K-12 level. Hummell and Huitt (1994) noted that simply having teachers give essay-type or activity oriented assignments, even ones that tap into the higher cognitive domains, will not necessarily improve students' higher order thinking skills. Hummell and Huitt further noted that the types of assessments used in all levels of education affect how students learn and should impact how teachers teach. They conclude, "what you measure is what you get" (Hummell & Huitt, 1994,p.10).

What are Higher Order Thinking Skills (HOTS)?

Higher order and lower order thinking have been delineated by many researchers (Bloom, Englehart, Furst, Hill & Krathwohl, 1956; Dewey, 1993; Gallagher, 1998; King & Kitchener, 1994; Perry, 1970). Maier (1933, 1937) used the terms *reasoning* or *productive behavior* (higher order) in contrast with *learned behavior* or *reproductive thinking* (lower order). Newman (1990) after observing classrooms and interviewing teachers developed the distinction between lower and higher order thinking. He concluded that lower order thinking demands only routine or mechanical application of previously acquired information such as listing information previously memorized and inserting numbers into previously learned formulas. In contrast, he noted that higher order thinking, "challenges the student to interpret, analyze, or manipulate information" (p. 44).

Critical thinking is probably the most current label for what many call analytical reasoning, synthesis, problem-solving, or higher mental processes (Scriven & Paul, 1992). Lewis and Smith (1993) indicate that much of the confusion surrounding the definition of higher order thinking comes from the inconsistent use of the term critical thinking. They noted that "critical thinking has been assigned at least three distinct meanings: (a) critical thinking as problem solving, (b) critical thinking as evaluation or judgment, and (c) critical thinking as a combination of evaluation and problem solving" (p. 134). Lewis and Smith (1993) identified a series of domains of teaching embodied in what they designated as higher other thinking. Thinking associated with the analysis of arguments involves one domain. When this thinking is done in a reflective manner then it may be called critical thinking. The other domain is related to problem solving. Lewis and Smith also note that higher order thinking encompasses critical thinking, creative thinking, problem solving, and decision-making. They offer the following:

> Higher order thinking occurs when a person takes new information and information stored in memory and interrelates and/or rearranges and extends this information to achieve a purpose or find possible answers in perplexing situations. (Lewis & Smith, 1993,p.136)

Magno (2010) identified critical thinking as comprised of five distinct factors: "inference, recognition of assumption, deduction, interpretation, and evaluation of arguments" (p. 140). These five factors map directly to Bloom's Taxonomy of higher order thinking skills of analysis, synthesis, and evaluation. Thus critical thinking and higher order thinking, while not synonymous are closely related.

The Need

Levin (2004) suggested that in order to effectively prepare students to successfully engage with their environment, more so than to prepare them to master a standardized state test, we must improve students' higher order thinking skills. The ability to engage in this type of thinking is much more important than scoring high on a standardized test Specifically, he stated "much of what is done under NCLB is done to increase scores on stultified tests, not to engage students in a world which they will succeed" (p.ix). According to Cotton (1991), the ability to engage in careful, reflective thought has been viewed in various ways: as a fundamental characteristic of an educated person, as a requirement for responsible citizenship in a democratic society, and more recently, as an employability skill for an increasingly wide range of jobs. The techniques of critical thinking require students to engage in higher order thinking skills such as evaluate and analysis instead of simply recalling information (McComas & Abraham, 2004).

How can students be taught to think? A beginning step may be teachers leading the thinking through the use of questioning as Socrates modeled years ago (Vlastos, 1995). "The first step in asking better questions is to identify the types of questions we are currently asking, why we are asking them, and finally what techniques can we utilize to improve the questioning that occurs in our classrooms"(McComas & Abraham, 2004, p.6).

Louis, Febey and Schroeder (2005) noted development of external accountability systems was not a proven strategy for long-range improvement. They note several authors "have argued that the cost of accountability systems are too high and tool weak to create real change in classrooms" (p. 177). Hummel and Huitt (1994) stated that good teaching and assessment is related to higher level thinking, but not enough educational resources and support are given to promote higher order thinking.

A Strategy to Assist

According to a major report (AACU, 2002) of the Association of American Colleges and Universities, many teachers have completed their pre-service collegiate experience without being taught to develop and use their own higher order thinking skills. Classes with critical thinking in the title are abundant. The report concluded that research shows many college graduates are falling short in reaching the goal of learning to think critically. Pre-service teacher training is void of the instructional methods necessary to create students who can think critically.

Minnich (2003) pointed out that if undergraduates are not learning to think, one major reason may be that most higher education institutions do not know how to systematically teach it. She argued that thinking can and should be taught more deliberately and intentionally in college courses. The AACU supports this finding, "To apply knowledge productively in field-based setting, all students should experience in-

depth questioning from faculty, staff, and other mentors about their assumptions, analyses, conclusions, and actions" (2007, pp.36- 37). Convincing educators, including college professors to change methodology is not going to be an easy task (AACU, 2007)

In their nation-wide study of high school language arts, science, and social studies teachers' writing practices, Kiuhara, Graham and Hawken (2009) found that less than 30% of the respondents assigned at least one higher level writing activity each week. In this same study, 71% of teachers reported receiving no formal preparation to teach writing and 52% indicated that they did not receive adequate preparation to teach writing in their content area . It should not be surprising that teachers who did not receive formal preparation to teach a skill are not teaching it. Likewise, to expect teachers to teach higher order thinking and use questioning to promote deep processing is unrealistic if they have not participated in this method of learning in their personal educational experience nor received formal training on how to incorporate the method into their teaching. This problem points to the need for teacher education programs to practice and explicitly teach research-based methods of instruction. The lack of undergraduate experience in developing higher order thinking skills also highlights the need for teacher professional development in this area (AACU, 2002, 2007).

Questions as an Avenue to Higher Level Thinking

The oldest teaching tactic for fostering critical thinking dates back centuries to Socrates (Vlastos, 1995). In Socratic teaching the focus is on providing questions with questions, not answers (Garlikov, 2006). The philosophy of higher order thinking (HOT) extends from the time of Socrates, Plato and Aristotle. Socrates (Garlikov, 2006) challenge the " loose" thinking of the youth of his day by asking such questions as: "What is the evidence?" and, "If this is true does it not follow that certain other matters are true?" (p.131).

Bloom's Taxonomy has multiple levels of higher order thinking (Bloom et al., 1956). The Gallagher and Aschner program, however, has fewer levels and seems more user friendly (Gallaher & Aschner, 1963).

Gallagher and Aschner Classification Model

Gallagher and Aschner (1963) suggested in their research that there is a high correlation with question asking and the development of higher order thinking skills. They offer an instrument capable of accurately classifying the thought level required of the student by a teacher's question. These researchers developed a four-level model designed to suggest the various kinds of questions teachers use in the classroom. The levels they identified are: (1) cognitive-memory (low order convergent) (2) convergence (high order convergent), (3) divergence (low order divergent), and (4) evaluative (high order divergent).

There are similarities between the Gallagher and Aschner (1963) model of questioning and the Bloom et al Taxonomy (1956). Bloom et al (1956) created a hierarchy of levels of thinking with remembering and recalling as the lowest level. Synthesis (creation) and evaluation were the highest levels of thinking based on the view that students begin with a basic understanding of the content (vocabulary, dates,

formulas) then move to integrate this understanding with prior knowledge eventually creating new conceptualizations. The Gallagher and Aschner model evaluates teacher questions by determining if they are higher or lower level of thinking. In this model, convergent questions, which typically only have one correct answer, are considered a lower level than divergent questions, which have many possible answers and thus invite students to consider several aspects of the question involving more cognitive processes. The model also divides the convergent and divergent questions into levels similar to Bloom et al where the amount of cognitive processing involved determines whether the question is considered higher or lower level (Gallagher & Aschner, 1963).

The first level of the Gallagher and Aschner (1963) classification model is the cognitive-memory level, which is considered the lowest level of thought required of students. Questions at this level demand that students recall, identify-observe, define, name, designate or respond yes or no. Examples of questions that fall under this category may be: (a) Who is the main character in the story, (b) what is energy, and (c) who was the first character in the book to find the hidden cave.

The second level of the Gallagher and Aschner model (Gallagher & Aschner, 1963) questioning system was called *convergence*. This category included more broad type of questioning that required putting facts together in order to acquire the right answer; however, it is still considered a low level of the thought. This type calls for students to explain, state relationships, or compare and contrast. Examples of such questions are: (a) Why does the moon give off light, (b) how are dogs and cats alike, and (c) what does the mother do when she discovers her ring missing.

The third level of the Gallagher and Aschner (1963) questioning system is considered broad and is called *divergence.* Divergent questions allow for more than one answer and encourage creative and imaginative responses. Students are required to predict, hypothesize, infer, or reconstruct. Examples are: (a) If you ruled the world, what would you change, (b) what do you think the girl will do next, and (c) how would the U.S be different if it had lost the American Revolution.

The final category of the Gallagher and Aschner (1963) scheme is called *evaluative.* The evaluative question is classified as broad and requires the student to judge, value, choose or defend. These types of questions may include examples such as: (a) Is America the best country within to live and why, (b) why did you select this one as the correct one, and (c) Why do you agree or disagree with the decision of our country to enter the war.

Recommendation for the Practicing Principal

Many studies (Cawelti, 2000; Haberman, 1999; Jesse, Davis, & Pokorny, 2004; McGee, 2004) identify the principal's leadership as important to a school's high performance. They consistently point to the principal as a key player in sustaining the sense of success for all. Carter (2000) asserts that the presence of a strong principal who holds everyone to the highest standards is the most notable factor in creating a high performing school. Sparks (2004) supports this assertion "Skillful teaching in every classroom requires skillful leadership by principals. There are no substitutes" (p. 1).

As agents of change, principals have the opportunity and responsibility to support teachers' use of higher order thinking in their classrooms. Teachers are the direct

influence on student behavior and test performance thus it is imperative that teachers understand and support the use of higher order thinking. "The teacher is the key figure when it comes to influencing student performance and therefore teacher professional development programmes should focus on improving teaching quality" (Kuijpers, Houtveen, & Wubbels, 2010, p. 1687). We recommend principals become familiar with the Gallagher and Aschner four types of questions then conduct professional development with teachers to share the understanding. Researchers have found that allowing teachers time to develop an understanding to a new method and to communicate with others regarding the change is a significant predictor of positive implementation (Buzhardt, Greenwood, Abbott, & Tapia, 2006).

It is crucial to provide time for professional learning communities to study and practice implementing higher order thinking strategies. This illustrates the school's commitment to improving the educational process. McComas and Abraham (2004) provide a questionnaire that learning communities of teachers could use to rate their own questioning behavior of students. Bringing awareness to the types of questions used is a first step in helping teachers become mindful of their teaching practice. Teachers could engage in peer observation and simply rate the questions as high/low, divergent/convergent for one another to get a third party analysis. Teachers could compare initial observation scores with later observations to track implementation success. This process of focusing on the goal, establishing a baseline through the self-report questionnaire, observation and post observation reflection is based on the Kuijpers, et al (2010) two cyclic process for professional development.

This first cycle focuses on individual performance and understanding. The second cycle or tier focuses on the teachers as a team evaluating progress on implementation as a group, practicing the new skills, and comparing data on student achievement or teacher competencies. The two-cycle process requires a time commitment on the part of the teachers and the principal to be successful. Individual teachers should expect to conduct peer observations at least three times in one another's classroom and student achievement data will take at least one quarter to note any change. The process could even take an academic year as the students and teachers adjust to a new form of teaching practice. The extent to which the principal supports the process will clearly demonstrate the importance of implementing this new teaching strategy.

Following staff development, it is recommended that the principal make classroom visits where the focus is on the levels of questions that a teacher asks. The questions should be ranked and discussed with the teacher during the post-conference. While the inclusion of questions that elicit higher order thinking is the goal, principals and teachers need to understand that teachers cannot, nor should not ask only high level questions. Responses to lower level questions are used as a foundation for responses to higher-level questions. A thorough understanding needs to be established before students have the necessary skills to engage in higher level thinking about new content.

Conclusion

Questioning students is a tool that is frequently used by teachers both as an instructional strategy and a means of assessment. Too often teachers rely on short, recall, convergent questions when interacting with students (Kuihara, et al. 2009). Reasons behind this type

of questioning may include inadequate understanding or experience regarding the higher order thinking questioning methods or a feeling of time pressure to keep on pace with curriculum expectations. Finally, a substantial reason for this type of questioning may be simply to prepare students for standardized tests, which ask similar types of questions. However, we are not educating students simply to perform well on tests. The goal of education is to develop the cognitive abilities of children to help them be successful in daily life. This requires higher order thinking skills. It is not enough to simply recall information.

"The most basic premise in the current thinking skills movement is the notion that students can learn to think better if schools concentrate on teaching them how to do so" (Presseisen, 1986, p.17). A general finding from research is that nearly all of the thinking skills programs and practices investigated have proven to make a positive difference in the achievement levels of students (Cotton, 1991). As the development of higher order thinking skills has been strongly correlated with improved standardized test performance (Levine, 1994; Uretsi, Goetz, & Bernal, 2002), principals and teachers can feel confident that research based evidence supports their efforts. The use of questioning to aid students in moving from simple lower level recall to high level evaluation and synthesis provides a structure to help students beyond basic knowledge that is typically assessed on a standardized test to a deep conceptual understanding that allows for meaningful transfer.

Finally, the principal needs to make sure that student performance is assessed on a regular basis as a way of modifying and steering the higher-order thinking program. These formative assessments will provide important feedback for teachers as they support students' development of higher order thinking skills. The principal also needs to conduct formative assessments with the teachers to determine challenges that may exist that prevent the implementation of the new questioning methods.

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