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**Case-Based Learning and Instruction: A Review of the Literature
and Suggestions for Implementation with Young Learners**

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**Case-Based Learning and Instruction: A Review of the Literature
and Suggestions for Implementation with Young Learners**

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**Case-Based Learning and Instruction: A Review of the Literature
and Suggestions for Implementation with Young Learners**

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This report will review some of the current and past literature on case-based learning and instruction, while also providing the reader with a background on the development of this particular learning strategy with implications for future research. The first two chapters will review case-based learning/instruction by examining its background and history, current uses, and benefits associated with its current uses in educational settings, as well as how these benefits may apply to younger learners. In chapter three, I have discussed some of the more well established discussion-based methods in K-12 education, specifically those most similar to case-based learning. This section is followed by suggestions for implementing case-based learning and instruction with younger learners. The report concludes with limitations associated with case-based learning and its implementation with younger learners, as this report is primarily focused.

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Chapter 1: Introduction

Consider a typical, American public school classroom. For many, this environment is represented by a somewhat flexible, yet primarily routine-based arrangement. Students file in with the bell, attendance is taken, students settle themselves as the instructor turns on the overhead or begins to write the objectives for the day on the board, and lecture begins. There is room for variation as the instructor typically has some form of an assignment prepared for students to complete, alone, at their desks, assuming they have a sufficient grasp of the material, an assumption that may be unwarranted. It may seem as though these typical activities would make the learning environment mundane and predictable. However, such an instructional approach may not be granting students the opportunity not only to learn, but also to master the various skills and tasks being taught in the classroom. Although this is a generalization about classroom activities and their subsequent effects on learning outcomes, those of us who have experienced public school education, whether as students or educators, can attest that these activities are the most common. This paper will examine a less commonly used instructional strategy in these academic settings that is based in group discussion, called *case-based instruction*.

The National Assessment of Educational Progress has reported that although approximately 67% of American fourth graders are reading and

comprehending at or above the Basic level, as set by the NAEP standards, only 25% are performing at the Proficient or Advanced levels (Lee et al., 2007, as cited in Murphy et al., 2009). These results indicate that a substantial majority of learners in American public schools are not equipped with the skills necessary to “demonstrate a strong understanding of the text . . . to extend the ideas in the text by making inferences, drawing conclusions, and making connections to their own experiences” (Murphy et al., 2009, p. 740). In other words, a vast majority of students are not demonstrating Proficient or Advanced reading comprehension skills. Although it may seem premature to express concern over these figures, given that these are the results of such young learners, the data indicate that reading skills progress quite modestly throughout the grade levels, as only 27% of eighth graders are demonstrating Proficient levels of reading comprehension (Lee et al., 2007 as cited in Murphy et al., 2009). To illustrate this issue more vividly, it has also been reported that only 8% of fourth graders are able to “judge texts critically... and explain their judgments...make generalizations about the point of a story and extend its meaning by integrating personal experiences and other readings,” (National Assessment Governing Board, 2007, p. 24, as cited in Murphy, et al., 2009, p.741). This low figure seems quite worrisome considering the increasing demands being placed on students through high-stakes testing, curriculum changes, and ultimately what will be expected of them in higher-level educational and professional settings later in life. Although this paper will not

focus solely on approaches to increasing the reading comprehension skills of young learners, these numbers should suggest that the current curriculum is not providing enough support for students to gain sufficient knowledge to think critically and develop meaningful schemas, crucial to future academic and professional career endeavors.

The growing demands of a technologically expanding society and highly competitive job market should start encouraging educational policy makers, instructors, and students alike to begin recognizing the need to read, comprehend, reflect, interpret, and analyze complex, content-rich texts in elementary, middle, and high-school education. This change can begin in the classroom, by providing students more opportunities to engage in tasks that allow them to discuss their various perspectives, assumptions, and beliefs, as case-based instructional methods may provide.

According to Vygotsky (1978), children develop reading skills and other abilities through “authentic participation in literacy-rich environments” while being guided by more knowledgeable others (Mojzisch et al., 2010, p. 741; Murphy et al., 2009). These others can include teachers, parents, and even other more capable peers. Based on this sociocultural perspective to learning, higher order learning is a product of social interaction, and through active learning activities based in strategies that promote discussion in small group learning environments, we may be able to promote higher level skills. Specifically, we can

try to promote reading comprehension skills through these types of instructional strategies, as Vygotsky (1978) viewed literacy as a socially constructed higher-order psychological process (Murphy et al., 2009). The argument is that when students are interacting with instructors and peers in a more active way through discussion, the learning outcomes go beyond those of the individual person. Students bring to a discussion their own prior knowledge and perspectives that may be shaped by their particular cultural, educational, and personal backgrounds. In turn, these characteristics are then shared with a group of others who may not have had exposure to those perspectives and information.

Through socially interactive learning methods, such as those based in discussion, students may begin to construct an internal dialogue, developing their metacognitive capabilities, through learning about others' viewpoints that deviate from their own, interpretations of text they may not have considered until hearing how others interpreted them, and in turn, begin to provide higher-level responses to texts. Discussion may also be tailored to foster specific skills that the instructor finds valuable or chooses to emphasize. Using techniques such as scaffolding, fading their facilitative role during discussion, or making their goals for students explicit, instructors can continue to maintain control of the learning environment, while building their students' confidence enough so that successful group discussion can take place, and specific skills, such as critically analyzing texts, and developing schemas, among others, can develop.

Research has identified a number of approaches to facilitating meaningful discussion in the classroom. The range of formats or approaches can stress a variety of learning objectives depending on the goals of the teacher, and have been shown effective in promoting high level responses to text in as early as the elementary years and on through high-school educational settings (Murphy et al., 2009). In this paper, I will examine one particular discussion-based instructional strategy, case-based learning and instruction. This paper will review the benefits of incorporating such an approach into current curricula to promote a variety of skills, while also addressing other; more commonly implemented discussion-based activities, in secondary educational settings. The limitations associated with some of the discussion based activities currently implemented will be addressed, and I will also identify ways in which case-based instruction may address these limitations, in an effort to reveal the advantages of using case-based activities as an alternative to some of the more well-established approaches to classroom discussion that are currently the standard for secondary learning environments. This review will conclude with suggestions for how instructors may want to try and utilize this method and the formats that might be most suitable, as well as making the reader aware of the possible drawbacks and problems that could occur in doing so.

In the next several chapters I will conduct an in-depth analysis of case-based learning and reasoning, followed by the benefits that have already been

observed when it is implemented correctly. I will then describe the discussion-based methods that are currently used in secondary educational settings, which are similar to case-based instruction, such as collaborative reasoning, problem-based learning methods, etc. This paper will also examine the limitations and possible disadvantages of those methods that have traditionally been used in secondary educational settings to facilitate classroom discussion, and how case-based instruction may address these limitations. Because case-based learning activities are available in a variety of formats, as will be discussed, this paper will conclude with suggestions for future research on the implementation of this particular discussion based learning strategy in secondary education.

Chapter 2: Case-Based Instruction, Background and History

Case-based instruction is perhaps best viewed under a constructivist framework. A constructivist learning environment emphasizes the associations between content, context, and understanding, the individual negotiation of meaning, and the construction of knowledge (Jonassen & Land, 2000). It is a learner-centered environment that supports individuals or groups as they attempt to address multiple perspectives or beliefs, reconcile competing or conflicting information, and ultimately construct personally relevant meaning (Jonassen & Land, 2000). In a case-based activity, regardless of the particular format, students are active participants in a discussion involving real or hypothetical problem situations. Through discussion, students are building connections between prior knowledge and content presented through the cases, and the various perspectives of other discussion participants, in an effort to construct meaningful learning and understanding, with the ultimate goal of applying their previous experiences to solve problems in new situations (Kolodner, 1992).

Case-based learning environments may also be viewed as situated learning environments, where knowledge is assumed to build through experience and ongoing support (Kim & Hannafin, 2008). As learners build their case knowledge, it becomes more situated in the context of a community, and it

becomes easier to retrieve and applied to new situations (Jonassen & Land, 2000; Kim & Hannafin, 2008). Oftentimes, learners are deprived of opportunities to engage in authentic first hand experiences, and case-based learning affords the opportunity to engage in real world problem situations in a more authentic manner than some other instructional techniques.

Case studies are useful active learning tools for undergraduates, graduates, post graduates, and novice professionals, in that they illustrate how “experts draw upon past experiences when making decisions in situations characterized by uncertainty, [and they] may substitute for direct experience in the workplace, [while helping to] smooth the transition to employment” (Zimitat, 2007, p.1).

Case studies present problematic events from the past or the present in a narrative, situational, data-based, or statement-based format (Barrows, 1999). Instructors often present case studies to their students in a variety of formats: finished, unfinished, or even fictional. The instructor’s implementation of a particular type of case depends on the instructor’s goals for his/her students. Is the purpose to measure breadth and depth of analysis or their ability to make logical predictions and relevant suggestions to a particular situation or problem?

The formal adoption of cases, as a means to facilitate active learning, first emerged at the turn of the twentieth century at Harvard Law School (Herried, 1997). In the 1940s, Harvard professor, James Conant, was under the impression that the American educational system in the sciences was “flawed,” and that there

was a lack of understanding as to “how scientific discoveries were made” (Merseeth, 1991, p.10). In an attempt to address this problem, Conant began incorporating case-based learning in conjunction with standard lecture practices (Herried, 1997). The case study method, became essential in the instruction of law, medicine, and business and is still a key strategy used today in these fields. Although the method of implementation varies from subject to subject, and instructor to instructor, its over-arching goals are universal, in broad terms, to develop the skills of critical inquiry and to facilitate discussion (Merseeth, 1991).

The Logic behind Case Based Instructional Activities

Referencing past situations or experiences (in other words, cases) has been well documented, in the literature, as one of the primary means by which humans solve new problems (Aamodt & Plaza, 1994). In other words, one naturally attempts to solve new problems by recalling a previous, similar situation, albeit not necessarily identical to, the current problem being presented, in an effort to reuse that information, and apply it to a new situation or “case.” Given the seemingly, simplistic nature of such an approach to problem solving, reasoning through cases, in actuality, can prove itself to be an especially sophisticated process. It is possible that one may adapt an old solution or situation (case) to meet some new demand, but past situations and solutions may also be used to critique a new solution, arguably a much more cognitively demanding task.

Case-based reasoning is used in daily common sense reasoning, but in the sense previously mentioned, it may also be promoting an individual's "ability and inclination to make and assess conclusions based on evidence," promoting the use and application of one's critical thinking skills (Elksnin, 2005, p.5; Kolodner, 1992). Although historically, the method has been used in medical, law, and other professional educational settings (as its applicability and benefits seem fairly obvious), several studies have provided evidence for its benefits, particularly in early learning environments (Aamodt & Plaza, 1994). One might suggest that a first year medical student, is, in fact, part of an early learning environment, but I hold that the evidence suggesting our natural tendencies to think in terms of cases provides support for the implementation of using case-based instructional strategies in K-12 educational settings, with true novice or early learners.

Consistent with the constructivist framework, in order to learn well from a case-based instructional experience, learners need to interpret case information so as to make them well-articulated cases in their memories, essentially building schemas for future situations. As noted above, this is something people tend to do naturally in ordinary problem solving situations (Kolodner, 1992). Once a case is well articulated, the actual use of that case in the context of solving a new problem involves two components, namely, recalling the old case or experience and interpreting the new situation in terms of the recalled case or schema

(Kolodner, 1992). Of course, the case does not have to be well articulated and organized, cognitively speaking, for one to recall it and use it for a new situation; however, without proper recall, there is the likelihood of misuse or inappropriate use of the case. Thus, supporting the creation of well articulated cases or schemas should be an important goal for instructors and facilitators who introduce case-based activities into their curricula.

Benefits of Case-based Teaching and Learning

With an overview having been presented, I now turn with the help of the logic that governs the application of case based learning activities and instruction, to describe the evidentiary support of its actual implementation, student experiences and perceptions, and subsequent benefits. The following is by no means representative of all the possible or potential benefits that may result from case-based instruction, but those I have chosen to list here are among some I consider to be most supportive to its implementation in the curriculum for younger learners. When taken together, the value of the benefits listed below could prove invaluable to young learners especially at a time when the educational system seems to have pigeonholed our young learners' intelligence and potential by evaluating academic success primarily on the basis of standardized test scores. One might argue that the benefits associated with the use of case-based instruction will be more likely to provide meaningful support to

these students in their later academic and professional career endeavors than the instructional methods focused solely on benefiting students' standardized exam scores, that unfortunately, many schools, teachers, and policy makers maintain we focus on teaching.

Many of the benefits of utilizing a case-based learning strategy in the classroom may be implied through the logic discussed in the previous chapter, namely, its contribution to a learner's ability to begin organizing information appropriately to be recalled for later use. In addition, case-based instruction, and subsequent learning, has been shown to generate experiences that students may not otherwise have been afforded the opportunity to obtain, which is likely one of the most important benefits with regards to its use in medical and legal academic settings. Because it is a social learning experience, it also lends itself to making visible a student's learning processes, can serve to enhance learner confidence, and promote critical thinking skills (Mayo, 2004; Thomas et al., 2001). These benefits will be discussed in the following subsections.

Learning to Organize Information

Because people naturally think in terms of cases, even if at a simplistic level, using case-based instruction in the classroom is a reasonable method to help students organize even very context dependent information. In the past, instructors and researchers assumed that teaching basic problem solving

techniques would be enough to facilitate meaningful learning outcomes across a variety of academic or work settings. The general consensus now is that there is no general problem solving process that can take place to ensure successful outcomes in all situations; instead, expert “problem solving” or reasoning is typically more context dependent (Mayo, 2004). This is not a pessimistic outlook on learning and human problem solving capabilities; I am obviously not arguing for students to learn anything and everything, that is simply not possible, as our working memory is only capable of holding a limited amount of information, or “chunks.” However, I am arguing that the amount of information one can store may be increased by incorporating information into larger chunks or cases so that many pieces of information may be recalled and utilized appropriately and efficiently. An example with regards to the education of nursing students, as a point of reference, may be helpful in illustrating this notion.

In nursing school, students learn and develop expert knowledge in a variety of clinical situations, but remain novices in unfamiliar situations. Their approach to the clinical diagnosis and consequent treatment of these unfamiliar or new cases relies heavily on their already stored knowledge and cognitive processes working together in pursuit of a meaningful solution or outcome. For these learners, it is imperative to structure the learning of information in a manner that parallels the way in which that information will be used when it is retrieved for later use. This, would essentially involve, “ combining the creation of a

knowledge structure and a search-and-retrieval strategy into a single operation, and case based instruction provides for the structuring of knowledge in this sense (Mandin et al., 1997, p.175 as cited in Thomas et al., 2001). Studies have shown that expert nurses retain large clusters of cases that serve as models and use these to compare whole new situations to those previously learned (Thomas et al., 2001). By retaining model cases in large clusters, even combining cases into one meaningful cluster, these learners and practitioners are able to retrieve relevant information appropriately and effectively when a new case or situation presents itself. With the nursing curriculum utilizing case-based instruction, these students are learning, or have learned, to organize information appropriately to be recalled for later use, in an active, self-directed process, which in and of itself is an invaluable tool in professional work environments such as nursing (Mayo, 2004).

How Instructors Can Learn What Their Students are Learning

A central characteristic of case-based instruction is the classroom discourse or dialogue surrounding the case in point, in other words, the discussion taking places between peers, colleagues, and instructors, around the topic the case presents. These discussions, in relation to the case being presented, can reflect a student's clinical reasoning – as in the case with nursing students. Generally speaking, these activities can provide insights into students' reflective thinking and analytical skills as they communicate with one another in a classroom

discourse (Mayo, 2004; Thomas et al., 2001). When students begin a discussion around a specific topic, the information they share, do not share, or misinterpret can serve as an index for an instructor's evaluations of where these learners stand in their comprehension and understanding of specific material. Instead of waiting to evaluate students at a later date through, perhaps, a standard written assessment, instructors can gain insight into the extent and depth of their students' knowledge in real time. The instructor would be more likely to recognize immediately specific problem areas, misunderstandings, misinterpretations, and immediately repair these issues through clarification and correction. Case-based instruction also affords the opportunity for students to use the discussion time to ask questions and seek guidance from the instructor or facilitator immediately, promoting the maintenance of a healthy communicative discourse in the analysis of the topic. By contrast, a standard lecture-based instructional technique may not lend itself so easily to students expressing concerns or thoughts, and leaving the instructor or facilitator, potentially, naïve to the state of the students' understanding.

Case-Based Instruction as a Method to Motivate

Group learning instructional strategies and techniques, in comparison to more traditional lecture-based, teacher-led instructional activities have been shown to enhance students' motivation to engage in their learning environment

and the respective tasks at hand (Gayford, 1995). One of the many indicators of students' motivation to learn is the degree to which the learners enjoy the activities in which they are actively engaging, and the perceived value of the activity, the latter being a central tenant of the motivational theory of self-determination (Gayford, 1995). Based on results from student surveys of preferred learning activities, group-based activities were significantly ($p > 0.05$) preferred by students over more conventional methods including, but not limited to, individually assigned projects and teacher-lead instruction (Gayford, 1995). It has also been revealed that group learning methods seemed to be more motivating, as opposed to more conventional methods, even for those students who were described by instructors as typically being more disruptive and less engaged with academic tasks than their peers (Gayford, 1995). Although Gayford (1995) examined broadly group-based learning activities, its findings are relevant and encouraging to the current topic under examination, case-based instruction. The logic would follow that if student satisfaction is a factor that influences motivation, and group learning environments elicit greater levels of student satisfaction than other classroom activities and assignments, than the effective facilitation of small-group collaborative learning via case-based instruction may also elicit more positive motivational outcomes for learners today. The one caveat here is the effect of the perceived value, or lack thereof, by students with regards to the topic or narrative being presented during the case-based activity. Students,

too often, lack the motivation needed to obtain meaningful learning outcomes from classroom activities, perhaps finding the topics or objectives to be irrelevant to their personal goals, current/future work, and/or personal interests. With regards to the application of case-based instruction in its traditional settings of higher education and professional educational settings, many of these issues may be underscored, as the very fact that these learners have chosen to pursue a highly domain-specific academic endeavor implies that they are probably motivated enough to engage in studying even the a less interesting topics or courses. In a later section, we will explore how case-based learning can be tailored to promote motivation in younger students as well.

Opportunities and Communities of Practice

Case-based instruction has historically been used in medical, law, and business schools as a means by which learners can gain insights into situations that they may encounter in later professional career settings. They afford an opportunity for students to obtain knowledge of the community of practice for which the eventual goal is to be an active participant.

For a medical student, the case may reflect a patient situation that illustrates how an expert in the field would strategize and make appropriate medical decisions, almost substituting for direct experience in the workplace (Zimitat, 2007). Case-based instructional activities allow learners to learn from

experts day-to-day professional experiences, as well as the less common or more difficult problems that may be encountered, making it a logical strategy for these higher education settings as “experience is a prerequisite for expertise” (Zimitat, 2007, p. 323).

It may seem like the benefits described here are not relevant to young learners who are not yet decided on a domain or field for future academic or career endeavors. I would argue that case-based instruction in earlier academic settings can still be useful, in this sense, by allowing the opportunity for students to learn from the experiences of experts and professionals in a variety of fields, and perhaps expanding upon a developing interest, or stimulating enough interest to pursue further knowledge in a particular field.

Critical Thinking Skills

Broadly stated, case-based instruction has been found to be a “more effective instructional method than conventional lecture based teaching for promoting students’ critical thinking and decision making skills” (Kim et al., 2006). Critical inquiry skills across disciplines are essential and cannot be overemphasized. Traditionally, these skills have followed a scientific analytic reasoning approach that tends to emphasize technical, statistical, measurement, and methodological issues raised often in textbooks (Bensley, 2009). Although the value of these skills is obvious, an alternative, with an emphasis on

considering information from varying perspectives and questioning assumptions, could potentially lead to the development of more strategic resources in a learner. Using cases that present sufficient and elaborate information provides opportunities for students to identify and interpret problems and situations from a variety of perspectives individually, and collaboratively, as a group, during discussion (Kim et al., 2006; Yanchar et al, 2008). The development of critical thinking in this sense may potentially lead to “greater innovation and improvement in theory,” because these skills are not available solely through the scientific analytic approach (Bensley, 2009). Many critical thinking theorists and researchers are now considering this alternative approach in addition to traditional critical thinking skills, specifically arguing for the development of dispositions such as open-mindedness and fair-mindedness as a way to “enhance intellectual productivity,” reflecting a more current position on the definition of critical thinking skills (Bensley, 2009).

Perhaps by emphasizing the alternative approach in early education, students will have already broadened their resources once they enter higher educational settings, increasing the potential for meaningful and successful academic outcomes. Promoting skills such as learning to consider information from varying perspectives and questioning assumptions could potentially be incorporated in post-secondary education. In a case-based learning format, these

skills cannot only be engaged, but may also be developed further due to the nature of this strategy of active learning.

As mentioned previously, a case-based learning approach involves a discussion format in which students are encouraged to engage in creative problem solving with guided instruction (Srinivasan et al., 2007). The nature of a small group discussion format, standard in case-based learning, could guide students toward the dispositions of open-mindedness and fair-mindedness, which could ultimately lead to the acquisition of the critical thinking skills aforementioned. Cases already present themselves with rich and sufficient content allowing the opportunity for multiple levels of analysis and interpretation (Kim et al., 2006). Cases can present multiple perspectives and voices in themselves, leading to a discussion and consideration of these perspectives in a respectful dialogue (Bensley, 2009; Kim et al., 2006). If facilitators (teachers) implement case-based instruction well, even the louder more dominating students in a discussion could be moderated accordingly. This would help to maximize the opportunity for a respectful dialogue to take place, and allow the opportunity for the critical skills, discussed above, to be promoted. Such guidance could subsequently encourage these more dominating students to listen and think more about their peers' input, and to try and incorporate a more fair and open-minded attitude. If the alternative approach to critical thinking could in fact promote innovation and enhance

productivity, the case study method would be a reasonable technique to incorporate in classroom learning.

The development and advancement of critical thinking skills is dependent on several factors, and does not always stem from traditional classroom work and assignments, such as reading an assigned text, taking notes during lecture, and completing exams (Elksnin, 2005). Case-based instructional techniques and activities supply a means within which instructors can facilitate the development of critical thinking skills in their students. Cases provide the opportunity for students to engage in solving problems and making decisions based on real life situations through active participation in their learning process (Elksnin, 2005).

The development of critical thinking skills, although compelling, relies heavily on the appropriate implementation of a case-based activity in the learning environment. Ideally, cases presented to students should be relevant, realistic, engaging, challenging, and instructional in order for beneficial outcomes to be observed in learners (Kim et al., 2006). Cases must be appropriately matched to the developmental level of the learner in order to maximize interest and motivation; otherwise the case activity may become irrelevant (Kim et al., 2006). It would not be suitable for a 10th grade Biology teacher to present a case intended for second year medical students to his/her students, and expect to observe a meaningful dialogue amongst students in the class. When cases are realistic or representative of real world problems or situations, it increases the likelihood for

learners to transfer the information learned to future problems or situations, overlapping with another benefit of this method of instruction, the ability to organize information effectively (Kim et al., 2006).

To avoid problems of oversimplification, overgeneralization, and/or lack of student involvement, cases should be made engaging with rich and adequate content on the topic being explored, as well as including multiple perspectives and angles to grant students the opportunity to engage meaningfully with the content and with one another (Kim et al, 2006). This factor seems especially central if case-based instruction were to be implemented more often with younger learners. It could make the process of exploration around multiple perspectives more natural, given students today are typically more accustomed to instructional activities that elicit only right and wrong, discrete answers. Cases, when engaging, could help younger students “think outside the box,” so to speak, when they are so often encouraged to be concrete and concise in their school work.

Studies have also revealed that cases must be challenging to students, in order to increase the likelihood for developing critical thinking skills. I would argue this particular factor would become more relevant as students gain more experience with the activities in general (Kim et al., 2006). If case-based instruction were to be used more often with young learners, it would be desirable for them slowly to increase the content difficulty, altering the structure of cases, and including cases of rare or unusual problems or situations (Kim et al., 2006).

Going back to the 10th grade Biology teacher, it may not be appropriate ever to alter cases in the ways mentioned, leaving this extent of implementing this factor at the discretion of the instructor and what he/she knows with regards to the particular students being taught.

Lastly, in order to maximize benefits to learners, the case-based instructional process should be “building upon students’ prior knowledge, assessing students’ knowledge and skills, providing specific feedback to students, and embedding various teaching aids to support student learning” (Kim et al., 2006, p. 872). Instructors can maintain this process by asking questions about previous cases studied to assess students’ current knowledge, and then presenting a new case to try and help students build upon that knowledge, increasing the possibility of them organizing information effectively. Another benefit of case-based instruction is the ability for instructors to track the progress of their students almost immediately. Feedback on students’ ideas, solutions, and questions about cases combined with the use of teaching aids are important to the instructional process if the development of critical thinking skills are to be maximized (Elksnin, 2005; Kim et al., 2006).

It may seem as if I have simply been repeating some of the factors that have been identified as central to the implementation of case-based instruction as a means to develop critical thinking skills. However, I am attempting to move the discussion to considering the use of case-based instruction outside of the

traditional settings of medical schools, law schools, and other professional educational settings. Although these factors may be essential in those environments, for younger learners, a more appropriate framework that includes stipulations for some of the factors, such as making cases challenging, might be helpful so that instructors in these settings can more readily apply them to meet the needs of their younger learners. Before discussing suggestions for implementing case-based activities with young learners; however, I will review some of the more currently used methods for promoting discussion with this age group.

Chapter 3: Case-Based Learning and Instruction in Comparison to other Discussion-Based Instructional Techniques

A central characteristic of case-based instruction is the implementation of discussion around the topic or problem being explored or presented. Research has identified a number of approaches to facilitating meaningful discussions in the classroom. The range of formats or approaches can stress a variety of learning objectives depending on the goals of the teacher, and have been shown effective in promoting high level responses to text in as early as elementary and on through high-school educational settings (Murphy et al., 2009). This section will examine some of the approaches instructors currently utilize with regard to facilitating classroom discussions and benefits that have been observed. The limitations of these approaches will be addressed, and I will conclude with the ways in which case-based learning and instruction may address many of these limitations, and reveal its advantages over the more usual methods.

Traditional Recitation Discussion (IRE)

In an effort to increase student involvement in the classroom, instructors often carry out traditional recitation discussion (Clark et al., 2003). With this method, the instructor poses a question, and explicitly calls on a student to answer. This process continues until the teacher determines that an acceptable

response has been reached, at which point he/she asks a new question. Is this really an approach to stimulating discussion? The term implies that discussion is involved, but will young learners be encouraged to start meaningful conversation on the learning topic when they are not called on and forced to provide an answer? Many researchers hold that the teacher initiation, student response, and teacher evaluation method, or IRE, is the most commonly implemented tactic used to stimulate discussion in the classroom. Many others might argue that in most cases such a discussion pattern does not stimulate discussion at all, especially with regards to young or novice learners (Clark et al., 2003). There has been a long standing concern that the IRE method may be restricting young learners from talking and thinking critically about complex issues (Clark et al., 2003). There is typically one right answer to the questions instructors raise in these situations, reducing opportunities for students to counter argue, challenge one another's statements, and express alternative points of view.

According to Kuhn (1992), theoretically, it is through argument "that we are likely to find the most significant way[s] in which higher order thinking and reasoning figure in the lives of most people" (Clark et al., 2003, p.183). However, nation-wide school assessments and research studies have consistently shown that a "majority of young and adult Americans do not have a firm grasp of argumentative discourse" and classroom approaches, like traditional recitation

discussion, are only contributing to this growing problem (Reznitskaya & Anderson, 2002, as cited by Clarke et al., 2003).

Questioning the Author and “Great Books” Discussion

Questioning the Author and the Great Books discussion format also represent two fairly common techniques that have shown some promise in increasing students’ abilities to interpret and comprehend complex texts through the use of discussion. In the Great Books method, the instructor facilitates discussion after students have completed a reading selection, while the Questioning the Author technique involves the instructor weaving in discussion throughout the reading selection, creating many opportunities for students to evaluate their own understanding and construct meaning out of what has transpired in the text. The ultimate goal of the Great Books method is to “improve students’ abilities to comprehend what they read, to encourage them to think for themselves about the meaning of an author’s words, and to develop the habit of reading literature for enjoyment,” which the instructor aims to accomplish by asking factual, interpretative, and evaluative questions about the text in a genuine and sincere manner (Dennis & Moldof, 1983 as cited in Sandora et al., p.182, 1999). The questioning format moves from activating lower level skills to more complex, higher-level reading comprehension skills, and ideally allowing students

to draw on prior knowledge and personal experiences once the instructor begins evaluative questioning (Sandora et al., 1999). It is important to note that the instructor, during discussion, is not necessarily the students' teacher; it may be a peer if the technique is implemented in a small group format. The discussion leader is encouraged to underline important selections in the text, write comments in the margins, and note any additional questions that they may have throughout their reading.

Questioning the Author is more of a constructive learning process as students are instructed to view the reading selection as open-ended and incomplete. It was initially created as a strategy to increase students' comprehension of written text in a more advanced way, rather than focusing solely on surface features of the text (Beck & McKeown, 2001). Beck & McKeown (2001) were concerned with the way instruction was focused solely on conveying straightforward factual information, rather than explaining information in such a way that students could begin connecting ideas into a coherent whole. Thus, the goal of Questioning the Author is for students to wrestle with the author's work in order to try and connect ideas and integrate them with their own prior knowledge to try and construct an understanding of the work (Beck & McKeown, 2001; Sandora et al., 1999). The instructor in this case purposely allows students to control the flow of discussion for the section being examined,

while providing guidance questions to stimulate the flow of discussion, and focusing students back on topic when necessary.

There is evidence that both of these techniques are successful at facilitating discussion, by allowing students to actively engage in meaningful conversation over the key ideas and their meaning within the grand scheme of a text. The question is whether one method is more effective at promoting higher level reading comprehension skills, such as understanding ideas in the stories, and being able to use those understandings to construct interpretations of the text (Beck et al., 1996; Criscuola, 1994 as cited in Sandora et al., 1999). Sandora et al. (1999) hypothesized that students who engaged in the Questioning the Author method would be better able to work through their ideas, because discussions are dispersed throughout a reading selection, thus increasing the frequency of understanding as opposed to students participating in the Great Books technique. Consistent with their initial hypothesis, the authors found that Questioning the Author was significantly more successful than the Great Books technique at facilitating students' comprehension and interpretation of selected texts (Sandora et al., 1999). The frequent discussions that took place throughout a reading selection seemed to benefit the students by allowing them to remain actively engaged with the different perspectives common to any reading selection: the narrator, the characters, the plot, and themselves, as the reader, rather than passively going through an entire text without frequent breaks to consider what

has transpired and hear other students' perspectives (Murphy et al., 2009; Sandora et al., 1999). These results indicate that distributed discussion may be more beneficial in helping students comprehend and interpret complex literature than traditional whole text discussion. The authors also noted that the Questioning the Author method may be particularly beneficial for lower achieving students.

Collaborative Reasoning

Another approach that has shown promise in learning settings is a method called Collaborative Reasoning. CR is intended to expand the way learners talk and think by creating a forum for children to listen to one another and think out loud, rather than promoting isolated instances of participation as traditional recitation discussion tends to allow (Clarke et al., 2003). Having consistent opportunities to engage in CR activities is assumed to allow for the formation of a developing schema or script of argumentative discourse, which in turn, should serve as a pre-cursor to higher order thinking and reasoning skills (Clarke et al., 2003).

During Collaborative Reasoning, the instructor poses a question that is intended to evoke varying points of view, so that learners are encouraged to draw on personal experiences, individual background, prior knowledge, and relevant textual information to form an opinion and/or a unique position on some issue. Once students settle on a perspective, they are encouraged to share the personal

reasoning that helped shape their particular point of view (Murphy et al., 2009). Anderson et al. (1998) found that students participating in the Collaborative Reasoning discussion method tended to engage in reasoned argumentation more frequently, challenged the opinions and thoughts of their peers more often, responded more easily to challenges from their peers, and were better able to draw upon relevant information from the base text to support their stance on an issue, as opposed to students engaging in traditional recitation discussion (Murphy et al., 2009). CR was also effective in increasing student participation, while lessening the instructor's role to allow more peer-to-peer interaction. However, it is important to note that reducing the instructor's role is not always adaptive to learning goals, and some balance needs to be reached regarding the instructor's participation, and that of the students'. Regardless, higher level reading comprehension skills such as critical thinking about text and reasoning seems enhanced when using the CR approach to classroom discussion (Murphy et al., 2009).

Collaborative reasoning has received a generally positive response from educators and students alike. However, there are some notable limitations associated with this approach for facilitating discussion, and as a means for promoting meaningful learning outcomes (Clarke et al., 2003; Murphy et al., 2009). Collaborative reasoning, in its current framework, calls for small-group discussions, and this can create problems for the instructor. Teachers may find it

difficult to divide their attention equally amongst the various groups in the classroom, increasing the potential for problems to occur. There may be some students who dominate discussion while reducing opportunities for other students to express their ideas; students may also be at risk for taking away incorrect or misguided information – because the teacher may not have overheard or been around to make corrections, and there is also the possibility of discussion groups roaming off task or going off on tangents without someone to steer them back on topic.

It is also of relevance to note that simply increasing student talk, and decreasing instructor talk, is not necessarily going to elicit academic benefits. A particular kind of talk is necessary to promote skills such as critical thinking and higher order reasoning, and this is more likely to occur if instructors are present, and aware of their facilitative role, and students are motivated and willing to participate (Clarke et al., 2003; Murphy et al., 2009).

Problem-Based Learning

Although problem-based learning activities are not commonly implemented in secondary educational settings as a method to promote discussion in the classroom, it is worthy to take note of its uses and limitations as its similarity to case-based learning methods are abundant enough to make it relevant to this review of other learning strategies based in discussion.

This discussion-based instructional strategy is intended to be used by students as a “process of discovery...to stimulate problem solving, independent learning, and teamwork,” (Srinivasan et al., 2007, p. 74). In its most common use, PBL does not call for a very active role for the facilitator, and most of the responsibilities of meaningful exploration around the problem being presented are placed on the students – whether novice or expert (Srinivasan et al., 2007). In other words, facilitators are not typically guiding the group discussion, but rather taking the backseat to the activity, and allowing students to assist one another in comments, questions, and ideas. Some researchers and instructors have referred to this method as an open-inquiry approach to learning as students are presented with a problem that they must struggle to define together, explore solutions to, and resolve as a group, again, with minimal support from the instructor (Roberts et al., 2005; Srinivasan et al., 2007).

Advocates of a PBL approach argue that this method promotes learning that will be available throughout an individual’s life time, in that, it simulates real world problem solving, encourages curiosity, promotes critical inquiry, and creates broad-based understanding of the knowledge essential to specific academic domains, like medicine (Srinivasan et al., 2007; Albanese et al., 1993). As mentioned previously, a problem based learning approach, in its traditional framework, calls for an open inquiry or “pure discovery” method to learning. Students are presented with a problem, and instructors provide little guidance, but

encourage learners to explore the issue(s) on their own (Mayer, 2006; Srinivasan et al., 2007). According to Mayer (2006), this technique of open exploration can be problematic in that it may not activate the three cognitive processes that are essential for meaningful learning to occur. In order for meaningful learning and subsequent transfer of knowledge in future activities to occur, one must be able to select relevant information, organize the selected information, and be able to integrate that organized information with prior knowledge (Mayer, 2006).

According to this model, when students engage in problem solving without guidance from more knowledgeable others, they may only be engaging in the integrative process whereby these students are searching their long term memory for ideas, but not necessarily selecting the appropriate information and organizing that selected information in a meaningful way (Mayer, 2006). The reasoning is that without any guidance or scaffolding, students are not encouraged to make sense of the to-be-learned material, which seems even more problematic for younger learners who are instructed to engage in this method of learning. In contrast, when students participate in learning activities with guidance from knowledgeable instructors, they are given enough support to prime the initial process of selecting relevant information, while still being allotted the freedom to organize and integrate information in a problem solving format that is more likely to produce meaningful learning outcomes (Mayer, 2006). Pure discovery methods have consistently been shown to be less effective in promoting problem

solving and transfer of knowledge than guided discovery methods, and perhaps even more so, for the younger learners which I am primarily interested (Mayer, 2006).

One way in which instructors can overcome these potential issues associated with a PBL approach is by merging it with case-based reasoning, which includes reasoning based on previous situations or cases. In other words, implementing a problem-based method combined with a “model of cognition [that] suggests we set up learning environments such that there are clear affordances for having the kinds of experiences one can learn from and interpreting them in productive ways” (Kolodner, 2003, p. 503). In doing so, problem based learning can still remain learner centered and inquiry oriented while providing a foundation for students to work from, rather than leaving students blindly to tackle a problem or issue without a frame of reference.

Chapter 4: Case-Based Instruction as an Alternative: Format that may be best suited for younger learners

All the techniques described above represent active learning models of instruction. In other words, they allow the opportunity for students to engage actively in their learning through asking questions, making comments, and expressing concerns, all through the use of discussion. We will now return to case-based instructional methods, and how it may be used as an alternative or in addition to, some of the more common and well-established approaches to facilitating classroom discussion.

When one considers a case-based activity, it is likely to be viewed in the format of a written case – either complete or incomplete; however, case-based activities are available in formats other than written paper cases. Web-based or web-enhanced cases are an alternative format that may be more appropriate for use with younger learners, without sacrificing the development and use of the skills and benefits associated with standard written cases.

Web-enhanced/Web-based Case Activities

Web-enhanced case-based activities allow learners to engage in authentic, contextualized learning experiences, and have been shown to be especially valuable to novice learners whose prior knowledge is less rich and complex than

more expert learners, deeming it more appropriate for elementary and secondary educational populations (Kim & Hannafin, 2008). Case-based activities in general afford the opportunity for novices to gain and refine their expertise through scaffolded interactions with expert case knowledge. This provides an apprentice-like experience during which novice learners are scaffolded using an expert's knowledge; however, web-based cases provide additional support accessible for the learner through web resources (Kim & Hannafin, 2008).

One of the drawbacks many teachers note when trying to implement discussion in the classroom is the difficulty associated with equally dividing their time to all students, as discussion techniques are often implemented in small group formats. Web-based case activities are designed so that learners are prompted throughout the process of completing a case-based activity to answer questions, interpret scenarios, brainstorm ideas, and eventually apply an idea, as a solution to the problem being presented, by collaborating via the web with their peers. The format is similar to that of Questioning the Author, in that discussion is distributed throughout the case, with the goal of helping students more easily comprehend and interpret rich complex content. Similar to other discussion based techniques described previously, students are still given the opportunity to generate and share ideas and encounter alternative perspectives, while remaining in the guidance of the program's design and live teachers, who can offer hints and resources to the learner - acting as the facilitator scaffolding the students'

learning. In essence, the program is doing the work an instructor would for each student if it were possible (Kim & Hannafin, 2008; Kolodner, 1992).

The critical role of discussion is still emphasized, if not more so, with this format, because students not only collaborate with one another throughout the process, they also share their narratives or solutions by posting their work in a public domain and participating in follow-up discussions. An added benefit to using web-based cases is that in addition to its potential for increasing higher level skills, the more collaborative aspect of web-based case activities also encourages reflection and increases the possibility of students' transferring their knowledge to other situations (Kim & Hannafin, 2008).

Instructors do not necessarily need to possess a vast knowledge of technology and computer programming to create web-based cases for their students. Templates are available for use, and are typically free of charge, allowing instructors to develop these interactive activities efficiently and appropriately tailored to their students' needs. Copyrighted templates such as, *Design A Case*, are available and have been used by medical education programs to build interactive web cases with relative ease and have been tested by educators over the years (Shokar, Bulik, & Baldwin, 2005). The template offers a sequenced series of modules that is intended to be representative of any other standard written case that would be presented to medical students (Shokar et al., 2005). Consistent with the web-based design presented earlier, students are asked

to work through the text in sections while being prompted with questions relevant to each subsection as they continue throughout the case. After each answer submission, students are presented with the instructor's answer, similar to the live feedback they would have received in a standard written case format activity. Additionally, this page will provide students with link to other relevant web resources if the student is seeking or is in need of further clarification.

As with standard written cases, students report their satisfaction with receiving immediate feedback from their instructors as they work through the web-based case (Shokar et al., 2005; Srinivisan et al., 2007). This should be encouraging to instructors and students who may be concerned that a web-based case format does not provide adequate feedback to students, because in fact, the feedback portion of web-based case activities has been reported as the most highly rated feature of the activity, in general (Shokar et al., 2005).

Case-based instruction, in its variety of formats, can be implemented for a variety of purposes including, but not limited to, knowledge acquisition, knowledge transfer, situation confrontation, problem exploration, and analysis and synthesis of skills (Zeng & Blasi, 2010). In a technologically expanding society and with the recent surfacing of more e-learning programs, cases can be portrayed in a more realistic way through web designs and can support a wide variety of learning objectives and goals that instructors aim to achieve in their teaching (Zeng & Blasi, 2010). Web-based learning environments combined with

the tools and resources that are made immediately accessible through this medium (i.e., discussion boards, live teachers, and intelligent tutoring systems) provide “rich representations of case situations and flexibility for students to work on cases at their own convenience” without sacrificing essential features of a case based instructional activity and the subsequent learning that may result (Rui & Blasi, 2010, p. 176). The use of technology, combined with the support provided through these programs, provides an alternative method of promoting benefits associated with discussion while also varying classroom activities a bit so that students may be more likely to remain interested and motivated to learn.

Chapter 5: Limitations and Conclusion

In reviewing the literature on case-based instruction and other common methods to facilitating discussion, it is apparent that discussion-based approaches in the classroom can be an effective instructional tool used to promote a variety of skills. Because discussion is a central feature of case-based instruction, it is reasonable to assume that using case-based instructional techniques may provide an alternative to some of the more common and well-established approaches to facilitating discussion in the classroom, given the flexibility of case-based activities and the variety of formats available for instructors to choose.

As I mentioned at the start of this report, in order for case-based activities to be effective and useful to learners in future situations, the learned cases need to be well articulated in the student's memory so that they can be recalled appropriately and subsequently be used to interpret new situations in terms of the recalled schema (Kolodner, 1992). Given this report's focus on the use of case-based learning with younger learners, instructors of this age group should exercise some caution when implementing a case-based activity with their students. Instructors must be aware of the academic level of the case being used, the prior knowledge of their students, and the case topic's relevancy to the overall subject and goals for the particular course. This is in order to maximize the likelihood that students will develop well articulated schemas of these cases and be able to recall

them appropriately, and in their entirety, when needed. These instructors will want to align course goals with student interests, backgrounds and experiences (Rui & Blasi, 2010). They may even have to reword or revise cases in various ways so as to make them developmentally appropriate, requiring significant knowledge and experience on the part of the instructor, as this may prove to be a delicate and complicated task (Rui & Blasi, 2010; Spiro, Feltovich, Jacobson, & Coulson, 1995).

The design of many case-based activities are founded on the basis of cognitive flexibility theory, which while emphasizing real-world problem situations and their subsequent complexities, is also mainly focused on the acquisition of advanced knowledge (Rui & Blasi, 2010; Spiro et al., 1995). In this respect, the teaching of various subject matter should include information that is presented in a variety of ways to ensure that the complexity of the topic at hand has not been underrepresented and that students are being presented with multiple perspectives in order to increase understanding by building upon knowledge (Rui & Blasi, 2010). Introducing a new topic to students and using one case to illustrate and teach to the topic will not be sufficient enough to ensure that meaningful learning will occur. Instructors would fare better if multiple cases are used, perhaps even together, along with other instructional activities to provide a more well-rounded learning experience. If instructors are cognizant of the complexity of most learning situations, even in introductory learning with

younger learners, the tendency for oversimplification of subject matter may be reduced, so that these students will not be compounding oversimplified information over time that can negatively affect meaningful learning in future higher academic settings (Spiro et al., 1995).

The argument developed throughout this report has not been intended to advocate for case-based instruction as the sole method to be used in classroom instruction. The current review presented and my hope for strategy implementation with younger learners, where this method has not typically been introduced, has been aimed at providing insight into how this particular discussion-based strategy may be used in addition to other discussion and non discussion-based techniques in early and secondary educational settings. Varying standard classroom activities with discussion-based methods like case-based instruction, and utilizing its variety of formats (web-based cases) can help students begin to learn how to identify important issues, form and share ideas for solutions to these issues, analyze information in a more advanced way, and perhaps be more interested in doing given its variation from currently used discussion-based activities.

Future research in these academic settings should give special attention to the uses and benefits of incorporating this method into earlier curricula. I have proposed web-based cases as being most appropriate for younger learners given the opportunity for instructors to incorporate a variety of supportive resources and

materials into these activities, based on the developmental level and prior knowledge base of their students. However, it may be found that more experienced teachers can provide the same support to all of their students using the standard text-based classroom discussion format. Educators and researchers should consider the various formats available to facilitate case-based instruction more closely for this age group, and actively search for possible problems, complications, and benefits with regards to the use of the different formats available. The potential academic benefits available to students by putting case based instruction into practice within earlier academic settings are substantial, but more insight into its practical application needs to be made available so that meaningful learning outcomes can be maximized for all students.

References

- Albanese, M. A., & Mitchell, S. (1993). Problem-based learning: A review of literature on its outcomes and implementation issues. *Academic Medicine*, 68(1), 52-81.
- Beck, I. L., & McKeown, M. G. (2001). Inviting students into the pursuit of meaning. *Educational Psychology Review*, 13, 225-241.
- Bensley, D. (2009). Thinking critically about critical thinking approaches: Comment on Yancher, Slife, and Warne (2008). *Review of General Psychology*, 13(3), 275-277.
- Clark, A., Anderson, R., Kuo, L., Kim, I., Archodidou, A., & Nguyen-Jahiel, K. (2003). Collaborative Reasoning: Expanding ways for children to talk and think in xSchool. *Educational Psychology Review*, 15(2), 181-198.
- Elksnin, L. (2005). Using case to improve the critical thinking skills of prospective teachers. *Inquiry: Critical thinking across the disciplines*, 24(3), 5-15. <http://search.ebscohost.com.ezproxy.lib.utexas.edu>.
- Gayford, C. (1995). Science education and sustainability: A case-study in

discussion-based learning. *Research in Science & Technological Education*, 13(2), 135-145.

Jonassen, D. H., & Land, S. M. (2000). *Theoretical foundations of learning environments*. Mahwah, N.J: Lawrence Erlbaum Associates Inc. Publishers.

Kim, H., & Hannafin, M. (2009). Grounded design of web-enhanced case-based activity. *Educational Technology Research and Development*, 56(2), 161-179.

Kim, S., Phillips, W., Pinsky, L., Brock, D., Phillips, K., & Keary, J. (2006). A conceptual framework for developing teaching cases: a review and synthesis of the literature across disciplines. *Medical Education*, 40(9), 867-876.

Kolodner, J. L. (1992). An introduction to case-based reasoning. *Artificial Intelligence Review*, 6(1), 3-34.

Koldner, J. L., Camp, P. J., Crismond, D., Fasse, B., Gray, J., Holbrook, J., Puntambekar, S., & Ryan, M. (2003). Problem-based learning meets case-based reasoning in the middle-school science classroom: putting learning by design™ into practice. *The Journal of the Learning Sciences*, 12(4), 395-547.

Kolodner, J. L., Owensby, J. N., & Guzdial, M. (2004). Case-Based Learning Aids. In D. H. Jonassen, (Ed.), *Handbook of Research on Educational Communications and Technology* (2nd ed.; pp. 829-861). Mahwah, NJ: Erlbaum.

Mayer, R. E., & Wittrock, M. C. (2006). Problem Solving. In P. A. Alexander, P. H. Winne, (Eds.), *Handbook of educational psychology* (pp. 287-303). Mahwah, NJ: Erlbaum.

Mayo, J. A. (2004). Using case-based instruction to bridge the gap between theory and practice in psychology of adjustment. *Journal of Constructivist Psychology*, 17(2), 137-146.

Murphy, P. K., Wilkinson, I. G., Soter, A. O., Hennessey, M. N., &

Alexander, J. F. (2009). Examining the effects of classroom discussion on students' comprehension of text: A meta-analysis. *Journal of Educational Psychology, 101*(3), 740-764.

Roberts, C., Lawson, M., Newble, D., Self, A., & Chan, P. (2005). The introduction of large class problem-based learning into an undergraduate medical curriculum: An evaluation. *Med Tech, 27*, 52-53.

Rui, Z., & Blasi, L. (2010). Learning through web-based multistoryline case studies: A design-based research. *Quarterly Review of Distance Education, 11*(3), 175-182.

Sandora, C., Beck, I., & McKeown, M. (1999). A comparison of two discussion strategies on students' comprehension and interpretation of complex literature. *Reading Psychology, 20*(3), 177-212.

Shokar, G. S., Bulik, R. J., & Baldwin, C. D. (2005). Student perspectives on the integration of interactive web-based cases into a family medicine clerkship. *Teaching and Learning in Medicine, 17*(1), 74-79.

Spiro, R. J., Feltovich, P. J., Jacobson, M. J., & Coulson, R. L. (1995). Cognitive

flexibility, constructivism, and hypertext: Random access instruction for advanced knowledge acquisition in ill-structured domains. In L. P. Steffe, J. Gale, (Eds.), *Constructivism in education* (pp. 85-107). Hillsdale, NJ: Erlbaum.

Srinivisan, M., Wilkies, M., Stevenson, F., Nguyen, T., & Slavin, S. (2007).

Comparing problem-based learning with case-based learning: Effects of a major curricular shift at two institutions. *Academic Medicine*, 82(1), 74-82.

Thomas, M., O'Connor, F. W., Albert, M. L., Boutain, D., & Brandt, P. A. (2001).

Case-based teaching and learning experiences. *Issues in Mental Health Nursing*, 22(5), 517-531.

Wilson, B.G. (1996). *Constructivist learning environments: Case studies in instructional design*. Englewood Cliffs, NJ: Educational Technology Publications, Inc.

Yanchar, S., Slife, B., & Warne, R. (2008). Critical thinking as disciplinary practice. *Review of General Psychology*, 12(3), 265-281.

Zimitat, C. (2007). Capturing community of practice knowledge for student learning. *Innovations in Education and Teaching International*, 44(3), 321-330.