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Using Mindtools to build information literacy and promote critical thinking

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Using Mindtools to build information literacy and promote critical thinking

Abstract

Information literacy is a skill that students need to handle the overwhelming amount of information. Using Mindtools can provide teachers with a way to help students use the information literacy skills. Mindtools are used to allow students to learn through the use of technology, not from technology. By giving students opportunities to use these skills, they will be able to think critically and independently about the information they access. As a result of focusing on information literacy and critical thinking, students will increase proficiency in locating, evaluating, synthesizing, and applying new information. The importance of this review is to determine how to use Mindtools to build information literacy. The most important findings are that Mindtools can be used to give students the tools that they need to independently plan for organizing and representing what they know.

USING MINDTOOLS TO BUILD INFORMATION LITERACY AND
PROMOTE CRITICAL THINKING

A Graduate Review
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by
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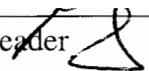
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Abstract

Information literacy is a skill that students need to handle the overwhelming amount of information. Using Mindtools can provide teachers with a way to help students use the information literacy skills. Mindtools are used to allow students to learn through the use of technology, not from technology. By giving students opportunities to use these skills, they will be able to think critically and independently about the information they access. As a result of focusing on information literacy and critical thinking, students will increase proficiency in locating, evaluating, synthesizing, and applying new information. The importance of this review is to determine how to use Mindtools to build information literacy. The most important findings are that Mindtools can be used to give students the tools that they need to independently plan for organizing and representing what they know.

Introduction

In the past few years, information literacy has gained attention throughout the curriculum in schools across the country, whereas in the past information literacy was only the concern of the media specialist. Due to the vast amount of information that is currently available it is necessary for all teachers to be aware of the importance of information literacy. Teachers need to consider what the implications of information literacy are in the classroom and how they should prepare students to handle the influx of information. One way that teachers can prepare students to handle the overwhelming amount of information is through the use of Mindtools. The use of Mindtools can help build the understanding of literacy and promote critical thinking that is required for students to comprehend the excess of information that is available today.

This literature review supports the use of Mindtools to promote information literacy and critical thinking. In order for Mindtools to be accepted, teachers have to understand what Mindtools, information literacy, and critical thinking are and then develop plans for incorporating this use of technology into the curriculum. This literature review provides definitions of Mindtools, information literacy and critical thinking. The review also explores Mindtools and describes how they can lead to developing students' critical thinking skills in regards to locating, evaluating, synthesizing, and applying information. In addition this literature review gives examples of how Mindtools can promote information literacy and critical thinking skills, and provides ideas of how teachers can apply the concept of Mindtools into the curriculum.

The importance of this review is to cite specific research that deals with the use of Mindtools to promote information literacy and to support the rationale of combining

technology with literacy. With the amount of information available online, students and teachers need to work together to create an environment in which students can navigate through the chaos of the Internet and critically analyze information to find the facts they need in a short amount of time. The key to the success of this process is that students are actively involved in defining search strings and creating keywords to combine and carry out the search strategy that they have created. By allowing students to be at the center of this process they are learning as they proceed. This should aid in retaining student's interest in locating information through the use of technology. This is an essential topic because information literacy is the integration of literacy and technology in an important way- using the information found through the use of media thoughtfully.

Definitions

Before beginning to investigate this topic, the following terms need to be defined: Mindtools, Semantic Networks, Databases, Information Literacy, and critical thinking.

Mindtools. Jonassen (2000) defined Mindtools as “computer applications that require students to think in meaningful ways in order to use the application to represent what they know” (p.4). This means that the user has to “work *with* the computer” (p.4). When students are engaged in learning with computers, they “function as interpreters, organizers, and designers of their personal knowledge” (Jonassen & Carr, n.d., para. 2). There are a variety of Mindtools that Jonassen (2000) described in detail in his book, *Computers as Mindtools for Schools: Engaging Critical Thinking*. He stated that too often students are allowed to search the World Wide Web without any thought being put into planning and using proper search strategies. Educators need to increase the use of the World Wide Web to support learning by meeting the two criteria set out by Jonassen. The criteria for using the WWW to support learning are to “articulate an information

need and intentionally searching the web to fulfill that need” (p. 176). Mindtools that will best help build information literacy are what he refers to as “semantic organization tools” (p.33).

Semantic networks. Semantic networks require “learners to analyze the underlying structure of the ideas they are studying” (Jonassen, 2000, p. 60). Concept maps are made up of nodes and links. Nodes are used to signify ideas or concepts. Links are used to signify the relationship between the ideas or concepts (Anderson-Inman & Horney, 1997). For example, prior to searching the web, students must consider the focus of their topic, brainstorm ideas, and use a concept mapping software such as Inspiration[®] to organize their ideas prior to actually searching the Internet. Inspiration[®] was “founded in 1982 by Donald Helfgott and Mona Westhaver with a focus on business software products” (Inspiration Software, Inc., 2003, para. 11). Beginning in 1987, they began developing software that focused on “brainstorming, thinking, and organizing” (para. 12). Currently, the software is used to support visual thinking and learning. The Inspiration Software, Inc. website stated that “[v]isual learning techniques - graphical ways of working with ideas and presenting information - teach students to clarify their thinking, and to process, organize, and prioritize new information. Visual diagrams reveal patterns, interrelationships, and interdependencies” (para. 5).

Databases. Databases are useful to “integrate and interrelate content ideas” (Jonassen, 2000, p. 38). Students can use the information they have located and build a database to help them organize and store information. Databases are made up of records which contain information for a single unit. Records contain various fields which help to define the individual units. Using Mindtools allows students to quickly and easily add

information into fields, create records and update concepts included in the database as they acquire new information.

Information literacy. Information literacy is different from print literacy. Traditional print literacy focused on reading words across a page from right to left and top to bottom. Current literacy skills involve reading articles online. These online articles contain hyperlinks in the text that readers must decide whether or not to follow. In addition to reading online, information literacy skills are necessary. Information literacy is defined as “[t]he ability to access and use information, analyze content, work with ideas, synthesize thought, and communicate results” (Holum & Gahala, 2001, para. 3). Information literacy is a skill that students and teachers need to use in order to make sense of the world in the Information Age. Carr (1998) stated that, “If teachers are to use information so that others can learn from them, then teachers must be information literate” (para.1). Educators need to stay current as the skills of information literacy will not remain static. As new sources of information are developed, information literacy skills will continue to be shaped and changed.

In today's digital world, ...technology has contributed to an expanded understanding of literacy. Besides having basic literacy skills, today's students also need technology skills for communicating, investigating, accessing and using information, computing, thinking critically about messages inherent in new media, and understanding and evaluating data. (Holum & Gahala, 2001, para. 3)

Teachers need to help students realize that anyone can post anything on the Internet and make the information seem believable. They should assist students in the understanding that information needs to be evaluated critically. At the current time,

information is presented in a non-linear fashion, while traditional literacy has usually followed a linear fashion.

Critical thinking. Critical thinking is defined as “a mental activity of evaluating arguments or propositions and making judgments that can guide the development of beliefs and taking action” (Astleitner, 2002, para.1). Jonassen (2000) provided a definition that is more focused. He stated that critical thinking involves three skills: evaluating, analyzing, and connecting. He further defined evaluating as “making judgments about something by measuring it against a standard” (Jonassen, 2000, p.27). Jonassen defined analyzing as “separating a whole entity into its meaningful parts and understanding the interrelationships among those parts” (p.27). Finally, Jonassen defined connecting as “determining or imposing relationships between the wholes that are being analyzed” (p.28). These are skills the learner needs to have as they become literate at using information accessed through technology.

Methodology

Electronic databases were used to locate journal articles that dealt with information literacy, critical thinking, and Mindtools. Articles that dealt with specific Mindtools such as concept maps (semantic networks) and databases were also utilized. ERIC, E*Subscribe, Education Full Text, and Expanded Academic ASAP were accessed through the Rod Library website at the University of Northern Iowa. The Wilson Web OmniFile Full Text database and the BigChalk eLibrary database were accessed through the Nebraska Library Commission website. Access to the EBSCOhost database was provided by Area Education Agency 13 in conjunction with a local school district. The North Central Regional Educational Laboratory (NCREL) was also used to locate

pertinent sources. The ERIC Clearinghouse on Information and Technology was also used.

The method used to select sources was to search for keywords and limit searches based on date, peer reviewed journal, and full text. Most of the searches were for articles that were written after 1997. This returned pertinent articles that contained current information that would not be outdated. By limiting searches to peer reviewed journals, the author was able to locate only relevant articles that had been read, scrutinized and approved by experts in the field. This way the information was coming from credible sources. Searches were also limited to full text so that the full article was available to be read.

The keywords that were chosen to limit searches included: information literacy, Mindtools, critical thinking, David Jonassen, Alan November, Jamie McKenzie, Lynne Anderson-Inman, concept maps, databases, Internet research, technology, curriculum, technology integration strategies, Internet, and Online Searching. Boolean logic was used to combine keywords to limit the number of returned search results.

The ERIC Database was used because changes were allowed in the search limits. On some of the searches limits were changed to publication year greater than 1997, ERIC journals, and ERIC documents. This decreased the number of records that were returned because the records had to match the criteria set by the search limits. The author searched for “mindtools” and returned eight results. The author browsed abstracts to quickly identify if the article fit the topic. Only one article was selected as a resource for this literature review. “Critical thinking” returned 9617 results which were too many to skim through and as a result was combined with “concept maps.” When combined, three

results were returned; of which only one was used as a reference. A search for “Jonassen, David” limited to publication year greater than 1997 returned twenty-one results; of which one article was used. The article used was the same as located by searching for “mindtools”. Searching for “Jamie McKenzie” returned twelve results of which one was included in this literature review as a reference. Searching for “information literacy” returned 607 results which was too cumbersome to skim through so the author added the keyword “databases” to limit the search more. The combined keyword search returned twenty-two results; one was used as a reference.

The Educational Full Text Database was used because the database allowed multiple changes in search limits. On some of the searches limits were changed to publication year greater than 1997, records with full text, and peer reviewed journals. This decreased the number of records that were returned because the records had to match the criteria set by the search limits. A search for “concept maps” returned thirty-one results. Of the thirty-one results, two were used as references. Using the terms “integrating technology” and “curriculum development” returned eleven search results. Only one search result was used as a reference for this literature review.

The Wilson Web OmniFile Full Text Database was used because the database allows multiple changes in search limits. Searches could be limited to full text, page image, and peer reviewed as well as by publication type, physical description, subject area, and date. Results could be sorted by date, relevance or customized. This decreased the number of records that were returned because the records had to match the criteria set by the search limits. Using the terms “information literacy” and “online searching” produced ninety-one search results. The 14th result was used as a reference. The author

searched for “critical thinking” and returned 6224 results. By combining “critical thinking” with the keyword “Internet,” 733 search results were returned, however because the author sorted the results by relevance the second search result was used as a reference. “Semantic networking” limited the search to ten results; one was used as a reference for this literature review. Searching for “concept maps” and “Anderson-Inman” produced 13 results; of the 13, one was used as a reference.

The EBSCOhost Database was used because searches were allowed within multiple databases. The databases that were searched were the Professional Development Collection, Academic Search Elite, MasterFILE Premier, TOPICsearch. All of the databases contain different types of sources ranging from journals, articles, periodicals, reference books, primary sources, and biographies. For example, the Professional Development Collection provides over 300 peer-reviewed titles which are part of 500 full text journals. On some of the searches limits were changed to records with full text. This decreased the number of records that were returned because the records had to match the criteria set by the search limits. The author searched for “concept maps” and returned 67 results. The results are returned in order of relevancy. By adding the term “information literacy” no results were given. The author then searched for “concept maps and literacy” and returned sixty results, however the first search result matched the search string with 100% accuracy and was subsequently used as a reference.

Analysis and Discussion

Information Literacy

Information literacy has been a focus of library programs since the late 1980s (ERIC Digest, 1994). The need exists for information literacy to be accepted and

integrated into the school curriculum. "Information literacy...equips individuals to take advantage of the opportunities inherent in the global information society. Information literacy should be a part of every student's educational experience..." (Association of Supervision and Curriculum Development, cited in American Association of School Librarians, n.d., para. 4). However, many in education have not recognized the implications for student learning.

The need increases for educators to teach students skills to find pertinent information available online as the amount of information available continues to grow. Students need to be taught the skills of searching, locating, evaluating, synthesizing and applying information (Salpeter, 2003; McKenzie, 1998; Orr and Fankhauser, 1996). Students need to become competent at being able to access information on the Internet, to make meaning from the information, to comprehend what they read, and to put the information together with prior knowledge to form new knowledge. "...[T]he process of accessing, evaluating, and using information is integral to understanding content." (Carr, 1998, para. 4). If students understand and use these skills they will have the ability to teach themselves how to learn (Carr, 1998). The capability to use information literacy skills will allow students to "know how to learn because they know how knowledge is organized, how to find information, and how to use information in such a way that others can learn from them" (Carr, 1998, para. 1).

Information literacy skills should not be taught in isolation, but are better suited for integration into the content areas (Plotnick, 1999). Students must be given many opportunities to use these skills so they can continue to use them outside of school and in the future workplace. "In this next century, an 'educated' graduate will no longer be

defined as one who has absorbed a certain body of factual information, but as one who knows how to find, evaluate, and apply needed information" (Breivik & Senn, 1998, cited in Plotnick, 1999).

Information literacy includes knowing how and when to search for different topics. Students need to know how to both broaden the search to turn up additional search results if only a few can be found and also how to narrow the search if too many results are displayed (Salpeter, 2003; Eagleton & Guinee, 2002; Brem & Boyes, 2000). For example, when searching for websites about the American Revolutionary War, students would need to type in "American Revolutionary War" instead of "war" or "Francis Marion." By typing in "American Revolutionary War" the student has narrowed the search and will most likely find pertinent information in the first few sites that are returned. "War" would present too broad of coverage and the student could get lost sifting through the amount of information returned. "Francis Marion" would present too narrow of a focus if the student were searching for an overview of the American Revolutionary War. A student may know Francis Marion if they had a background knowledge of the Revolutionary War. They would know that Francis Marion was known as the Swamp Fox for his use of guerilla warfare to launch surprise attacks on the British in the south. While not an excellent choice for locating information about the Revolutionary War, a student may need to search for "Francis Marion" if they had to locate facts about an influential person during the American Revolutionary War. Students need to recognize the importance of being specific when searching. Depending on the student's needs, the student should start their search as narrow as possible (Dodge, 2003). Students need to recognize what keywords are going to be most beneficial when

searching. They should devise search strings that are based on their individual information needs so that they can be successful at locating information quickly.

Students must also be taught how to limit searches using Boolean logic. Boolean logic uses the phrases AND, OR, and NOT. These are not used universally. Each search engine or directory uses different logic when limiting searches. Currently most websites support pluses, minuses and quotation marks as a way to limit search results. For example, to search for “Francis Marion,” the student could enter “Francis Marion + Swamp Fox” which would locate websites with all of these terms included. Using search strategies such as this requires students to possess background knowledge of the topic or using the strategies will not be productive. If the student does not possess knowledge that Francis Marion was known as the Swamp Fox, this search will not work. Another example would be searching for Francis Marion and finding information about Francis Marion University, Francis Marion and Sumter National Forest, or the Francis Marion Hotel, which are not pertinent to the search. The student could limit this search by entering “Francis Marion - University - Forest - Hotel”. This search would find pages without the terms “University,” “Forest,” or “Hotel.” To search for web pages that contain only the phrase Francis Marion, the Swamp Fox, the student would use quotation marks around the phrase “Francis Marion, the Swamp Fox.” The results would contain only web pages that contained this exact phrase.

Using different search engines or directories will turn up different results for students. Eagleton & Guinee (2002) explained the difference between Google, a search engine, and Yahoo, a directory. Google is a search engine that matches the text that you are searching for to websites that contain that text. Yahoo is a directory that has staff

members sort websites into categories. Yahoo also allows the student to enter keywords, but the number of results that would come back from Yahoo would be much smaller than Google.

Students need to know that information can contain bias or misinformation because anyone can post anything on the Internet. Students need to be taught how to evaluate information to make sure the information that they find is valid. One way to determine whether or not a site is credible is to find out as much as possible about who created the site. In some cases, students may have to look very hard to find out any information about the author of a website. In other instances, the information may be out of date. In these cases, students have to be concerned that information they have located may not be current or correct.

Once students find and evaluate the information, they need to be able to arrange and synthesize the information so that new knowledge is created. Almost as important as having students create new knowledge is the duty of educators to make sure that students are taught the significance of giving credit to the sources that they have used. They need to properly cite the sources they use so that they are not guilty of plagiarism, which is becoming more prevalent (Plagiarism.org, 2002). Plagiarism is on the rise because students can quickly and easily copy and paste information without any thought as to consequences for their actions. To combat copying and pasting educators need to ask questions that require students to use the information to create a unique situation or solve a problem.

Roblyer (1998) stated that much has been written about having students locate information on the Internet and that educators need to become aware of the fact that

students lack the knowledge or experience of using the information after they have located their sources. Roblyer (1998) concluded that students have difficulty using the information literacy skills of “synthesizing information and using it to generate meaningful products” (para.1). Developing a curriculum that allows students opportunities to locate and evaluate information and then synthesize the new information that they have gathered into a product that they can use to demonstrate their knowledge will help to lessen the difficulty that students have with synthesizing information. The problem exists because students have not been given the opportunity or have not been expected to be active participants in their own education.

Information literacy is a necessity in today’s education. “Knowing how to ask the right questions may be the single most important step in learning.” (ERIC Digest, 1994, para. 13). Educators need to change the curriculum so that students are given more control about asking questions and locating information that will help them answer these questions. Too often students are expected to be passive receivers of education instead of being allowed investigate their natural curiosities about the world.

One way educators can begin to give students more control over asking questions and locating information is to use Mindtools. Students can use Mindtools to help organize their thinking and develop relationships between prior knowledge and new information. Semantic networking is a Mindtool that would allow students to play an active role in determining how they process information.

Use of semantic networking (concept maps) is an example of providing students with more freedom to become active learners. Semantic networking (concept maps) allows students to represent “concepts and relationships in a graphical form” (Anderson-

Inman & Ditson, 1999, para.1). Using Mindtools allows the learners to be responsible for deciding “how to organize and represent their knowledge” (Jonassen, n.d.) as opposed to having teachers tell the student exactly what to include and the specific format or structure that they want the information presented in. Each concept map that is created will have some differences because the student is allowed to represent their knowledge so that the information makes sense to them.

Pre-Search

Prior to searching the web for information about a specific topic, Novak (n.d.); Anderson-Inman & Ditson (1999); McKenzie (1998); and Plotnick (2001) recommend using concept mapping software to have students begin by brainstorming ideas about the topic that they will be searching. They can use concept mapping software to record their brainstorming. Robertson (2000) had students use Inspiration® which allowed students to “shape, move, link, draw, connect, arrange and rearrange the individual concepts and ideas” (Software section, para. 2). The brainstorming strategy created by the Ditson, Kessler, Anderson-Inman, & Mafit (1996) consists of three steps: (a) “gather ideas,” (b) “reorganize results,” (c) “explore and expand the concepts” (p. 21). The students should record the topic in the main idea node. Inspiration® has a RapidFire tool that will allow the students to record information quickly which will aid in speeding up the brainstorming process (Watts, 2002; Ditson, et al, 1996). When using RapidFire, students begin gathering ideas. This process entails simply recording as many words, phrases, or ideas that the learner can about the topic. Using a concept map allows the student to record their prior knowledge of the topic and formulate keywords or phrases that they will use as they search the Internet. These keywords are represented by the nodes that the

student creates. By using Inspiration®, students can reorganize results easily. They can move generated words and ideas into groups that have similar characteristics. After they have grouped the ideas and words, they can explore and expand the concepts. In this step students make links between similar ideas and the main idea. As they analyze their map, they can rearrange the concept map easily to make connections between nodes. At this point the student should label the links because the labels tell the learner the relationship between each idea. The benefit to this is that students organize their ideas prior to actually searching the Internet. McKenzie (1998) stated that using pre-search strategies “can save a huge amount of time and can speed one toward information that is pertinent and helpful” (para.5). The benefit of using concept mapping software, such as Inspiration® is that students can “define the relationships that exist in their knowledge structure” (Robertson, 2000, para. 2).

Novak (n.d.) stated that using concept maps “makes instruction ‘conceptually transparent’ to students” (para. 2). The students can look at the map and visually see how the knowledge that they have represented is interrelated. They can then use concept maps as tools that can help keep the students focused as they begin to search for topics on the Internet. The students still need to have an understanding of how keywords work and how to use simple strategies to help search engines better locate information that is related to the students’ topics (Eagleton & Guinee, 2002). Ditson, Kessler, Anderson-Inman, and Mafit (1996) recommended using concept mapping for “concept formation tracking” (p. 82). While searching and locating sources, students can add to the concept map which represents their change in knowledge (Anderson-Inman & Ditson, 1999) and demonstrates that learning is an ongoing process (Orr and Fankhauser, 1996). As they

search the Internet, students can also create new links and nodes to the previously created nodes. These new links and nodes represent the students newly created knowledge. The new nodes can include notes that will allow the students to record citations so the student can easily locate that source again (Watts, 2002).

Locate and Evaluate Sources

As students locate Internet sources, they may want to record potential sources in a database that includes citation information such as title, author, date, URL, key words and a brief description of the information found there (Orr and Fankhauser, 1996; McKenzie, 1998). This way they can organize potential sources and then revisit the database to organize the sources. After they have identified sources they can sort the database and organize the resources by keywords used or date of publication. Jakes, Pennington, and Knodle (2002) recommended having students cross check references to compare the similar resources for similarities in content and look for differences in material presented. By cross checking references, students can evaluate the information for reliability. Using a database to store sources found on the web will allow the students to begin to analyze and evaluate the sources they have found. The sources that have been located need to be checked for “applicability, authority and reliability” (Jakes, Pennington, & Knodle, 2002 in Salpeter, 2003, p.34). The need for students to evaluate information and sources of information will continue to grow as the amount of information continues to expand as well. Leu (1999) acknowledged that there is a need to teach students how to “critically comprehend and challenge information they encounter through careful analysis of Web pages and Web links” (in Labbo, 2001). The skill of evaluating information and sources of information will improve if students are given numerous opportunities to use the skill.

Synthesize

After the sources of information have been analyzed and evaluated, the student can then set out to use these sources of information to create their understanding of the topic that they have been searching. Anderson-Inman, Horney, Knox-Quinn, Ditson, and Ditson (1997) recommended using concept maps to “synthesize information from multiple sources.” (cited in Anderson-Inman & Ditson, 1999, para. 2). Students would use the sources they have gathered and enter one new idea or fact into the concept map that they have created. After they have entered all of the ideas or facts, they would begin to look for correlations or relationships among the new topics and then connect these nodes with links.

Apply

After completing the map the student should then reflect on their concept map and use the new knowledge that they have gained to start putting together their paper, multimedia project, website or other means of transmitting new knowledge to the intended audience.

The people who learn the most from designing instructional materials are the designers, not the learners for whom the materials are intended. The process of articulating what we know in order to construct a knowledge base forces learners to reflect on what they are studying in new and meaningful ways.

(Jonassen, Carr, & Yueh, 1998, p. 30)

Using multimedia projects to demonstrate new knowledge is also a form of using Mindtools. Students have to make decisions about the best way to represent the new knowledge that they have gained such as how the information should be presented.

Jonassen, Carr, and Yueh (1998) stated that “[w]hile they are thinking harder, learners are also thinking more meaningfully as they construct their own realities by designing their own knowledge bases” (p. 31).

In order to help students build information literacy skills educators need to make sure that technology tools that are used are “not the focus of the instruction, but are embedded in the facilitation of the learning process” (Robertson, 2000, Conclusion section). By using technology as a tool, students realize that learning is the primary objective and that the technology is available to make the process quicker and easier. Educators need to help students see the importance of not getting caught up in the technology itself. If the students were to focus solely on using the technology and fail to recognize the learning that takes place then the student is not benefiting from using technology in education.

Conclusions and Recommendations

Educators can no longer neglect to teach our children how to find, access, and evaluate information. These skills are important because society is becoming more reliant on the wealth of information available with a keystroke. Education needs to shift from teaching facts, to students constructing their own meaning and being responsible for their own learning. Educators need to provide students with opportunities to find and use information and to synthesize it into useful knowledge. If educators can create an environment that allows for students to be actively engaged, students will become more responsible for their own learning. By using Mindtools, educators may be able to assist students to becoming more capable users of information.

The use of Mindtools give the students the tools they need to plan for organizing and representing what they know. By planning before they search the Internet, they will be able to limit the number of results they get as they search. This is just the first step to helping students become information literate. Educators also have to allow the students multiple opportunities to use the information they retrieve and give them tools necessary to analyze and evaluate the sources and synthesize the information so that they can make their own meaning. By giving students many opportunities to use these skills, over time they will be able to think critically and independently about information that they access on the Internet.

The author believes that the vision of teaching and learning should be focused on teaching students how to learn on their own. Educators can not assume that students have been exposed to these skills in the past and are therefore proficient at thinking critically about information they find on the Internet. Immediately teachers should plan on having the students use Inspiration ® prior to searching. This brainstorming will allow the students to slow down and think through what exactly they are looking for. This “intentionality” (Jonassen, 2000, p. 177) will stop the students from getting caught up in information overload and will help them be able to maneuver deliberately through the magnitude of information that is present. When searching the Internet, teachers will model thought processes by doing think-alouds, in which the students will be told exactly why irrelevant web sites are skipped over when searching for information. After modeling teachers will allow the students to make the decisions to give them ownership of the search.

The author recommends providing teachers with training dealing with the importance of information literacy and how Mindtools can aid in the building the skills necessary for students to be proficient at locating, evaluating, synthesizing and applying facts and information into something that demonstrates their comprehension of the topic. Teachers need to see the benefit of information literacy and become comfortable using technology to build information literacy. If teachers fail to see the benefit in using Mindtools to build information literacy and promote critical thinking, then they will not persist in providing students with opportunities to develop these skills. The skills of information literacy and critical thinking cannot be taught in a classroom.

Students must develop these skills in an environment that fosters active engagement in the learning process. Students cannot become information literate if they are only passive receivers of information that is given by the teacher. Students must have occasions where they are allowed to be curious and try to find answers to questions that they may find interesting or intriguing. By providing students with chances to answer questions that they are curious about school becomes more meaningful because they have some say in what they are responsible for learning.

Information literacy allows for some responsibility for learning to be given to the students; however this does not mean that the role of the teacher becomes any less important. The teachers' role is not diminished, but fundamentally changed. Instead of being in charge of dispensing information that the teacher hopes all students will learn, the teacher must guide the students thinking and steer them towards an understanding that takes into consideration multiple perspectives so that the student has to examine not only

the topic but also has to challenge their ideas and beliefs about the world that surrounds them.

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