Integrating Information Literacy Instruction into a High School Science Classroom

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Abstract

Twelve pairs of eleventh and twelfth grade anatomy and physiology students enrolled in a Midwest school participated in this study. The purpose of the study was to determine whether integrating information literacy instruction into a high school science class improved students’ ability to select credible information sources. The instruments used to collect data included a pre-assessment and a sub-score for research accuracy from a research project produced by the students. The data from this research study suggested that integrating information literacy instruction resulted in an increase in student’s ability to select credible information sources.
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Chapter I: Introduction

As the newly hired school library media specialist and a graduate student in science education, the intern wanted an action research project that would combine science education with my new role as the library media specialist. A project involving information literacy met this objective. According to Leu, Leu, and Coiro (2004), information literacy skills were beneficial in science education to access and use the science content on the Internet and to develop scientific thinking skills. Not only did information literacy benefit science education, it also improved academic achievement and prepared students for higher education, a technology rich work place, and everyday information needs (ACRL, 2000; Allen, 2007; Conley, 2005; Riedling, 2007). After reading about the benefits of information literacy in science education, the intern wanted to determine if the positive results described by the professional literature might be duplicated in her classroom.

Statement of Problem

The purpose of this project was to determine if the implementation of an instructional unit on information literacy skills improved students’ ability to select credible information sources in a high school science classroom.

The research questions were:

1. How did the professional literature define information literacy?

2. According to the professional literature, what were the benefits of information literacy skills?

3. In the professional literature, how were information literacy skills taught in the high school science classroom?
4. Did students’ ability to select credible information sources improve after the implementation of an instructional unit on information literacy skills in the high school anatomy and physiology classroom?

Justification

The intern was interested in determining if the implementation of an instructional unit on information literacy skills improved the students’ ability to select credible information sources in a high school anatomy and physiology classroom. This topic was of specific importance to the intern because the intern wanted to assess the information literacy skills of high school students in the school district where she was recently employed. Additionally, a review of the professional literature indicated teaching information literacy skills improved the research skills of young scientists (Leu, Leu, & Coiro, 2004; Klosterman & Sadler, 2008). By implementing an instructional unit on information literacy skills, the intern hoped to demonstrate to other science educators that teaching information literacy skills improved the students’ ability to select credible information sources when conducting research.

Definition of Terms

- Information Literacy: “...understanding how to access and use information...” (American Association of School Librarians & Association for Educational Communications and Technology, 1998, p. vii)

- Credible information source: a trustworthy source of information.

- High School Science: life science education in grades 9 through 12.

- Anatomy and Physiology class: a life science education class that studies the structure and function of the human body.
• Instructional Unit: a unit of study related to one topic including lesson plans, activities, and assessment.

Limitations

There were several limitations that may have affected the results of this project. The intern implemented the study in one anatomy and physiology class with students from the eleventh and twelfth grades which limited the sample size. The research was conducted in a small rural school district in a Midwestern state with students of similar age, racial, and economic background. Additionally, the intern completed the project in a four week period during the second semester of the school year. Results of the study may have varied if the study was conducted over a longer period of time. Furthermore, the intern was a pre-service student teacher with experience teaching information literacy skills to college freshmen but limited teaching experience in a high school setting; results may have differed if the study was conducted by a teacher with more experience. Because of the stated limitations, the results may not be generalized to other school populations.
Chapter II: Review of Literature

Introduction

The purpose of this project was to determine if the implementation of an instructional unit on information literacy skills improved students’ ability to select credible information sources in a high school science classroom. Four research questions were asked when constructing the project: 1) How did the professional literature define information literacy?; 2) According to the professional literature, what were the benefits of information literacy skills?; 3) In the professional literature, how were information literacy skills implemented in the high school science classroom?; 4) Did students’ ability to select credible information sources improve after the implementation of an instructional unit on information literacy skills in the high school science classroom?

Research Question 1: How did the professional literature define information literacy?

To answer research question number 1 and define information literacy, a review of literature was conducted. The American Association of School Librarians (AASL) in collaboration with the Association for Educational Communications and Technology (AECT) published the first edition of *Information Power: Guidelines for School Library Media Programs* in 1988. Within these guidelines, the AASL and AECT developed a mission statement for school library media centers which stated, “The mission of the library media program is to ensure that students and staff are effective users of ideas and information” (AASL & AECT, 1988, p.1). Based on this mission statement, the following year the American Library Association’s *Presidential Committee on Information Literacy: Final Report* (1989) defined information literacy as recognizing the need for information, having the ability to locate, evaluate, and use effectively the needed information. Ten years after their first collaborative work, the AASL and
AECT published a second edition of *Information Power* (1998) in which they defined information literacy as “…understanding how to access and use information…” (p. vii). The AASL and AECT advocated that information literacy skills were essential to helping students become independent, information-literate lifelong learners (AASL & AECT, 1998).

In 2000, the Association of College and Research Libraries (ACRL) published *Information Literacy Competency Standards for Higher Education*. The ACRL listed a set of abilities or competencies of an information literate individual had including being able to determine the extent of information needed, accessing the needed information effectively and efficiently, evaluating information and its sources critically, incorporating selected information into one’s knowledge base, using information effectively to accomplish a specific purpose, and understanding the economic, legal, and social issues surrounding the use of information, and access and use information ethically and legally (ACRL, 2000).

After the original *Information Power* was written, the definition of information literacy expanded to encompass what to do with the information once it was found including using, synthesizing, and communicating information (Taylor, 2006). According to Taylor, students needed to learn not only how to find the information, but also how to evaluate and use it. She stated students had to take the newly found information combine it with previous knowledge, and then develop new knowledge and communicate it.

According to the professional literature reviewed, information literacy was defined as a set of skills or competencies for accessing and using information (ACRL, 1999; ALA, 1989; Taylor, 2006). The early definition of information literacy of accessing and using information has expanded over time to include identifying an information need, accessing information,
locating information, using the information, synthesizing the information, and communicating the new knowledge (Taylor).

Research Question 2: According to the professional literature, what were the benefits of information literacy skills?

The second research question was answered through a review of the professional literature. According to the ACRL (2000), an essential benefit of information literacy was the development of reasoning and critical thinking skills enabling a person to learn how to learn forming the basis of lifelong learning. In a research study conducted by Conley (2005) entitled “Standards for Success”, the intern identified several cognitive skills students needed to be successful in entry level college courses including research skills, critical thinking skills, and the ability to think independently. Conley recommended high schools teach information literacy to develop these abilities.

Another important benefit of learning information literacy skills according to Allen (2007) was to prepare students to meet the demands of college, the workforce, and community obligations. To be successful, Allen remarked students needed to be knowledgeable about how to use information in addition to knowing how to use technology. Riedling (2007) agreed with Allen when she stated students needed information literacy skills to access and use the enormous amount of complex information that is available in today’s world. Furthermore, Reidling stated information literacy skills transferred to all learning environments, to all levels of education, to the workforce, and to everyday situations.

The professional literature also identified benefits pertaining specifically to science education. Leu, Leu, and Coiro (2004) stated the Internet was a beneficial tool in accomplishing the two main goals of science education: teaching science content knowledge and developing
scientific thinking skills. However, in order for all students to be successful in using the Internet, Leu et al. recommended integrating information literacy instruction into science education. Additionally, Leu et al. noted information literacy skills helped develop scientific thinking because students used a similar thinking process when searching the Internet. The process included asking questions, searching and locating appropriate information, critically evaluating the information, synthesizing information to answer a specific question, and then communicating the final product to others (Leu et al.).

According to the professional literature reviewed, information literacy was an essential skill needed by students to be successful academically (Conley, 2005). Information literacy developed critical thinking and reasoning skills which formed the basis of lifelong learning and transferred to all levels of education and everyday life situations (ACRL, 2000; Allen, 2007; Conley, 2005; Riedling, 2007). In addition, researchers found information literacy skills were beneficial in science education to access and use the science content available on the Internet and to develop scientific thinking skills (Leu et al., 2004).

Research Question 3: In the professional literature, how was information literacy skills implemented in the high school science classroom?

In order to answer research question number 3, professional literature was reviewed which documented several methods to implement information literacy skills. One such method was to integrate information literacy instruction into content areas (Allen, 2007; Eisenberg, 2001). Eisenberg stated information literacy and technology skills should be taught together and be integrated into content areas to help students learn to apply these skills. According to Eisenberg, integrating technology into content areas was motivating and assisted students to see the relevance of the skills learned. Allen concurred with Eisenberg when she proclaimed
Information literacy should be integrated into the curriculum instead of being taught in a standalone class because students need to be able to apply and transfer the skills to a variety of academic and everyday life situations. For this reason, Allen asserted that information literacy is a curriculum issue for the entire faculty not just an issue for the library or technology staff.

Furthermore, Bielich and Page (2002) reminded science educators that information literacy was part of national and state standards for each content area. Integrating information literacy instruction into science education was simplified because the goals and standards of science education and information literacy were similar (Ercegovac, 2003). According to Ercegovac, the similar goals included locating and using information, developing critical thinking skills, analyzing or evaluating information sources, knowing when to cite sources and communicating new knowledge to others.

In order to integrate information literacy instruction into the content areas, the professional literature suggested classroom teachers collaborate with school library media specialists (Abilock, 2003; Allen, 2007; Ercegovac, 2003). Abilock noted collaboration combines the science content knowledge of the classroom teacher with the information literacy expertise of the library media specialist to the benefit of the student.

The professional literature contained many examples of science educators and school library media specialists collaborating to integrate information literacy instruction in high school science classrooms (Abilock, 2003; Allen, 2007; Bielich & Page, 2002; Eisenberg, 2001; Ercegovac, 2003). One example of collaboration was demonstrated Page, a science teacher at Northwestern High School in Detroit, Michigan, who teamed up with Paul Bielich, a library media specialist. Together, they introduced a research process to Page's advanced astronomy class with the main objective of learning the value of authoritative databases over Internet
resources. Bielich and Page stated that through this lesson, students learned how to evaluate and locate credible sources.

Through a review of literature, the intern examined methods to implement an instructional unit on information literacy skills. Integrating information literacy instruction into the content areas was recommended by the professional literature (Allen, 2007; Eisenberg, 2001). Integration was supported by national and state standards (Bielich & Page, 2002). Incorporating information literacy instruction into science education was simplified by the fact that information literacy goals and science standards were similar (Ercegovac, 2003). To accomplish integration, the professional literature suggested classroom teachers collaborate with school library media specialists (Abilock, 2003; Allen, 2007; Bielich & Page, 2002; Eisenberg, 2001; Ercegovac, 2003). Many examples of science teacher and library media specialist collaborations were documented in the professional literature (Abilock, 2003; Allen, 2007; Bielich & Page, 2002; Eisenberg, 2001; Ercegovac, 2003).

Conclusion

Through a review of the literature, the intern was able to define information literacy, describe the benefits of implementing information literacy instruction in a science classroom, and describe the methods of implementing an instructional unit on information literacy. The professional literature defined information literacy as a set of skills that included identifying an information need, accessing information, locating information, evaluating information, synthesizing information, and communicating the new knowledge to others (ALA, 1989; ACRL, 1999; Taylor, 2006). According to the professional literature, the benefits of information literacy included developing critical thinking and reasoning skills which transferred to all levels of education and everyday life situations preparing students for higher education and the workforce
Researchers also found information literacy skills were beneficial in science education to access and use science content information on the Internet and to develop scientific thinking skills (Leu, Leu, & Coiro, 2004). To implement information literacy instruction in a science classroom, the professional literature suggested integrating the instruction by forming a collaboration between the science teacher and the library media specialist (Abilock, 2003; Allen, 2007; Bielich & Page, 2002; Eisenberg, 2001; Ercegovac, 2003). In order to answer the fourth and final research question, methods and procedures for implementing information literacy instruction and collecting data were developed.
Chapter III: Methods and Procedures

Introduction

The purpose of this project was to determine if the implementation of an instructional unit on information literacy skills improved students’ ability to select credible information sources in a high school anatomy and physiology classroom. Four research questions were asked when constructing the project: 1) How did the professional literature define information literacy?; 2) According to the professional literature, what were the benefits of information literacy skills?; 3) In the professional literature, how were information literacy skills implemented in the high school science classroom?; 4) Did students’ ability to select credible information sources improve after the implementation of an instructional unit on information literacy skills in the high school anatomy and physiology classroom?

Participants

Twenty-four eleventh and twelfth grade students participated in the study. They were enrolled in an elective anatomy and physiology classroom in a small rural school located in a Midwest state. Twelve students were males and twelve were females. In the 2008-2009 school year, the school district was comprised of 2,245 students in grades pre-school through twelfth grade. The racial makeup of the district consisted of the following: 0.09% American Indian/Alaskan Native, 1.20% Asian/Pacific Islander, 0.09% Black Non-Hispanic, 94.12% White Non-Hispanic, and 3.52% Hispanic. For this study, the twenty-four students were divided into twelve pairs. The pairs were randomly assigned by drawing names out of a cup.

Treatment/Intervention

For this project, the intern integrated an instructional unit on information literacy into an elective high school anatomy and physiology class as the intervention. According to the
professional literature, information literacy was defined as a set of skills or competencies for accessing and using information. The intervention was used to develop the students' scientific thinking skills and research skills.

The instructional unit on information literacy was embedded in a research project that the anatomy and physiology students were required to complete. On the first day of the project, the intern introduced the research project to the students by giving them a copy of the Research Project Outline and the Research Project Rubric.

Furthermore, on the first day the intern reviewed the Research Project Outline and Research Project Rubric with the students. The research project required the students to research how a specific drug physiologically affects the body. The drugs researched were tobacco, alcohol, methamphetamine, marijuana, MDMA (ecstasy), cocaine, heroin, steroids, inhalants, and prescription drugs. The prescription drugs were broken down into three categories: OPIOID's, depressants, and stimulants.

The students were required to answer seven specific research questions which were listed on the Research Project Outline. These questions included:

1. Name of drug, street names or slang names
2. How is the drug taken?
3. Describe the physiological affects the drug.
4. What are the short term affects of using the drug?
5. What are the long term affects of using the drug?
6. Include statistics regarding how many people use the drug.
7. Include other interesting facts and statistics.

Following the instruction provided by the intern, the students were randomly assigned a partner by drawing names out of a cup. Then the pairs were randomly assigned a drug to research by drawing a slip of paper out of a cup.

Next, the students were given a worksheet entitled “Pre-Assessment: Websites to Evaluate” (see Appendix D for Pre-Assessment: Websites to Evaluate). Using this worksheet, the students evaluated four websites and answered the following questions: Is this a credible website? Would you use the website for research? Why or why not?

After the students completed evaluating the websites and filling out the Pre-Assessment: Websites to Evaluate, the intern asked the students how they decided which websites to use for research. Many students gave vague answers as to whether they thought the websites were credible. Most students did not base their decisions on any criteria. However, a few students stated that one website was credible because it was a government website.

After this discussion, the students received the handout “Five Criteria for Evaluating Websites” (see Appendix C for Five Criteria for Evaluating Web Pages) developed by Kapoun (1998). Kapoun stated the credibility of information from web pages should be evaluated in the same manner as print items. In order to evaluate web pages, Kapoun developed five criteria which included accuracy, authority, objectivity, currency, and coverage. The intern then discussed these criteria in detail. Then, as a whole class, we used these criteria to evaluate each of the websites listed on the Pre-Assessment: Websites to Evaluate worksheet. The students were then given the rest of the 50-minute period to work with their partner to find one or two credible websites to be used in their research project based on the criteria listed on the handout Five Criteria for Evaluating Web Pages (Kapoun).
On the second day of the project, the intern demonstrated how to use the following research databases: Health Reference Center, Science Online, and EBSCO Host. The intern used a computer and projection system to display the databases. For each research database, the intern showed the students how to access the databases and how to perform a search. The students were told they may also use Sirs Researcher and Questia School. Students were given bookmarks with usernames and passwords to each database so they could continue their research at home or from any computer within the school. The students then worked with their partner to locate two credible sources for their research projects. The students used the Five Criteria for Evaluating Web Pages handout (Kapoun, 1998) to determine if they had found a credible source.

On day three of the project, the intern instructed the students on how to prepare a Modern Language Association (MLA) style work cited page. A work cited page was required to document the sources used for the research project. Following the instruction, the students continued conducting research to answer the research questions listed on the Research Project Outline. When students finished researching, they began preparing their PowerPoint presentations.

Day Four was a workday for the students to complete their PowerPoint presentations. And finally on Day Five, the students began presenting their research projects to the class. Seven pairs of students presented their research projects on Day Five. The remaining five groups presented their projects on Day Six. After giving their presentations, the students were required to submit a copy of their PowerPoint presentations and an MLA style work cited page.

**Instruments/Protocols**

Two instruments were developed to collect data to determine if implementing information literacy instruction improved students’ ability to select credible information sources.
The first instrument was the Pre-Assessment: Websites to Evaluate (see Appendix D for Pre-Assessment: Websites to Evaluate). The second instrument was the sub-score for Research Accuracy from the Research Project Rubric (see Appendix B for Research Project Rubric).

Pre-assessment: websites to evaluate.

The pre-assessment was a worksheet listing four websites. Using this worksheet, the students evaluated the four websites by answering the following questions: Is this a credible website? Would you use the website for research? Why or why not? The acceptable passing score was seventy percent (70%).

Sub-score: research accuracy.

The sub-score for Research Accuracy from the Research Project Rubric (see Appendix B for Research Project Rubric) was used to assess whether students selected at least four credible sources when completing their research projects. The information sources were evaluated based on the handout Five Criteria for Evaluating Web Pages (see Appendix C for Five Criteria for Evaluating Web Pages) (Kapoun, 1998). The acceptable passing score was seventy percent (70%).

Procedures

Prior to beginning the research project, the intern met with her supervising teacher and with the building principal to request permission to conduct the study. The intern presented the professional literature which detailed the benefits of information literacy instruction. The supervising teacher and principal gave permission for the intern to proceed with the study. A newsletter (see Appendix E for Newsletter) was sent home to the parents of the students explaining that the intern was conducting an action research study and explaining the purpose and benefits of the project. The newsletter also included a permission slip for parents to exclude
their child from the project if a parent did not want their child to participate in the action research project.

The instructional unit on information literacy was integrated into a research project that the anatomy and physiology students were required to complete. The unit consisted of three days of instruction with time each day for students to conduct research and prepare a PowerPoint presentation. The fourth day was a workday for the students to complete their research and PowerPoint presentations. On the fifth and sixth days, students presented their PowerPoint presentations to the class.

The intern used two specific instruments to collect data to determine whether students’ ability to select credible information sources improved after the implementation of an instructional unit on information literacy. The intern then developed procedures to administer these instruments.

*Pre-assessment: websites to evaluate.*

In order to study any improvement in students’ ability to select credible information sources, the intern first administered the Pre-Assessment: Websites to Evaluate (see Appendix D for Pre-Assessment: Websites to Evaluate). The students completed the pre-assessment individually. The intern then graded the pre-assessments. Next, the scores for each pair of students were averaged. These scores were then recorded in a spreadsheet.

*Sub-score: research accuracy*

The students developed PowerPoint presentations for their research projects and then presented them to the class. The students were also required to submit a printed copy of their PowerPoint presentations and a MLA style work cited sheet. The PowerPoint presentations and MLA style work cited sheets were graded using the Research Project Rubric (see appendix B for
Research Project Rubric). Then the sub-score for Research Accuracy was isolated and recorded in a spreadsheet.

**Timeline**

The research study was conducted during the month of March. The principal and mentor teacher gave approval for the project in early March. The intervention began on Monday, March 16 and ended on Monday, March 23 with the student presentations and the students’ submission of printouts of their PowerPoint presentations and a MLA style work cited sheet.

**Data Analysis**

The data from the two data collection instruments Pre-Assessment: Websites to Evaluate and the Sub-score: Research Accuracy were analyzed by creating a spreadsheet (see Appendix F for Data Analysis spreadsheet). The first column of the spreadsheet contained the Team number of each pair of students. In the second column, the mean score for the Pre-Assessment was calculated for each pair and recorded. The third column contained the Pre-Assessment’s minimum acceptable passing score of seventy percent (70%). A check mark was inserted in the fourth column if the Team met or exceeded the minimum acceptable passing score of seventy percent (70%) for the Pre-Assessment. An “X” was inserted in the fourth column if the minimum acceptable score for the Pre-Assessment was not met. The fifth column contained the Sub-score for Research Accuracy. In the sixth column, the minimum acceptable passing score of seventy percent (70%) for the Sub-score for Research Accuracy was entered. The seventh and final column contained a check mark if the team met the minimum acceptable passing score of seventy percent (70%) for the Sub-score for Research Accuracy or an “X” if the team did not met the minimum acceptable passing score.
Additionally, the number of teams meeting the minimum acceptable score for the Pre-Assessment was counted. Then, the number of teams meeting the minimum acceptable score for the Sub-score for Research Accuracy was counted. Next, a graph was created to compare the team mean scores for the Pre-Assessment to the minimum acceptable passing score for the Pre-Assessment. A second graph was created to compare the Sub-scores for Research Accuracy to the minimum passing score. Finally, the class’s average team scores for the Pre-Assessment and the Sub-score for Research Accuracy were calculated and compared to the minimum acceptable passing score for each instrument.

Conclusion

Two instruments and procedures for collecting data were developed in order to determine whether students had improved their ability to select credible information sources. The teams’ mean scores from the Pre-Assessment and the teams’ Sub-score for Research Accuracy were analyzed by creating a spreadsheet and graphs. The data was collected and analyzed in order to answer research question four, “Did students’ ability to select credible information sources improve after the implementation of an instructional unit on information literacy skills in the high school anatomy and physiology classroom?”.
Chapter IV: Results

Introduction

The purpose of this project was to determine if the implementation of an instructional unit on information literacy skills improved students' ability to select credible information sources in a high school anatomy and physiology classroom. Four research questions were asked when constructing the project: 1) How did the professional literature define information literacy?; 2) According to the professional literature, what were the benefits of information literacy skills?; 3) In the professional literature, how were information literacy skills implemented in the high school science classroom?; 4) Did students' ability to select credible information sources improve after the implementation of an instructional unit on information literacy skills in the high school anatomy and physiology classroom?

Pre-assessment: websites to evaluate.

Grades from the Pre-Assessment: Websites to Evaluate were analyzed in order to determine the students' beginning knowledge level of selecting credible information sources. Ten (10) out of the twelve (12) pairs of students met the minimum passing score of 70.0%. The average team score of the class was calculated to be 72.7%. Additionally, the teams' mean scores were graphed and compared to the minimum acceptable passing score as displayed in Figure 1.
The data indicates that ten (10) out of twelve (12) teams met the minimum acceptable passing score, indicating that most students had some knowledge of how to select credible information sources. However, the class’s average team score was 72.7% which is only 2.7% above the minimum acceptable score indicating that there was room for improvement.

**Sub-score: research accuracy.**

The Sub-scores for Research Accuracy were then analyzed to assess whether students selected at least four credible information sources when completing their research projects.

Eleven (11) out of the twelve (12) pairs of students met the minimum passing score of 70%. The class’s average team Sub-score for Research Accuracy was calculated to be 95.8%. The Teams’ Mean Sub-scores for Research Accuracy were then graphed and compared to the minimum acceptable passing score. Figure 2 displayed the Sub-scores for Research Accuracy compared to the minimum acceptable passing score.
The data indicates that eleven (11) out of twelve (12) teams met and exceeded the minimum acceptable passing score for the Sub-score for Research Accuracy indicating that most teams understood how to select credible information sources. The class’s average team grade was a 95.8% which is 25.8% above the minimum passing score indicating improvement in the team’s ability to select credible information sources.

Conclusion

Twelve pairs of eleventh and twelfth grade anatomy and physiology students participated in this study. Two instruments were developed to collect data to determine whether the integration of information literacy instruction improved students’ ability to select credible information sources. The first instrument was the Pre-Assessment: Websites to Evaluate and the second instrument was the Sub-score for Research Accuracy. The class’s average score from the Pre-assessment was 72.7% indicating that the students had some knowledge of how to select credible information sources. After the integration of information literacy instruction, the class’s
average team Sub-score for Research Accuracy was 95.8% which was 25.8% above the minimum passing score. The data indicated that the majority of the students surpassed the minimum passing score.
Chapter V: Discussion

Introduction

The purpose of this project was to determine if the implementation of an instructional unit on information literacy skills improved students’ ability to select credible information sources in a high school anatomy and physiology classroom. Four research questions were asked when constructing the project: 1) How did the professional literature define information literacy?; 2) According to the professional literature, what were the benefits of information literacy skills?; 3) In the professional literature, how were information literacy skills implemented in the high school science classroom?; 4) Did students’ ability to select credible information sources improve after the implementation of an instructional unit on information literacy skills in the high school anatomy and physiology classroom?

The intern wanted to implement information literacy instruction into a science classroom because the professional literature suggested information literacy skills were beneficial in science education to access and use the science content on the Internet and to develop scientific thinking skills (Leu, et al., 2004). Additionally, the professional literature suggested information literacy skills helped prepare students for higher education, a technology rich work place, and everyday information needs (ACRL, 2000; Allen, 2007; Conley, 2005; Riedling, 2007). The intern also wanted an action research project that would combine her new role as the school library media specialist with her internship in science education.

Meaning of Findings

The data collected and analyzed for this project might suggest that the integration of information literacy instruction might have improved students’ ability to select credible information sources. Prior to the intervention, the students were administered a pre-assessment to
determine their beginning knowledge level of how to evaluate and select credible information sources. The class’s average team score for the pre-assessment was 72.7% which was barely above the minimum passing score of 70.0%. This data indicated that the students had some knowledge of how to select information sources but there was room for improvement. During an informal conversation with the students, it was learned that the students did not use any tools or criteria to base their judgments when evaluating the credibility of information sources. Following the intervention, the majority of the students demonstrated improvement in their ability to select credible information sources by using credible information sources in their research projects as substantiated by the class’s average team Sub-Score for Research Accuracy of 95.8%.

Summary

Twelve pairs of eleventh and twelfth grade anatomy and physiology students participated in this study. The purpose of the study was to determine whether integrating information literacy instruction into a high school science class improved students’ ability to select credible information sources. According to the professional literature reviewed, information literacy skills were beneficial in science education to develop students’ scientific thinking skills and research skills (Leu, et al., 2004). Two instruments were developed to determine whether the integration of information literacy instruction improved students’ ability to select credible information sources. The data from these instruments might have indicated that the intervention was successful. At the end of this project, the students were able to select credible information sources.

Recommendations

The intern has several recommendations for the replication of this study. First, the intern would suggest utilizing more data collection instruments to strengthen the findings of the
research study. The second recommendation is to use widely accepted professionally developed data collection instruments such as TRAILS developed by The Institute for Library and Information Literacy Education (ILILE, 2004). TRAILS is a multiple choice assessment of information literacy skills based on ninth grade Ohio Academic Content Standards and Information Power. The third recommendation is to have the students work individually throughout the research project instead of in pairs. Working individually would simplify the tracking of improvement.

Finally, the intern would recommend that future research extend to students from different grade levels and different science courses. This study was implemented in one anatomy and physiology class with only twenty-four students from the eleventh and twelfth grades. Increasing the number of students in the study and including students from all secondary grade levels and different science courses would increase the reliability of the findings.

Conclusion

It is the recommendation of this intern that other science educators integrate information literacy instruction into their classrooms to improve students’ scientific thinking skills and research skills. The data from this research study suggested that integrating information literacy instruction resulted in an increase in students’ ability to select credible information sources.
References


Appendix A
Research Project Outline
Anatomy & Physiology

Directions:

You and a partner will be assigned a drug to research. You should focus your research on the adverse effects of taking the drug on the body. You will create a PowerPoint presentation, a brochure, or other visual aide with the information you find. Together you and your partner will do a 3-5 minute presentation to our Anatomy class and then to one of the Health classes.

Your research should include the following:
1. Name of drug, street names or slang names
2. How is the drug taken?
3. Describe how the drug affects the body—Be as specific as possible using the information you have learned in this Anatomy & Physiology class.
4. What are the short term affects of using the drug?
5. What are the long term affects of using the drug?
6. Include statistics regarding how many people are using the drug.
7. Other interesting facts and statistics.

Grading Rubric:
Content of presentation & visual aide + 4 valid sources 50
Teamwork 10
Originality 10
Classroom presentation (to our class) 10
Presentation to Health class 20
Total 100 points

Drugs:
1. Tobacco
2. Alcohol
3. Methamphetamine
4. Marijuana
5. MDMA (Ecstasy)
6. Crack Cocaine
7. Heroin
8. Steroids
9. Inhalants
10. OPIOID Prescription drugs (OxyContin, Vicoden, Percocet)
11. Depressants Prescription drugs (Xanax, Valium, Librium)
12. Stimulants Prescription drugs (Ritalin, Dextedrine, Meridia) prescribed to treat ADHD
(These are the top 10 misused drugs in the world today—prescription drugs were split by category.)
## Appendix B

### Research Project Rubric

#### Anatomy & Physiology

<table>
<thead>
<tr>
<th>Component</th>
<th>Value</th>
<th>Unsatisfactory</th>
<th>Satisfactory</th>
<th>Excellent</th>
<th>Points</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Research Accuracy</strong></td>
<td></td>
<td>Inaccurate information, little or no use of Research databases, few research questions addressed. Internet sources are not credible.</td>
<td>Good information, but needs more depth, some use of Research databases, some research questions not addressed. Most Internet sources are credible.</td>
<td>Informative, well researched, in depth knowledge with excellent use of Research databases, all research questions addressed. All Internet sources are credible.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>30</td>
<td>(0-10)</td>
<td>(11-20)</td>
<td>(21-30)</td>
<td></td>
</tr>
<tr>
<td><strong>Bibliography page &amp; Sources</strong></td>
<td>10</td>
<td>Sources used for quotes and facts are not cited.</td>
<td>Most sources used for quotes and facts are cited correctly.</td>
<td>All sources used for quotes and facts are cited correctly.</td>
<td>(8-10)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(0-3)</td>
<td>(4-7)</td>
<td>(8-10)</td>
<td></td>
</tr>
<tr>
<td><strong>Visual Aide (PowerPoint, brochure, or other)</strong></td>
<td>10</td>
<td>Makes use of font, color, graphics, effects, but these sometimes distract from the presentation content.</td>
<td>Makes good use of font, color, graphics, effects, etc. to enhance the presentation.</td>
<td>Makes excellent use of font, color, graphics, effects, etc. to enhance the presentation.</td>
<td>(8-10)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(0-3)</td>
<td>(4-7)</td>
<td>(8-10)</td>
<td></td>
</tr>
<tr>
<td><strong>Originality</strong></td>
<td>10</td>
<td>Presentation shows very little attempt at original thought.</td>
<td>Presentation shows some originality and inventiveness. The content and ideas are presented in an interesting way.</td>
<td>Presentation shows considerable originality and inventiveness. The content and ideas are presented in a unique and interesting way.</td>
<td>(8-10)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(0-3)</td>
<td>(4-7)</td>
<td>(8-10)</td>
<td></td>
</tr>
<tr>
<td><strong>Teamwork</strong></td>
<td>10</td>
<td>Group often is not effective in delegating tasks and/or sharing responsibility.</td>
<td>Good thought, some effort, and group members participated relatively equally</td>
<td>Attained goal, all working together – true group effort. Well thought out, outstanding effort</td>
<td>(8-10)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(0-3)</td>
<td>(4-7)</td>
<td>(8-10)</td>
<td></td>
</tr>
<tr>
<td><strong>Presentation to our Anatomy &amp; Physiology class</strong></td>
<td>10</td>
<td>Delivery not smooth and audience attention often lost. Does not appear to listen to other presentations &amp; is distracting.</td>
<td>Rehearsed with fairly smooth delivery that holds audience attention most of the time. Does not appear to listen to other presentations, but is not distracting.</td>
<td>Well-rehearsed with smooth delivery that holds audience attention. Listens intently to other presentations.</td>
<td>(8-10)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(0-3)</td>
<td>(4-7)</td>
<td>(8-10)</td>
<td></td>
</tr>
<tr>
<td><strong>Presentation to Health class</strong></td>
<td>20</td>
<td>Delivery not smooth and audience attention often lost. Does not appear to listen to other presentations &amp; is distracting.</td>
<td>Rehearsed with fairly smooth delivery that holds audience attention most of the time. Does not appear to listen to other presentations, but is not distracting.</td>
<td>Well-rehearsed with smooth delivery that holds audience attention. Listens intently to other presentations.</td>
<td>(15-20)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(0-7)</td>
<td>(8-14)</td>
<td>(15-20)</td>
<td></td>
</tr>
</tbody>
</table>

**Total Points Earned**

100
## Five Criteria for Evaluating Web pages

<table>
<thead>
<tr>
<th>Evaluation of Web documents</th>
<th>How to interpret the basics</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1. Accuracy of Web Documents</strong></td>
<td><strong>Accuracy</strong></td>
</tr>
<tr>
<td>• Who wrote the page and can you contact him or her?</td>
<td>• Make sure author provides e-mail or a contact address/phone number.</td>
</tr>
<tr>
<td>• What is the purpose of the document and why was it produced?</td>
<td>• Know the distinction between author and Webmaster.</td>
</tr>
<tr>
<td>• Is this person qualified to write this document?</td>
<td></td>
</tr>
<tr>
<td><strong>2. Authority of Web Documents</strong></td>
<td><strong>Authority</strong></td>
</tr>
<tr>
<td>• Who published the document and is it separate from the &quot;Webmaster?&quot;</td>
<td>• What credentials are listed for the authors?</td>
</tr>
<tr>
<td>• Check the domain of the document, what institution publishes this document?</td>
<td>• Where is the document published? Check URL domain.</td>
</tr>
<tr>
<td>• Does the publisher list his or her qualifications?</td>
<td></td>
</tr>
<tr>
<td><strong>3. Objectivity of Web Documents</strong></td>
<td><strong>Objectivity</strong></td>
</tr>
<tr>
<td>• What goals/objectives does this page meet?</td>
<td>• Determine if page is a mask for advertising; if so information might be biased.</td>
</tr>
<tr>
<td>• How detailed is the information?</td>
<td>• View any Web page as you would an infomercial on television. Ask yourself why was this written and for whom?</td>
</tr>
<tr>
<td>• What opinions (if any) are expressed by the author?</td>
<td></td>
</tr>
<tr>
<td><strong>4. Currency of Web Documents</strong></td>
<td><strong>Currency</strong></td>
</tr>
<tr>
<td>• When was it produced?</td>
<td>• How many dead links are on the page?</td>
</tr>
<tr>
<td>• When was it updated?</td>
<td>• Are the links current or updated regularly?</td>
</tr>
<tr>
<td>• How up-to-date are the links (if any)?</td>
<td>• Is the information on the page outdated?</td>
</tr>
<tr>
<td>5. Coverage of the Web Documents</td>
<td>Coverage</td>
</tr>
<tr>
<td>----------------------------------</td>
<td>----------</td>
</tr>
<tr>
<td>• Are the links (if any) evaluated and do they complement the documents' theme?</td>
<td></td>
</tr>
<tr>
<td>• Is it all images or a balance of text and images?</td>
<td></td>
</tr>
<tr>
<td>• Is the information presented cited correctly?</td>
<td></td>
</tr>
<tr>
<td>• If page requires special software to view the information, how much are you missing if you don't have the software?</td>
<td></td>
</tr>
<tr>
<td>• Is it free or is there a fee, to obtain the information?</td>
<td></td>
</tr>
<tr>
<td>• Is there an option for text only, or frames, or a suggested browser for better viewing?</td>
<td></td>
</tr>
</tbody>
</table>

**Putting it all together**

- **Accuracy.** If your page lists the author and institution that published the page and provides a way of contacting him/her and . . .
- **Authority.** If your page lists the author credentials and its domain is preferred (.edu, .gov, .org, or .net), and, . . .
- **Objectivity.** If your page provides accurate information with limited advertising and it is objective in presenting the information, and . . .
- **Currency.** If your page is current and updated regularly (as stated on the page) and the links (if any) are also up-to-date, and . . .

**Coverage.** If you can view the information properly--not limited to fees, browser technology, or software requirement, then . . . **You may have a higher quality Web page that could be of value to your research!**


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Appendix D

Pre-Assessment

Websites to Evaluate

Evaluate the following websites.

   Is this a credible website? Would you use the Website for research? Why or Why not?

2. http://zapatopi.net/treeoctopus/
   Is this a credible website? Would you use the Website for research? Why or Why not?

   Is this a credible website? Would you use the Website for research? Why or Why not?

   Is this a credible website? Would you use the Website for research? Why or Why not?
March 12, 2009

Dear Parents,

As part of the Anatomy & Physiology class, your child will be studying the effects of drugs on the nervous system. The academic goal is to understand that improper use of drugs can adversely affect the body.

With your permission, your child will participate in a service-learning research project related to this curriculum. The purpose of the project is to learn that an individual can make a contribution to his/her community through service, and academic content can be learned through service learning.

In class, the students will work in pairs to research the effects of improper use of a specific drug. Before conducting the research, students will learn information literacy skills including Internet search strategies, how to evaluate print and electronic sources, and how to use research databases. The students will then develop a 3-5 minute presentation and a visual aide (PowerPoint presentation, brochure, or other) summarizing their research. The students will then present their findings to one of the Sophomore Health classes.

This project will also serve as my Master's project at Defiance College. The purpose of the Master's action research project is to determine if academic achievement improves after teaching students information literacy skills in a high school science classroom.

My supervising teacher, Mrs. Elser, the Health teacher, Mr. Savage, and the principal, Mr. Alspaugh, have approved this project. Completing a service-learning project and a Master's project are requirements of my student teaching internship at Defiance College.

Thank you for allowing your child to participate in this service-learning research project. This experience will help prepare students to conduct research in college and provide students with lifelong research skills. Please sign the attached form and return this form to school only if your child may not participate in this service-learning project. If you have any questions, please contact me.

Sincerely,

Ann Bible
Student Intern
Defiance College
Email: bry aca abi@nwoca.org
Phone: 419-636-4536 x 6224

________________________________________ may not participate in the service-learning project.

child's name

________________________________________

parent's or guardian's signature
# Appendix F

## Data Analysis Spreadsheet

<table>
<thead>
<tr>
<th>Team</th>
<th>Team Mean Score from Pre-Assessment</th>
<th>Minimum passing score: Pre-Assessment</th>
<th>Pre-Assessment Minimum passing score met=✓: Minimum Passing score Not met=×</th>
<th>Sub-score: Research Accuracy Percentage</th>
<th>Minimum passing score: Sub-score: Research Accuracy</th>
<th>Sub-Score: Research Accuracy Minimum passing score met=✓: Minimum Passing score Not met=×</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>62.5%</td>
<td>70.0%</td>
<td>×</td>
<td>100.0%</td>
<td>70.0%</td>
<td>✓</td>
</tr>
<tr>
<td>2</td>
<td>75.0%</td>
<td>70.0%</td>
<td>✓</td>
<td>67.0%</td>
<td>70.0%</td>
<td>×</td>
</tr>
<tr>
<td>3</td>
<td>87.5%</td>
<td>70.0%</td>
<td>✓</td>
<td>100.0%</td>
<td>70.0%</td>
<td>✓</td>
</tr>
<tr>
<td>4</td>
<td>62.5%</td>
<td>70.0%</td>
<td>×</td>
<td>100.0%</td>
<td>70.0%</td>
<td>✓</td>
</tr>
<tr>
<td>5</td>
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<td>✓</td>
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<tr>
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<td>✓</td>
<td>100.0%</td>
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<td>✓</td>
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<td>70.0%</td>
<td>✓</td>
<td>83.0%</td>
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<td>100.0%</td>
<td>70.0%</td>
<td>✓</td>
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<tr>
<td>12</td>
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<td>100.0%</td>
<td>70.0%</td>
<td>✓</td>
</tr>
<tr>
<td>Avg</td>
<td>72.7%</td>
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</tbody>
</table>