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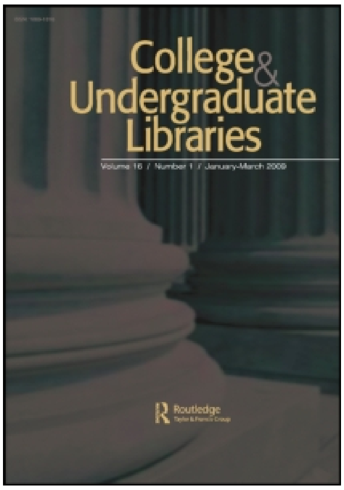

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The Impact of Information Literacy-Related Instruction in the Science Classroom: Clickers Versus Nonclickers

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The goal of information literacy instruction is to enable students to develop skills that they can use for life to facilitate their empowerment through information. Instruction librarians, particularly those teaching Millenials whose need for "hands on" instruction has been widely emphasized, are constantly searching for methodologies that will provide appropriate levels of interactive instruction. Many methods for enhancing the relevance of library instruction have been discussed in the literature. This study, designed and developed by a collaborative team of librarians and science faculty, describes the effects of providing course-integrated, interactive (with clickers) information literacy instruction to undergraduates at a small private nonprofit university in the Southeast.

KEYWORDS *Academic libraries, clickers, information literacy, science*

INTRODUCTION

The aim of this study was to determine if the involvement of clickers in course-integrated information literacy (IL) instruction improved students' ability to evaluate information for accuracy, authority, currency, objectivity, and relevance. Students in two science courses (environmental science and life science) participated in information literacy instruction that focused on developing skills for evaluating information (Standard 3 of the Association of College and Research Libraries' Information Literacy Competency

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Standards for Higher Education) (ACRL 2000). Librarians utilized an interactive PowerPoint presentation linked to online videos and Websites that illustrated the principles of information evaluation. During the instruction sessions, students in the experimental group used the five evaluative criteria to assess a variety of information sources and provide responses using clicker devices. On the other hand, a control group of students raised their hands to respond to the same questions. Throughout the sessions, the librarians used these responses to facilitate class discussions about evaluating information. After instruction, students in both the experimental and control groups practiced these skills in a variety of "mini-case" exercises. Pre- and posttest results were then compared for an analysis of students' skills development and knowledge retention. To further facilitate course integration of the IL instruction, the material in the IL presentation, the examples used for discussion, the in-class exercises, and the test material were studied.

BACKGROUND AND LITERATURE REVIEW

IL and ACRL Standard Three

The instruction in this study was intended to address the needs of a specific group of undergraduate students with regard to the Association of College and Research Libraries' Information Literacy Competency Standards for Higher Education, more specifically, the following standard, performance indicator, and outcome:

Standard Three

The information literate student evaluates information and its sources critically and incorporates selected information into his or her knowledge base and value system.

Performance Indicator 2

The information literate student articulates and applies initial criteria for evaluating both the information and its sources.

Outcome A

Examines and compares information from various sources in order to evaluate reliability, validity, accuracy, authority, timeliness, and point of view or bias.

Literature exploring attempts by librarians and faculty to address the evaluation of information in the classroom has been fairly prolific. While a comprehensive overview of these attempts would be overwhelming, a brief mention of several previous publications that have special relevance to this study is appropriate. For example, Burkhardt, MacDonald, and Rathemacher's *Teaching Information Literacy: 35 Practical Standards-based Exercises for College Students* (2003) has been especially influential in the development of information literacy exercises on the campus where the study took place. As implied by its title, the authors of this publication have provided librarians and instructors with pragmatic active learning exercises that target specific information literacy outcomes. While these exercises were not used directly in the development of the information literacy module on evaluating resources, the concept behind exercise 24 in this workbook, which poses targeted evaluation questions for examining book resources, and the questions associated with exercise 32, which poses questions regarding similar criteria to those used in our study, influenced the authors' thinking. Another book relevant to this study is *Web Wisdom: How to Evaluate and Create Information Quality on the Web* (Alexander and Tate 1999). This book remains one of the most comprehensive on the topic of Website evaluation and provides numerous examples illustrating how to determine the credibility of a given site. Most influential in the development of our module has been Kapoun (1998), whose five criteria for evaluating resources, which mirror those of ACRL's published standards, were worked into both the presentation and group/active learning piece of our instruction.

While other studies, such as those by Edzan (2007), Floyd, Colvin, and Bodur (2006), and Robinson and Schlegl (2004), have sought to examine student ability to evaluate resources by examining artifacts such as bibliographies (for quality of sources chosen, for instance), we based our study on students' ability to recognize and apply the five evaluative criteria presented. Meola (2004), on the other hand, criticizes Kapoun and similar approaches as being too regimented and focused on a "checklist approach" to teaching information literacy. Meola contends that, by setting out the specific criteria and then selecting specific questions, instructors and librarians oversimplify the evaluation process and do not foster critical thinking. The authors would argue, however, that providing students with these benchmarks enables instructors and librarians to guide their ability to consider a topic from a critical thinking perspective. We also feel that having a basic checklist as a starting point and then incorporating deeper thinking about evaluation are not mutually exclusive. That is, one approach may be used to build upon the other in the long run. Students with very limited IL experience, for example, might benefit from the structured introduction offered by a checklist approach to be later enhanced by more challenging critical thinking exercises. In contrast to other studies, students did not score sources but rather qualitatively weighed their value within the context of specific information need. This was done in the presentation portion of our instruction, the group exercise portion, and in the pre- and posttesting of their knowledge.

The Science Curriculum

The authors chose to integrate Standard Three into the science curriculum because of the strong emphasis on evaluating information in the scientific inquiry method. Without skeptical and open-minded examination of evidence, students are likely to fall into the trap best described in the words of William James: "A great many people think they are thinking when they are merely rearranging their prejudices" (Prochnow and Prochnow 2002, 168). This may already be the status quo in standard science education. As science courses have not, in general, helped students learn to distinguish between science and pseudoscience, a large proportion of the public believes in borderline ideas without a scientific basis, such as ESP (60%), astrology (40%), or "lucky numbers" (32%), to mention a few listed by Shermer (2002) in explaining why smart people believe weird things. Another 20% of the public believes that the sun revolves around the earth and over two-thirds are ignorant of the role of DNA as the material of genetic inheritance (Moore 2008). Matthews (1994, xv) echoes this in stating that "pseudoscientific and irrational world views already have a strong hold in Western culture; antiscience is on the rise."

The failure is less in teaching scientific fact than in communicating the method of scientific inquiry and how scientists weigh contrasting points of evidence. Indeed, it is less important whether the solar system is actually geo- or heliocentric than knowing how science has established the actual astronomical fact. Science education must familiarize students with a method of inquiry that is based on careful observation, imaginative thinking in constructing hypotheses, skeptical consideration of a range of evidence, careful evaluation of information sources, and an understanding of the cause-and-effect mechanisms at work in the universe (Hoernschemeyer 2000). This cannot be effectively accomplished through rote instruction, but rather only through practice, reflection, and critical discussion of how conclusions are reached using actual examples. Successfully addressing the tasks set forth in Standard Three in order to improve our students' abilities in evaluating information with regard to accuracy, authority, objectivity, currency, and relevance will go far towards achieving this end.

Clickers and Active Learning in Information Literacy and Science Instruction

"Educational studies have clearly shown that for significant and lasting learning to take place, students' minds must be active" (Duncan 2004). In addition to a number of introductory articles detailing how to use classroom response systems (henceforth referred to as "clickers") and teachers' experiences with them, their effect in the classroom is well-documented. Studies usually fall into four general categories: students' reaction to clickers, the effect of clickers on participation, how clickers can be used in large classes to generate student involvement, and their impact on learning outcomes. There does not appear, however, to be a general consensus in the literature when learning outcomes are considered. In some cases (Lasry 2008; Stein, Challman, and Brueckner 2006), researchers determined that clicker use does not have a strong influence on test scores. In others (Caldwell 2007; Eagle 2006; Ewing n.d.; Kennedy and Cutts 2005), clickers, whether directly or in conjunction with peer-to-peer instruction, seem to have a positive effect on test scores. One study involving clickers and science focuses on their benefits as "a formative assessment tool, as a means to foster student collaboration" (MacArthur and Jones 2008, 193).

The design of this study is unique in some respects and does not have numerous parallels in the literature. Singular variables or a few taken from the study can be found in the literature. For example, clicker use and science classes are examined in Preszler et al. (2007), Rangachari and Rangachari (2007), and MacArthur and Jones (2008). The use of pretests and posttests to examine learning outcomes occurs in Petersohn (2008) and Lasry (2008). Examination of clickers in library instruction is found in Dill (2008), Corcos and Monty (2008), and Petersohn. However, the authors were unable to locate a study that provided a true comparison that included all of the variables tested in this study. That is to say, a study that combined clicker use, information literacy sessions taught in conjunction with a science course, and the use of pre- and posttests as measurement tools was not found.

On the other hand, the literature contains numerous studies with one or more attributes that are applicable and which shed some light on the effect of clickers on learning outcomes related to evaluating information resources. Lasry also implemented clickers in a study examining pre- and posttest results relative to coursework in physics. His primary goal was to identify the relative effectiveness of clicker and flashcard use. In addition, he used peer instruction. He concluded that clickers do not "provide any significant learning advantage over low-tech flashcards"(244) and that "no data were found in this study to support the claim that clickers increase conceptual learning or exam performance." (243) For Lasry, the clicker impact was much greater on teaching style rather than student improvement.

In their study, Rangachari and Rangachari addressed two of the evaluation criteria (currency and credibility) that we used when assessing resources and utilized test results as evidence; yet, their study deviated from ours because clickers were not a component. Dill was concerned with clickers and library instruction and utilized pre- and posttests; however, the material covered was strictly library-related with no connection to science. She surmised that clickers "may not always be effective in aiding student learning" (Dill 2008, 529). Eagle made a strong case for the gradual "significantly positive effect" (2006, viii) of clickers in her semester-long study of an introductory statistics course. She examined how clickers created a cumulative improvement and demonstrated how daily clicker test scores reflected final grades. She also noted improved attendance, which led to sustained attention and preceded a general upturn in basic learning for a statistics class. "The overall increase in understanding, in turn, helps the students to perform better on other assignments such as quizzes, homework and tests" (21).

A publication that deals with numerous, but not all, similar variables matching this study is Duncan's *Clickers in the Classroom: How to Enhance Science Teaching Using Classroom Response Systems*. Duncan addressed learning outcomes when clickers were combined with cooperative learning and peer instruction. He examined the cognitive gains of students in Mazur's physics course at Harvard University when peer instruction was used. Although he did not specifically include studies of clicker effects, he connected these types of gains through proxy. Reviewing the studies documented here reveals a number of historical antecedents for a number of the variables used in our research. Moreover, despite the fact that very few, if any, match up completely, we were able to draw various connections and infer supporting or oppositional statements.

Study Design

In this study, the authors specifically attempted to answer the following question: does using clickers in library instruction affect posttest scores that reflect students' ability to identify evaluative criteria (currency, relevancy, objectivity, authority, and accuracy) and apply them to specific contexts? Within the parameters of our study, the library instruction classes were presented to students enrolled in life science or environmental science courses. Students in the experimental group used clickers to respond anonymously to multiple-choice questions, while students in the control group raised their hands to respond. The study consisted of seven multiple choice questions, with one question polling participants about which of two similarly designed Websites was the official version and another quizzing the students on the value of skepticism when evaluating information. The remaining five questions reinforced the five criteria for evaluation after each one was presented. After all sessions, students took part in a group activity that reinforced the information evaluation process. Students were broken into small groups, given four information snippets (e.g., articles, Website pages, etc.) to discuss and then evaluate their strengths and weaknesses in relation to the five criteria. This activity was completed before the posttest. Therefore, this activity could have had a bearing on the posttest scores, but only if one were to attempt to generalize our attempt and results as coming from a purely active learning approach versus one that is not. Rather, our main goal was to determine if a student's ability to recognize and apply criteria to the evaluation of information was affected by clicker use.

METHODOLOGY

This study consisted of two research questions with two hypotheses:

- Q1: Will student ability to identify evaluative criteria and apply them to specific contexts increase as reflected in higher posttest scores?
- Q2: Will student ability to identify evaluative criteria and apply them to specific contexts be greater in the clicker/experimental group as reflected in higher posttest scores?

Hypotheses

- Hypothesis 1: Student test scores will be significantly better over time (i.e., students will show a significant improvement in their average test scores from pre- to posttest). Thus, student scores will improve significantly based on either instructional approach.
- Hypothesis 2: Scores of students in the experimental group will be higher.

Study Parameters

This study took place in the spring of 2009 at a small private university with a campus enrollment of approximately 2,400 students (of these students, 67 were part of the control group and 78 were part of the experimental group). The university focuses on hands-on, career-oriented education, and it offers programs in three areas: culinary arts, business, and hospitality. Students pursuing a Bachelor's degree are required to take one of two science courses, life science or environmental science. Students learn basic information literacy concepts and the use of library resources in an English composition course (Module I: Finding Information), and they learn how to evaluate sources in a second module (Module II: Evaluating Information). A third module, which focuses on the ethical use of information and for which previous results have been published (Moniz, Fine, and Bliss 2008), had become an optional module by the time of this study.

Pilot Study

A pilot study was conducted during the Winter 2009 trimester. As part of the pilot, the researchers changed and adapted validated teaching and testing materials originally created by the outgoing instruction librarian. More specifically, the original ten-item multiple choice pretest was adapted to convey greater clarity based on feedback from earlier students who had taken the test and to ensure that it contained specific elements that the researchers wanted to assess (e.g., understanding of each specific evaluative criterion). This pretest was administered prior to any instruction taking place.

The PowerPoint presentation used for instruction contained five criteria for evaluating Websites and other information sources. It employed embedded video and a variety of Websites to emphasize strengths and weaknesses of information in relation to the stated criteria (currency, authority, accuracy, objectivity, and relevance). The presentation also included seven questions for formative assessment. It measured student learning not only at the end of a session, but also on an ongoing basis throughout the lesson. These questions were embedded at critical points to determine student understanding. One version involved students by collecting responses through the use of clickers, while the other involved students raising their hands. In both cases, the librarian attempted to address incorrect responses and further engage the students about any misconceptions they may have had. Students viewed the presentation during the first hour of the two-hour class.

In the second part of the two-hour class, students evaluated four short information excerpts on science topics relevant to the courses. For example, one might examine a journal article related to dieting or a Website sponsored by a drug company to promote dieting medication. In addition to the excerpts, students were also provided a specific context or information need associated with the information (e.g., a mini-case study). The students then had to use the five evaluative criteria to discuss and highlight the relative strengths and weaknesses of each of the first three samples. They were also asked to provide suggestions for verifying the accuracy of the fourth sample (e.g., check with other reliable primary and secondary sources, etc.). They did this first on their own and then developed a consensus in groups; the group consensus was later shared with the entire class.

One week later, students took a ten-item multiple choice posttest with the same questions as those on the pretest to determine whether they could apply their understanding of the material within specific contexts. After calculating scores for the pre- and posttests, the researchers noticed significant improvements from the pre- to the posttest overall. Since the purpose of the pilot was to examine the effectiveness of approach, methods, and materials, no attempt was made to determine if one approach resulted in significantly higher scores. Small adjustments to both the instrument and the PowerPoint presentation were made based on feedback received from faculty and students. The pilot also gave the two librarians responsible for teaching the opportunity to synchronize their presentations.

Clickers Versus Nonclickers

Once all of the life science and environmental science courses for the Spring 2009 term were scheduled, the researchers divided these up evenly so that each librarian taught an equal number of clicker and nonclicker sessions and also partnered with each of the two science faculty members an equal number of times. Prior to the onset of instruction that occurred just past the middle of the term, the students were asked to complete the pretest to ascertain knowledge levels prior to any instruction. Students then participated in the IL instruction sessions.

As in the pilot, the first part of the instruction session involved the use of a PowerPoint presentation highlighting the necessity of evaluating information and emphasizing the five criteria used to do so: relevancy, currency, objectivity, accuracy, and authority. The presentation included a number of examples from Websites and included several embedded film clips. At critical points, the librarian stopped to ascertain student knowledge by having the students raise their hands (control) or click (experimental) to answer various multiple choice questions. The librarian then took a moment to reiterate a given point and clear up any student misunderstandings. While the librarians synchronized most of their presentations, the nature of discussions varied somewhat from class to class (based on student responses and feedback). Feedback provided typically required not more than one to two minutes of clarification on the part of the librarian. Following the presentation, students were given a five-minute break.

After the break, students were provided with a worksheet that contained four different excerpts of information from sources ranging from scholarly journals to commercial Websites. The content of the material was chosen specifically to relate to science classes. Three of the four selections required students to consider the source using the five specified criteria. The fourth selection required students to consider how they would go about verifying the accuracy of the information provided. After spending five minutes on the worksheet, they then formed groups and combined their answers. After they accomplished this (approximately fifteen minutes later), each group shared its findings with the rest of the class. One week later, a posttest identical to the pretest was administered in class to determine how much of the material was learned and retained.

Instrumentation

The researchers created the instrument used in this study. The pretest and posttest (see Appendix) consisted of ten multiple choice questions. Two questions focused on authority, two on currency, two on relevancy, two on objectivity, and one on accuracy. One additional question sought to determine whether or not students could accurately identify a list of these five key elements in evaluating information. Based on the initial pilot study in which pre- and posttest scores were compared, several minor changes were made. Two questions that proved especially difficult were reworded to make them more straightforward. Additionally, two of the easier questions (based on insignificant differences between pre- to posttest scores and a high number of correct answers on both) were changed to include more choices with the hope of making them slightly more challenging. In addition to data collected from the actual quiz, the pretest version of the instrument collected the following student data: J# (a unique number assigned to each student), class day and time, instructor's name, estimated current GPA, major, and year of study. The posttest version included only the J# so that the pre- and posttests for each student could be matched up.

DATA ANALYSIS AND RESULTS

A total of 169 students completed the pretest for the project, whereas 170 students took the posttest. In order to perform a repeated measures test, the authors excluded participants who did not take both a pretest and a posttest. We administered the *t*-test to 146 students; of that group, one did not fill out the pretest completely and had to be excluded from the regression analysis ($N = 145$).

The authors initially analyzed the data, using a two-tailed paired *t*-test (for repeated measures). The analysis found that pretest scores (7.041) were significantly different ($p = 0.0000357$) than the posttest scores (7.595). Thus, the information literacy lecture had a statistically significant impact.

Next, a multiple linear regression was performed to determine which of the independent variables were associated with the significant differences in pre- and posttest scores. None of the independent variables had a significant association with the change in scores. Several, however, had a strong association worth noting. Current GPA (0.058) and clickers versus nonclickers (0.080) had a strong trend.

In conclusion, the information literacy project supported the first research question and hypothesis but not the second research question and hypothesis.

- Q1: Will student ability to identify evaluative criteria and apply them to specific contexts increase as reflected in higher posttest scores?
- Hypothesis 1: Student test scores will be significantly better over time (i.e., there will be a significant improvement in their average test scores from pre- to posttest). Student scores will improve significantly based on either instructional approach.

- Q2: Will student ability to identify evaluative criteria and apply them to specific contexts be greater in the clicker/experimental group as reflected in higher posttest scores?
- Hypothesis 2: Scores of students in the experimental group will be higher.

In addition, a Cronbach's Alpha was run on the final test scores. Since a fairly weak score of .37 was achieved, this indicates some potential reliability issues regarding the instrument. This will be discussed further in the next section.

DISCUSSION OF RESULTS

While instruction did have a definitive impact on student learning overall, the authors were somewhat disappointed that the use of clickers did not. Although not statistically significant, the scores were slightly better among those who used clickers. Could other factors have been responsible for the difference expected? Most significantly in this regard, the authors suspect that the limited use of clickers in the session may not have been sufficient to differentiate groups based on their use. Clickers were employed only during the first half of the two-hour session; therefore, both groups received the same treatment during the second hour. Furthermore, only seven questions were asked using the clickers. This may not have been enough to establish a difference in engagement.

As stated, overall scores improved considerably regardless of group. The authors felt that this justified further exploration. When we examined the scores from pre- to posttests in our final data, we noticed an anomaly. Question 4, which asked students to identify elements of a Website that helped establish its accuracy, showed a decrease from 63% correct on the pretest to just 39% correct on the posttest. After some discussion, we determined that the difference may have been the result of how we framed one of our slides in the presentation. Specifically, we showed students the World Trade Organization Website together with a hoax site. We then asked them to explore why one or the other might be the real site. In doing so, we drew their attention to features of the site such as its ability to be read in multiple languages. We think that this question possibly confused students when they were queried as to whether or not the "bells and whistles" on a site should be a criterion in determining the accuracy of the actual information. This may also be seen as a failing of "a checklist approach," or rather the inability of our students at this stage to rise above such an approach. Thus, students may not have advanced enough to be able to conceptualize what we were saying. Our failure to catch this problem with this specific question, however, leads us to believe that we had an even greater impact than our analysis shows since this pulled scores down. For example, Question 5, which explored the students' ability to determine the currency of an article, showed a marked

TABLE 1 Time of Test Average Scores for Both Student Groups Combined

$n = 145$	Pretest	Posttest	Difference
Question 1	.72	.79	.07
Question 2	.81	.88	.07
Question 3	.83	.81	−.02
Question 4	.63	.39	−.24
Question 5	.63	.77	.14
Question 6	.82	.81	−.01
Question 7	.56	.6	.04
Question 8	.47	.81	.34
Question 9	.85	.91	.06
Question 10	.74	.83	.09

increase from 63% to 77% correct. Question 7, which sought to instill understanding of authority, showed an increase from 56% to 60% correct. Last, and most significant, the ability of students to identify the five criteria that we established for evaluation (as posed in Question 8) saw an increase of 47% to 81% correct. Although there was no significant difference between clicker and nonclicker groups, significant differences existed between pre- and posttest scores (see Table 1). Again, attention needs to be paid to the overall reliability of the scores. As some questions seemed to work better than others, it might be prudent to continue tweaking the instrument.

One last item that the authors would like to point out was the model of faculty—librarian collaboration that arose from this project. The researchers met on numerous occasions throughout the process of designing and conducting the study. We feel that the librarians gained significant insight into the science curriculum and classroom. Likewise, the science faculty gained significant insights into information literacy and how it fits into the broader curriculum. It should be noted that, as a group, we felt that one of the reasons this collaboration was so successful was because of the natural fit that exists between ACRL's IL Standards and the objectives for the two science courses.

IMPLICATIONS FOR FUTURE RESEARCH

We think that the expanded use of clickers and their implications for student engagement need to be considered further. As mentioned, it may be that clickers should be used more thoroughly if students are to make noticeable gains in this regard.

Several other issues arose in our discussions of future research and direction. While some literature on it exists, the contrast between stand-alone versus integrated information literacy instruction warrants further exploration. Despite the fact that other studies have considered this on a superficial level, we would suggest more research on how course outcomes for particular classes match specific IL outcomes. As stated, in our case, we felt that the concept of evaluating information fit well with teaching students basic concepts related to scientific literacy. Another area of future research worth exploring would be to examine student abilities more qualitatively. In other words, instead of using a standardized test, a work product that will test for all of the necessary outcomes could be developed along with a reasonably objective way to assess those outcomes.

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APPENDIX 1

J#______________________

1. You are researching the health effects of herbal weight loss supplements. Which of the following resources is most likely to provide you with credible, objective information? (10 points)
   A. A study completed by a manufacturer of herbal supplements
   B. A report published by the National Institute of Health
   C. An article from the Website supplements.com, a prominent retailer of vitamins
   D. A personal story of weight loss using herbal supplements

2. Biased information is completely worthless. (10 points)
   A. True
   B. False
3. For a paper on the health effects of herbal weight loss supplements, which of the following authors is most likely to offer accurate and authoritative information? (10 points)
   A. An individual with a PhD in marketing
   B. A medical doctor with an advanced degree in biochemistry
   C. A user of herbal weight loss supplements
   D. The CFO of a company that is offering a new weight loss product
4. Which of the following helps you determine if a site has accurate information? (10 points)
   A. Other reputable site confirms the site's information
   B. The sources for the site's information are cited
   C. The site is very detailed and has lots of features and links
   D. It was third on the list of sites found in a Google search
   E. A and B
   F. A, B, and C
5. When deciding if an online article is up to date, which of the following should you check? (10 points)
   A. The date the article was published
   B. The dates of any sources cited in the article
   C. The publication dates of articles/pages the site links to
   D. A and C
   E. A, B, and C
6. You have been assigned to write a 5-page research paper on the possible health benefits of drinking red wine. Which of the following resources is the most relevant? (10 points)
   A. Time magazine article on wine preferences among millennials
   B. "Alcohol: A Women's Health Issue" (article posted by the National Institute of Health)
   C. "Red Wine and Resveratrol: Good for Your Heart" (article posted by www.mayoclinic.com, a well-known medical hospital)
   D. The book Pairing Wine and Cheese: Easy Solutions
7. You have been asked to do a presentation on treatments for cancer before an audience of healthcare professionals and to use a single *authoritative* source. Which of the following would be your *best* choice? (10 points)
   A. A cancer patient
   B. Someone who has recovered from cancer
   C. An article written by an oncologist (medical doctor who specializes in cancer treatment)
   D. A Time magazine article on cancer treatments
   E. B and C

8. What are the five most important criteria when evaluating a Website for the usefulness of its information?
   A. detail, currency, accuracy, relevance
   B. search functionality, contact information, page design, objectivity
   C. relevance, authority, accuracy, currency, search functionality
   D. currency, accuracy, objectivity, authority, relevance
   E. currency, relevance, page design, links
9. You have come across an article entitled "Genetic Modifiers in Hemoglobinopathies" in a journal entitled *Current Molecular Medicine*. The language in the article is extraordinarily difficult to read with many technical terms but seems to highlight groundbreaking research underway. The intended audience for this article is *most likely* which of the following?
   A. people with sickle cell anemia
   B. people with hemoglobin problems
   C. medical doctors conducting research into genetic diseases
   D. college undergraduates majoring in science
10. If an article is published in the current year it is guaranteed to have the most current information.
    A. True
    B. False