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# Using the I-LEARN model for information literacy instruction

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## Abstract

With the increasing availability of information and the importance of lifelong information literacy (IL) skills, instructional designers, school media specialists, and librarians need to determine how to best design IL teaching in order to help students locate, evaluate, and use information more effectively. This paper describes the first experimental research study conducted to determine how teaching designed using the I-LEARN model could increase student understanding and application of IL concepts and offer recommendations for future implementations of the model. The experimental study described in this article examined whether IL skills teaching designed using the I-LEARN model increased student understanding and application of IL concepts. The experimental group received an instruction session and a library research guide designed using the I-LEARN model, and the control group received an instruction session and a library research guide designed using a systems model. While the analysis of the results of pre- and post-test scores and scores on a citation analysis showed that there was no significant difference between the two groups, students in the experimental group used the I-LEARN-designed research guide more often than students in the control group and self-reported benefits of using the I-LEARN-designed research guide.

## Keywords

instructional design; design models; library instruction; information literacy; teaching; US

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## 1. Introduction

Information literacy (IL) can be defined in multiple ways, though most definitions describe it as encompassing the skills of locating, evaluating, and using needed information effectively (ALA 2000; SCONUL 2011). IL skills are essential for lifelong learning, through all levels of schooling, in the workplace, and in daily life decisions. While librarians have provided this (or related) types of teaching for decades, the need for teaching IL skills is increasing as information becomes more available outside of libraries and other academic settings (Breivik and Gee 1989; Bell and Shank 2007). Use of an instructional design model provides a systematic approach to accomplishing specific learning objectives. Design models often incorporate multiple theories of learning and are based in research and practice, and appropriate use of a well-designed model increases the chance that learning will occur in the instruction. As librarians become increasingly involved in teaching, it is important that they use an appropriate design for this instruction.

Based on its theoretical foundations, the I-LEARN model (Neuman 2011) could be ideal for designing IL instruction. The primary purpose of this study was to determine if IL skills instruction designed using the I-LEARN model would increase student understanding and application of IL concepts as compared to a common way of providing IL skills instruction using a systems approach.

## 2. Literature Review

I-LEARN (Neuman 2011) is an instructional design model connecting information science and instructional design. The model is not solely a library skills model; it is a learning model which could be applied in a variety of situations focused in nearly any subject. Grounded in instructional

design research and theories of cognitive science, the model's central premise is that information is the basic building block of all learning and that use of information is learning. Simply put, learning is the central reason for seeking information in the first place. Neuman describes the work of a number of prominent researchers in information science theory (Marchionini 1995; Kuhlthau 2004) and uses Anderson and Krathwohl's (2001) revised Bloom's Taxonomy as the underlying framework. The framework includes the following components: remember, understand, apply, analyse, evaluate, and create. Neuman argues that the world is full of information that is in all formats, is "complex and messy," and is the basic foundation of all learning. I-LEARN is a framework to help students learn and use information.

**Table 1: The I-LEARN model**

| | |
|---|---|
| **Identify** | an information problem by activating an interest, scanning the environment, and focusing on a question |
| **Locate** | the needed information through searching and extracting the relevant information |
| **Evaluate** | that information through questioning its authority, relevance, and timeliness |
| **Apply** | that information to the question thorough organizing and communicating |
| **Reflect** | on what is found and revising as needed |
| **kNow** | through personalising and internalising the information |

Numerous instructional design models exist, and the author chose I-LEARN based on Neuman's background, and the author's interest, in instructional design. Since the research described in this paper was conducted, other studies of the use of I-LEARN have been reported in the literature (Yang et al. 2014; Neuman et al. 2015).

The model used with the control group in this study is a systems framework from Morrison et al. (2006) that can be used in designing any type of teaching. Goodman (2009) describes how the model maps to the ACRL instructional guidelines. An iterative model, the stages include: determine the needs of the learner; define the topics for instruction; outline the content, tasks, and procedures; analyse the characteristics of the learner; define the learning objectives; design the instructional activities and instructional resources; identify available support services; and design the assessment and evaluation tools. The theory behind the model is both behavioural and cognitive, and the approach is circular in that the process can start at any point and be repeated as necessary (Morrison et al. 2006). The author chose this model as the control due to its iterative nature and frequent adoption in teaching.

# 3. Methodology

## 3.1 Research questions

The two research questions for this study are:

1. Does teaching designed with the I-LEARN model increase student understanding of the steps necessary to locate and evaluate information?
2. Does teaching designed with the I-LEARN model increase student ability to select appropriate information resources for a given assignment to write a research paper?

## 3.2 Hypotheses

The two hypotheses to be tested in this study are:

1. Students who receive IL skills instruction designed with the I-LEARN model will perform significantly higher on the IL skills test that covers the steps and procedure necessary to locate and evaluate information compared to students who do not receive the instruction.
2. Students who receive IL skills instruction designed with the I-LEARN model will perform significantly higher on the citation analysis rubric than students who do not receive the instruction.

## 3.3 Participants

This research was conducted at a large research university with a student body of approximately 29,000 in the south-eastern United States. Participants in this research included undergraduate students enrolled in a composition and communications course. The course is required for all undergraduate students as part of the university's general education curriculum, and approximately 70 classes are taught each semester. Librarians offer IL skills teaching to sections of the course upon faculty request, and students have access to a library research guide tailored to the needs of the course.

## 3.4 Design

This experimental research involved two groups: the experimental group (I-LEARN instruction) and the control group (standard instruction). Both groups received IL skills teaching conducted by the researcher in a single class period and had access to a library research guide. Both groups were tested with the IL skills test instrument, and the information resources participants selected for their class assignments were evaluated using the citation analysis rubric.

## 3.5 Instrumentation

The following instruments were used in this research:

### 3.5.1 IL skills test

The IL skills test (Appendix A) consists of 20 multiple choice items to gauge participant understanding of how to locate and evaluate information. Item topics include: choosing a topic; finding background information; selecting keywords; choosing tools to locate information; evaluating information; and applying information to an assignment. The author created the test items and tested them for validity via review from local librarians and library science graduate students. The IL skills test was administered to participants one week prior to the in-person teaching and two weeks following the in-person teaching. The instruments distributed are slightly different in that the pre-test includes more demographic data items than the post-test, but the test items are the same.

### 3.5.2 Citation analysis rubric

The citation analysis rubric (Appendix B) was used to evaluate the information resources participants selected for their class assignment. Each citation was scored based on the rubric. It was modelled from Reinsfelder (2012) and local librarians reviewed the rubric to provide feedback. The rubric includes a 1-4 scale for three criteria: authority; relevance; and timeliness. Authority refers to the author(s)' credentials; relevance describes the appropriacy of the information resource to the topic; and timeliness refers to choosing a source published at an appropriate time to address the topic. While additional criteria are sometimes used in rubrics for evaluating information resources, these three were used as they are specifically described in the I-LEARN model. Each citation was evaluated using this rubric and a score was assigned to each item based on the rubric's four point scale.

### 3.5.3 Participant survey

The participant survey (Appendix C) was given to participants upon submission of their assignment and included items gauging use of the library research guide, participant attitudes, and perceived value of the in-person teaching.

### 3.5.4 Library research guide usage tracking

Usage of the library research guides for each group of participants was tracked using the library research guide software. Tracking was not available for individual participants, but total hits per guide are available. While this is a crude measure, it provides some data regarding use of the guides.

## 3.6 Treatments

Both treatments included a one-shot, 50 minute class period of teaching. For both groups, the first 20 minutes included the same content:

> **0-5 min:** Objectives; class needs/topics; introduction to library research guide which includes research process steps, links to relevant databases, checklists for evaluating information resources, where to get help.
> **5-10 min:** Importance of evaluation, steps for evaluating an information resource, evaluation practice.
> **10-20 min:** Background research and pre-search strategies, keywords versus subjects, developing basic search strategy with practice searching, places to find sources for class needs/topics.

For the remaining 30 minutes, the control group had an opportunity for hands-on practice with assistance from the course instructor and the author. The control group used a standard online library research guide designed with a systems approach (Morrison et al. 2006) and addressing learning outcomes described in the Association of College and Research Libraries (ACRL) IL competency standards as their primary tool for this activity. For experimental group, the remaining 30 minutes included an introduction to the steps of the I-LEARN process through an online library research guide designed using I-LEARN as the framework. The experimental group had a class discussion about various types of information and their uses, focusing on how those could be used for class topics. The experimental group discussed how they would find, evaluate, and integrate information resources for their assignment. Participants had time to practice finding information in groups, and the session concluded with a review of the model via the guide.

Both groups were tested with the same IL skills test instrument one week prior to the in-person teaching and two weeks following the in-person teaching. The information resources participants selected for their class assignment were evaluated using the same citation analysis rubric. The experimental (I-LEARN instruction) and control (standard instruction) groups were composed of seven randomly assigned sections of a composition and communication course: four sections for the experimental and three sections for the control.

## 3.7 Procedures

During Autumn 2012, the researcher worked with instructors of the seven sections of the composition and communications course to plan specific procedures for teaching and data collection in Spring 2013. The seven sections were randomly assigned to experimental or control with assistance from the campus statistical support lab: four sections in the experimental group and three sections in the control group. These were the only sections available to the researcher. In January 2013, students in each section were given the opportunity to participate in the research, and upon signing the consent form, completed the IL skills pre-test. The library research guide appropriate for each group was then made available to each section via electronic communication

and an in-class announcement. The URL for each group's research guide was not made available to anyone outside the group, and the guide was not discoverable via the library website or an internet search. Participants were asked to include the last four digits of their phone number on the IL pre-test, post-test, participant survey, and their assignment. This was the only identifier on these items, and it was used to track their responses across the study.

In late January – early February 2013, each section attended one class period devoted to IL skills teaching. The researcher presented each session following the appropriate outline to keep the structure and content as similar between sections as possible. Approximately two weeks later, each section completed the IL skills post-test. Students submitted their class assignments in late February-early March 2013. The researcher received copies of these assignments to conduct the citation analysis. The researcher examined the references in each assignment, scoring them for authority, relevance, and timeliness using the citation analysis rubric. The only identification on the assignments was the last four digits of the participant's phone number which was used for tracking, so the researcher did not know which section a given assignment was from at the time of scoring. This helped to reduce any bias from the researcher scoring the assignments. The participant survey was given to participants in late February-early March 2013 and includes items gauging student use of the library research guide as well as participant attitudes and perceived value of the in-person teaching.

### 3.8 Data analysis methods

Statistical analysis was used to test the hypothesis that students receiving teaching designed with the I-LEARN model will perform significantly higher on the IL skills test covering the steps and procedure necessary to locate and evaluate information than students who do not receive this instruction. A *t-test* (a comparison of means) was conducted on the difference scores to determine if students in the I-LEARN instruction group scored higher on the IL skills test than students in the control group (standard instruction).

A citation analysis was used to test the hypothesis that students who receive IL skills teaching designed with the I-LEARN model will select information resources for a given class assignment that are more authoritative, relevant, and timely than students who do not receive this instruction. Each citation was evaluated using the citation analysis rubric and a score was assigned based on the rubric. A *t-test* was used to compare the means of the two groups to determine if students in the I-LEARN instruction group scored significantly higher on their citations as scored with the citation analysis rubric than students in the control group (standard instruction).

## 4. Results

### 4.1 Demographic data

The study included 134 first-year undergraduate students enrolled in seven sections of the same composition and communications course. Of the 134 students enrolled, 112 attended the IL skills class session and completed the IL skills pre-test, IL skills post-test, and participant survey. Of the 112 participants, 66 were female and 46 were male. At the large research university in the south-eastern United States where this research was conducted, this demographic makeup is consistent with the freshman class. No significant demographic differences were found between the experimental and control groups.

### 4.2. Descriptive statistics

This section includes descriptive statistics of the data gathered for the IL skills test (Table 2), the citation analysis rubric (Table 3), the number of library research guide views (Figure 4), and the frequency of library use (Table 5).

### 4.2.1 Test scores and citation analysis

**I-LEARN instruction**
This group had 70 participants. On the IL skills test, the group had a pre-test score of *M*=70.79, *SD*=12.15 and a post-test score of *M*=74.86, *SD*=13.78. The difference score for this group was *M*=4.07, *SD*=11.37. The citation analysis score for those who submitted their assignment online to the researcher (*N*=38) was *M*=2.89, *SD*=0.96 on a four point scale.

**Standard instruction**
This group had 42 participants. On the IL skills test, the group had a pre-test score of *M*=62.62, *SD*=15.51 and a post-test score of *M*=66.07, *SD*=18.63. The difference score for this group was *M*=3.45, *SD*=17.62. The citation analysis score for those who submitted their assignment online to the researcher (*N*=25) was *M*=2.92, *SD*=0.72 on a 4 point scale.

**Table 2: Pre and post test scores of participants classified by group**

| | | Pre-Test Score | | Post-test Score | | Difference Score | |
|---|---|---|---|---|---|---|---|
| | *N* | *M* | *SD* | *M* | *SD* | *M* | *SD* |
| I-LEARN instruction | 70 | 70.79 | 12.15 | 74.86 | 13.78 | 4.07 | 11.37 |
| Standard instruction | 42 | 62.62 | 15.51 | 66.07 | 18.63 | 3.45 | 17.62 |

**Table 3: Citation analysis scores of participants classified by group**

| | *M* | *SD* | *N* |
|---|---|---|---|
| I-LEARN instruction | 2.89 | 96 | 38 |
| Standard instruction | 2.92 | 0.72 | 25 |

### 4.2.2 Number of library research guide views

Usage of the library research guides for each group of participants was tracked using the library research guide software. Tracking was not available for individual participants, but total hits per guide were available as shown in Table 4.

**Table 4. Number of library research guide views, January – March 2013**

| | |
|---|---|
| I-LEARN instruction (*N*=70) | 678 |
| Standard instruction (*N*=42) | 282 |

These usage figures show that the guide (Appendix D) for the experimental group, I-LEARN Instruction (*N*=70), was viewed 678 times. The guide was viewed approximately 16 times per day during the period that participants were completing their assignments. Standard instruction group participants (*N*=42) viewed their library research guide 282 times. The guide was viewed approximately 8 times per day during the period that participants were completing their

assignments. Participants in the I-LEARN group viewed their guide twice as often as those in the standard instruction group. Despite examination of all data collected in the study, it is unclear why this is so and warrants future study.

#### 4.2.3 Library use in person and online

Participants reported on their use of the library (both in-person and online) on the IL skills test pre- and post-test instruments. In the I-LEARN instruction group, 11 participants reported not using the library online, and in the standard instruction group, 5 participants reported not using the library online. For both groups, this is an increase in using the library online.

**Table 5: Library usage in person and online of participants classified by group**

| | | Standard Instruction (*N*=42) | I-Learn Instruction (*N*=70) |
|---|---|---|---|
| Library use pre-treatment | Daily | 0 | 4 |
| | More than once per week | 8 | 8 |
| | Once a week | 3 | 3 |
| | More than once a month | 9 | 19 |
| | Once a month | 13 | 18 |
| | Once a semester | 8 | 15 |
| | Never | 1 | 3 |
| Used library online pre-treatment | Yes | 21 | 37 |
| | No | 21 | 33 |
| Library use post-treatment | Daily | 1 | 3 |
| | More than once per week | 6 | 9 |
| | Once a week | 6 | 10 |
| | More than once a month | 9 | 12 |
| | Once a month | 10 | 18 |
| | Once a semester | 9 | 16 |
| | Never | 1 | 2 |
| Used library online post-treatment | Yes | 37 | 59 |
| | No | 5 | 11 |

Both groups were consistent in their use of the library in-person as reported on the pre- and post-test instruments.

### 4.3 Reliability

Cronbach's Alpha (a test to estimate reliability) was run on the IL skills pre- and post-test items. The result of .79 indicates a fairly high level of internal consistency for the test instruments.

### 4.4 Hypothesis testing

#### 4.4.1 Test of hypothesis 1

The first hypothesis tested was as follows: "Students who receive IL skills teaching designed with the I-LEARN model will perform significantly higher on the IL skills test that covers the steps and procedure necessary to locate and evaluate information compared to students who do not receive the instruction."

In order to test the hypothesis, a *t-test* was performed. Prior to conducting the *t-test*, Levene's test for equality of variances was conducted. Based on the result ($F(1,110) = 2.08$, $p = 0.15$), equal variances were assumed. The test of the primary hypothesis that students who receive IL instruction designed with the I-LEARN model ($M$=4.07, $SD$=11.37) will perform significantly higher on the IL skills test compared to students who received the standard instruction ($M$=3.45, $SD$=17.62) did not yield a significant difference ($t(110) = 0.23$, $p$ =0.82). Thus the hypothesis is not supported.

### 4.4.2 Test of hypothesis 2

The second hypothesis tested was as follows: "Students who receive IL skills teaching designed with the I-LEARN model will perform significantly higher on the citation analysis rubric than students who do not receive the instruction."
In order to test the hypothesis, a *t-test* was performed. Prior to conducting the *t-test*, Levene's test for equality of variances (a test to assess the equality of variances for a variable calculated for two or more groups) was conducted. Based on the result ($F(1,61) = 2.41$, $p = 0.13$), equal variances were assumed. The test of the primary hypothesis that students who receive IL instruction designed with the I-LEARN model ($M$=2.89, $SD$=0.96) will perform significantly higher on the citation analysis rubric compared to students who received the standard instruction ($M$=2.92, $SD$=0.72) did not yield a significant difference ($t(61) = 0.13$, $p = 0.89$). Thus the hypothesis is not supported.

## 4.5 Secondary data analysis

Given that there were no differences found in either hypothesis test, additional tests were completed in order to determine if additional trends or findings in the data could be reported. On the IL post-test, the majority of students gave incorrect answers to questions 4, 5 and 18, despite largely getting those items correct on the IL skills pre-test. Leaving out those three questions failed to yield a significant difference.

To see if any further insight could be gained, additional analysis was conducted. The questions on the IL skills test measure specific steps in the IL process and map to four learning outcomes. Testing only the items from a single step in the process or from a single learning outcome failed to yield a significant difference.

## 4.6 Summary of results of participant survey

Participants were given a ten item scaled survey rating their experience with the teaching and the library research guide as well items gauging use of the library research guide, participant attitudes, and perceived value of the in-person teaching. The participant survey included two open-ended questions to provide participants with the opportunity to elaborate on their responses. Most participants agreed with all of the statements in the participant survey.

Looking across both groups, there were no striking differences in responses. Of all the participants ($N$=112), 94 agreed or strongly agreed that using the library research guide made it easier to find information resources for their assignment, 90 agreed or strongly agreed that they developed a better understanding of the research process after participating in the IL teaching session, 90 agreed or strongly agreed that information from the IL teaching session and library research guide will help them academically in the future, 88 indicated that they will use the library research guide for assignments in other classes, and 84 indicated that they will use what they learned from the IL teaching session for assignments in other classes. Only three participants commented negatively on the IL teaching session.

Additionally, the participant survey included two open-ended items. Of the 57 participants who completed the open-ended items, 39 described the IL teaching session as helpful and 26 participants offered a specific suggestion to improve the session or the library research guide for

the future, with nine stating that the amount of time spent on IL instruction during the semester needed to be increased. Most of those respondents suggested that at least two class periods be devoted to library research. Five participants specifically described using the library research guide for an assignment in another course. Once again, only three participants commented negatively on the IL teaching session, describing it as boring or a waste of class time.

## 5. Discussion of results

Most participants in this study described the IL teaching session as valuable and a good use of class time. Of the participants (*N*=112) responding to the participant survey, 90 agreed or strongly agreed that they developed a better understanding of the research process after participating in the IL teaching session and that information from the IL teaching session and library research guide would help them academically in the future. Survey results showed that 84 participants indicated that they will use what they learned from the IL teaching session for assignments in other classes. Of the 57 participants who completed the open-ended items, 39 specifically described the IL teaching session as helpful.

Participants also found the library research guide valuable, with 94 (*N*=112) participants agreeing or strongly agreeing that using the library research guide made it easier to find information resources for their assignment. Of the participants, 88 indicated that they will use the library research guide for assignments in other classes. Using the I-LEARN model as a template made for an attractive and useful library research guide, and some of the faculty commented anecdotally on the value of organising the library research guide by using the I-LEARN model as a template. Library research guides facilitate student information gathering, and perhaps a future study should examine I-LEARN specifically within the context of library research guide design and functionality.

Some participants recommended that they needed more time than one class period to help them in finding, evaluating, and using information sources, and 26 participants offered a specific suggestion to improve the session or the library research guide for the future, with nine stating that the amount of time spent on IL teaching during the semester needed to be increased. Most of those respondents suggested that at least two class periods be devoted to library research. While the single class period format is generally not ideal, it is often the only option available; more studies could be done to determine how best to improve this limited format.

For many years, librarians have been making the case to faculty that IL teaching is important, and valuable class time should be allotted to it. The student participants in this research study suggested that more time is needed for IL instruction, particularly in working with their team and the librarian to find credible sources to help in making their argument. Perhaps student perspectives like these help support librarians in making the case to faculty that IL teaching is an important use of class time.

Based on this discussion of the results of this study, several general conclusions can be drawn. Many students find IL teaching sessions to be helpful in developing research skills. Online library research guides facilitate student information gathering, and students find them valuable in finding sources for their assignments. In particular, the I-LEARN model can be helpful in designing an attractive and helpful library research guide.

## 6. Recommendations for future research

While no statistically significant difference was found, participants who received the standard instruction did not perform as well on the IL skills test as participants who received the I-LEARN instruction. The IL skills test difference score of those in the I-LEARN group (*N*=70) was *M*=4.07, *SD*=11.37, and the difference score for those in the standard instruction group (*N*=42) was *M*=3.45, *SD*=17.62. The I-LEARN model is new, and at the time of this experiment, no examples of its use were available in the literature. This was one of the first times the model had been used in a

real-world setting, particularly in an academic library environment. As the I-LEARN instruction was the same as, or slightly better, than the standard instruction, this suggests that future study of the use of the I-LEARN model is needed.

Based upon this study, the author has several suggestions for future implementation and study of I-LEARN. First, it would be helpful for the librarian to work more closely with the faculty member on the class assignment. This would allow the teaching to be integrated more closely with the assignment and might provide opportunities for the librarian to participate in the class throughout the semester. Instruction designed with the I-LEARN model does lend itself to needing more time than a single class period IL teaching session; however, continuing to explore ways to improve the single class period IL teaching session is important as it is often the only time allotted for this teaching.

Future use and study should consider other options for delivery. In particular, the use of I-LEARN as a framework for an online library research guide should be examined more closely. Given the positive reaction from students in using the I-LEARN-designed research guide, the author has continued to explore using I-LEARN as a template for developing online library research guides.

A future study might include more qualitative components in the research. Some questions arose as a result of this study. For students, what specifically did they find valuable about the in-person teaching and the library research guide designed using the I-LEARN model? The student insights in the participant survey were invaluable, and perhaps focus groups could be conducted in a future study to better understand student preferences of the use of one design model versus another.

For faculty, how might they consider integrating concepts from the I-LEARN model into their course? The author and the model's author began work with a small group of faculty in order to encourage them to develop instructional materials designed using I-LEARN. The rationale for having faculty create materials is that they will be able to work with students throughout the entire research process. Librarians typically help with identifying a research question and locating and evaluating information. The faculty will work with students throughout the process and can be of particular assistance in helping students apply the information, reflect on/revise their work, and ultimately incorporate the information into their knowledge base and develop new questions with this new knowledge.

The model is promising in developing other types of instructional materials. The author is planning to develop an I-LEARN-designed online learning module to scaffold an assignment for a course she is teaching next year. I-LEARN could potentially serve as a strong framework for video tutorials as well.

## 7. Conclusion

The primary purpose of this study was to determine if IL skills teaching designed using the I-LEARN model would increase student understanding and application of IL concepts as compared to how librarians currently provide IL skills teaching. This study did not show a significant difference between participants who received instruction designed with the I-LEARN model and participants who received the standard instruction. The IL skills test difference score of those in the I-LEARN group ($N$=70) was $M$=4.07, $SD$=11.37, and the difference score for those in the standard instruction group ($N$=42) was $M$=3.45, $SD$=17.62.

Participants who completed the participant survey found the teaching to be valuable and a good use of class time. They found the library research guide to be useful, and based upon hits to the guide and self-reporting of usage; it appears that most participants did use the guide for their assignment. Several participants reported that they did not have enough time to work with their groups and the librarian on finding credible sources, and they suggested that future classes should be given more time for IL teaching. These student insights might help faculty see the value of using class time for an IL teaching session.

Several possibilities for future studies were presented. The librarian might work more closely with the faculty member on the assignment in order to better evaluate the use of information. Rather than a single class period IL teaching session, the librarian might break the session into four or more parts and present them at appropriate times throughout the semester. A future study might look at using the I-LEARN model to design a semester-long, credit-bearing IL skills course. Another study might consider the use of the I-LEARN model as a design template for library research guides to better understand the effectiveness of using the model in this way. Finally, future studies might include more qualitative aspects to better understand faculty and student experiences in the use of the I-LEARN model. For example, how might faculty consider integrating concepts from the I-LEARN model into the course?

At the time of this experiment, no other examples of the use of the I-LEARN model were available in the literature. This study was one of the first times the model had been used in a real world setting, particularly in an academic library environment, and the result was that the I-LEARN instruction was as good as the standard instruction, if not slightly better, though no statistically significant difference was found. This study has shown that use of the I-LEARN model for designing teaching is promising, and further studies in this area would be beneficial.

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# Appendix A

## Information literacy (IL) skills test

Last four digits of your phone number_____
Gender_____
Age_____
Major_____
State/country of permanent residence_____

How often do you visit the library? (circle one)
Daily
More than once per week
Once a week
More than once a month
Once a month
Once a semester
Never

Do you use information resources in the library? (circle one)
Yes
No

Do you use information resources on the library website? (circle one)
Yes
No

Please circle the BEST choice for the following items:

1. Which of the following is a good practice for developing your search strategy?
    A. Type your research question into Google
    B. Make a list of abbreviations and alternate spellings of search terms
    C. Browse the current periodicals section
    D. Type your research question into a library database

2. Which of the following is a topic suitable for a five page research paper?
    A. The environment
    B. Environmental issues
    C. Environmental issues in California
    D. Impact of charging for plastic bags on the use of reusable grocery bags

3. If your keyword search “foreign policy United States” retrieves 923 results, what should you do next?
    A. Try the keyword search “United States foreign policy”
    B. Add more terms to the search and try again
    C. Scan the list to find the most relevant items
    D. Try the search again with fewer terms

4. Of the following keyword examples, which would likely provide the best results in a database search when searching for the topic: “how does exposure to smokers affect children with asthma?”

A. exposure smoke asthma
B. smoke affect children asthma
C. secondhand smoke children asthma
D. secondhand smoke asthma

5. If your assignment is to find scholarly journal articles about global warming, what should you do?

A. Browse through the periodicals section until you find an article on that topic
B. Search InfoKat, the library catalog
C. Search journal article databases
D. Search on Google

6. Which of the following is an effective search strategy?

A. Use phrases surrounded by quotation marks for more specific results
B. Search using capital letters for more emphasis
C. Look through every result you retrieve in order to choose the best one
D. Use just one search engine

7. Which would be the best source looking for current information about the price of oil?

A. Journal article
B. Newspaper article
C. Book
D. Encyclopedia

8. The most helpful research strategy for locating additional information related to your topic is:

A. Finding related sources using bibliographies of relevant sources
B. Scanning the newspaper headlines
C. Asking a friend for advice
D. Looking at Twitter

9. Which of the following would you find on the library’s website?

A. Access to electronic collections the library created or purchased
B. Hours, policies, and contact information for the library
C. Course guides that include links to recommended databases and other information resources
D. All of the above

10. Which of the following is NOT a Boolean search term?

A. AND
B. NOT
C. HOW
D. OR

11. You are looking for information about the impact of having a job on college student grades. Which of the following searches would yield the MOST results?

A. college students AND working AND grades

B. (college students OR undergraduates) AND (work* OR employment) AND (grades OR academic achievement)

C. (college students OR undergraduates) AND working AND grades

D. (college students AND undergraduates) AND (work* AND employment) AND (grades AND academic achievement)

12. Which of the following is a primary source?

A. Journal article

B. Chapter in your textbook

C. A Letter

D. Scholarly book

13. Which search would retrieve the greatest number of items?

A. Philosophy OR objectivism

B. Philosophy AND objectivism

C. Philosophy LIKE objectivism

D. Philosophy NOT objectivism

14. Looking at a website from PETA (People for the Ethical Treatment of Animals), what should you consider most closely?

A. Currency

B. Bias

C. Other links

D. Presentation style

15. Where would you find peer reviewed articles?

A. Popular magazines

B. Newspapers

C. Journals

D. Almanacs

16. Which of the following is a recommended technique for evaluating information?

A. Rely solely on author information provided from the source

B. If it has been published, it must be factual

C. Find out who published the information

D. Select only information that confirms your own opinion

17. How might you incorporate statistics into your paper?

A. Ignore ones that don't agree with your point of view

B. List statistics in your paper with no context

C. Find some that seem to fit from a Google search

D. Describe them in your paper with context

18. Now that you have found your information sources, the next step is to:

A. Use sources that are easiest to read

B. Name all of them in your references, even if you don't use them

C. Start working on your paper and fill in the gaps with quotes

D. Read your sources to see if you need to search for more information

19. After you have read an assigned reading for class, you have to write a one page paper about that reading. Which of the following is correct?

A. Because the paper is so short, you don't have to cite the reading

B. If you don't plan to publish the paper, you don't have to cite the reading

C. You need to search a library database to find the full text of the reading so that you can cut and paste into your paper

D. Even though you are paraphrasing the content, you must cite the reading in your paper

20. When performing research, you should first:

A. Locate books using the library's online catalog

B. Analyze your topic to identify broader and narrower terms and synonyms

C. Use a library database to find articles

D. Browse the shelves in the library

# Appendix B

## Citation analysis rubric

Last four digits of subject phone number _____

| Citation # | Authority | Relevance | Timeliness | Total |
|---|---|---|---|---|
| 1 | | | | |
| 2 | | | | |
| 3 | | | | |
| 4 | | | | |
| 5 | | | | |
| Average | | | | |
| | | | Total: | |

**Authority**

1 No author identified
2 Publication of business or organization with possible bias
3 Popular or journalistic
4 Peer reviewed, scholarly, or government publication

**Relevance**

1 Not at all relevant to the topic
2 Partially relevant to the topic
3 Mostly relevant to the topic
4 Completely relevant to the topic

**Timeliness**

1 Outdated
2 No date indicated
3 Acceptable but need more timely sources to complement
4 Appropriate and timely

# Appendix C

## Participant survey

Last four digits of your phone number_____

Please circle the item which best describes your experience:

1. I used the library research guide to help me in the research process for my paper. Strongly Agree Agree Neither Agree Nor Disagree Disagree Strongly Disagree

2. I developed a better understanding of the library research process after participating in the library instruction session.
Strongly Agree Agree Neither Agree Nor Disagree Disagree Strongly Disagree

3. The library research guide made it easier to find information resources for my paper.
Strongly Agree Agree Neither Agree Nor Disagree Disagree Strongly Disagree

4. As I worked on my paper, I thought about concepts I learned from the library research guide and the library instruction session.
Strongly Agree Agree Neither Agree Nor Disagree Disagree Strongly Disagree

5. The library instruction session was a good use of class time.
Strongly Agree Agree Neither Agree Nor Disagree Disagree Strongly Disagree

6. I will use information resources from the library research guide for assignments in other classes.
Strongly Agree Agree Neither Agree Nor Disagree Disagree Strongly Disagree

7. The library instruction session and library research guide helped me academically.
Strongly Agree Agree Neither Agree Nor Disagree Disagree Strongly Disagree

8. I will use what I learned from the library instruction session in assignments for other classes.
Strongly Agree Agree Neither Agree Nor Disagree Disagree Strongly Disagree

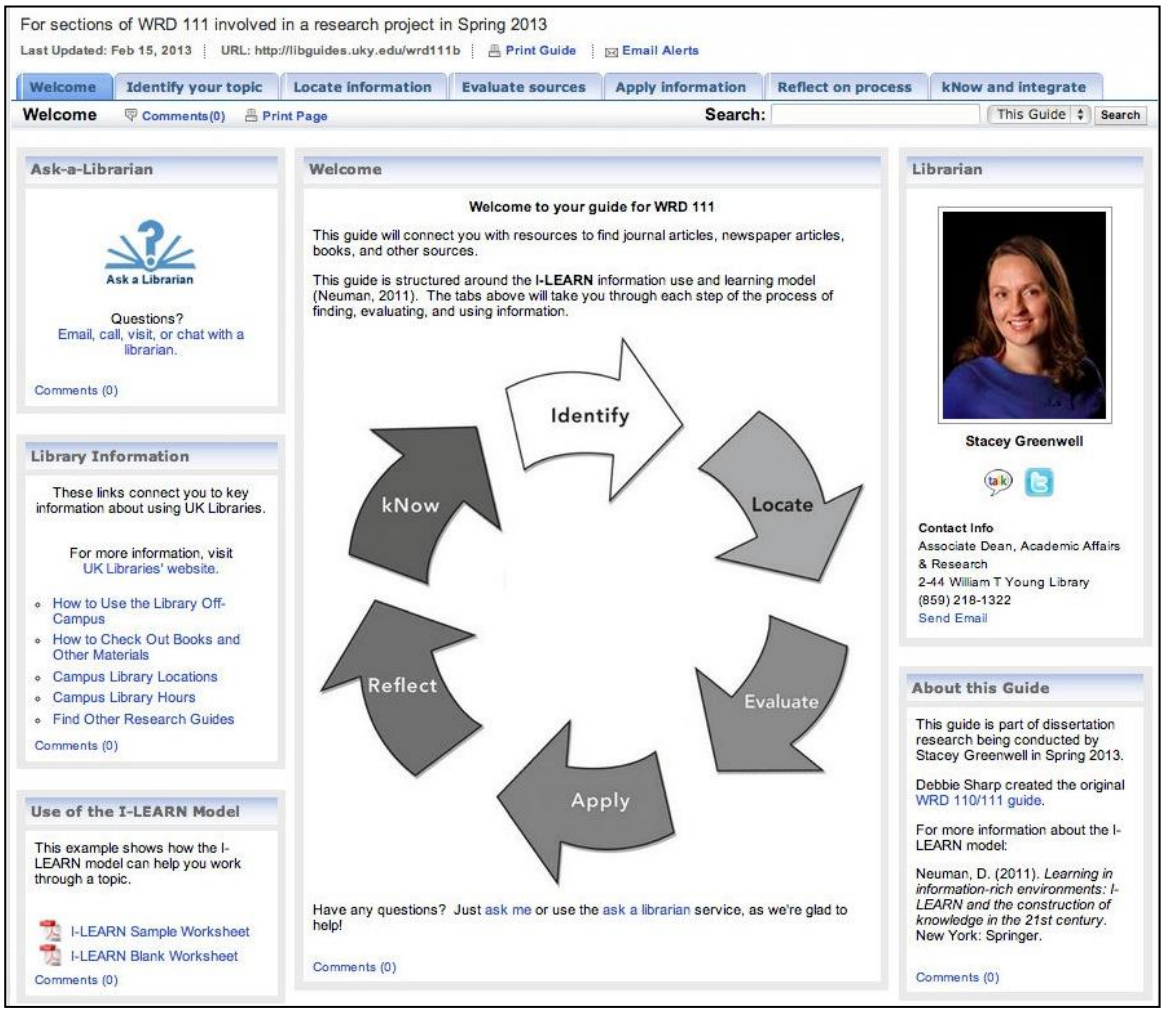
9. Concepts covered in the library instruction session or on the library research guide were integrated into the class.
Strongly Agree Agree Neither Agree Nor Disagree Disagree Strongly Disagree

10. What I learned in the library instruction session was reinforced in class.
Strongly Agree Agree Neither Agree Nor Disagree Disagree Strongly Disagree

11. What suggestions or comments do you have regarding the library instruction session?

12. What suggestions or comments do you have regarding the library research guide?

# Appendix D

## Experimental group (I-LEARN instruction) library research guide

The guide is designed for students to use independently to conduct library research. The guide includes selected databases, reference books, and other information resources appropriate for the assignment as well as a checklist for evaluation of information resources. Participants in the experimental group (I-LEARN Instruction) had access to a library research guide designed using the I-LEARN model.