Don't Use a Hammer When You Need a Screwdriver: How to Use the Right Tools to Create Assessment That Matters

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Abstract

Instruction librarians want clear data showing the effectiveness of our workshops as a way of demonstrating our value in education. This article uses instructional design approaches to show how to make specific changes when writing and measuring our learning outcomes to capture what we are doing in our sessions. Unlike instructors with classes that develop over several months, we are faced with unique challenges when conducting one-shot instruction sessions. By focusing our attention on student satisfaction and learning, we see ways to improve those sessions for everyone involved. In this essay, we provide examples and discuss how to write effective learning outcomes to answer specific questions about learner satisfaction and what the participants learned. In addition, we suggest ways to reform the evaluation and assessment questions that we use to reinforce our lessons. These methods can be used in both online and face-to-face environments.

Keywords: learning outcomes; learning objectives; assessment; Kirkpatrick; ABCD Model; Likert scales; one-shot sessions; workshops

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Introduction

Imagine: You have been asked to teach a one-shot library workshop in a credit course. (N.B.: For the purposes of this article, we will refer to time spent with learners as "workshops"; they could involve a stand-alone session, multi-part sessions, or one part of an ongoing credit class.) You are unlikely to have access to student work after the workshop is over, but you would like to know how well the workshop went and what students learned. What would you do? Many of us use some kind of assessment tool and compare the answers against our stated learning outcomes for the workshop.

There are numerous tools to determine if we have been successful and if students have learned something useful. The list includes surveys; pre- and post-tests; the "one-minute paper" (Cross, 1998; Grassian, 2001); student reflections; worksheets; "fist-to-five" or "give me five" (Fisher, 2007); short questions and answers; analysis of student bibliographies; and more. These forms of assessment are popular, they are quick, and we use them because we hope they prove that students are better prepared to complete an assignment after seeing us than they were before our session. While all of these tools are used with the noblest of intentions, we want to be clear about what they can realistically tell us about what actually happened during our instruction session. We believe that meaningful assessment of student learning, the kind that shows changes in information-seeking behavior, is nearly impossible to do in a one-shot workshop. We cannot teach every skill a student needs in one session, nor expect to quantify that the session changed how students do their research. Instead, we should focus our efforts on evaluating what is possible in a single workshop.

This article provides a framework to help you assess one-shot instruction sessions. First, we explain the ABCD Model for writing learning outcomes (LOs). If each of your LOs incorporates most of these elements, you will find that they help to clarify the content of your instruction sessions and the questions that you will want to ask students at the end of your session.

Once you have developed clear outcomes that incorporate the elements described in the ABCD Model, you should consider how best to determine whether students have met them. We suggest employing the four-part Kirkpatrick Model to guide these assessment decisions. Although the Kirkpatrick model was developed and widely used in private industry for decades, it is applicable to library instruction because it helps clarify what can be evaluated and assessed given the time and resources at your disposal.

It is impossible for instructors to change students' research behavior after one interaction with them. You will learn more about what students learned, and what they thought about the class, if you use the instructional design models presented here. It is important to have reasonable expectations of what you can evaluate or assess, and then to focus on developing methods that provide that data. We hope this article will help you create assessment that matters by choosing the right tools to provide specific feedback.

ABCD Model

As librarians, we know that our workshops should be guided by learning outcomes (LOs), which are statements written by an instructor that describe what learners should be able to do as a result of instruction. LOs can guide workshop design to help focus on specific behaviors and/or skills that you have determined are important for students to demonstrate as a result of instruction. By taking time to consider the LOs for a workshop, you will reflect on the most important behaviors and/or skills necessary to fulfill the instructional goal, and you will be less likely to overwhelm students with extraneous information. Many educators rely on Bloom's Taxonomy to create LOs. Developed in 1956 (Bloom & Krathwohl, 1956) and revised in 2001 (Anderson, et al., 2001), Bloom's Taxonomy is used "to categorize intellectual skills and behavior important to learning" (Coffey, n.d.). The revised Bloom's Taxonomy provides six categories of outcomes: remember, understand, apply, analyze, collaborate and create. Each level has verbs associated with it that describe the cognitive process used by a learner. For example, the "remember" category might include verbs like *recall, define, list*, etc., while the "create" category includes verbs like *design, develop, investigate*, etc. The goal is to get learners to apply the cognitive processes in the highest category possible: i.e., analyze, collaborate, or create. However, a learner will likely need to "remember" facts and "understand concepts" before they can achieve the higher order learning. Many educators use the verbs suggested in Bloom's taxonomy when writing their

outcomes. An update by Anderson and Krathwohl (2001) is widely used and is an excellent resource for appropriate verbs to use in writing your own LOs.

While including the observable behavior, associated verbs, and cognitive scaffolding suggested by Bloom's Taxonomy are important aspects of writing a complete LOs, there is still more that you can do with them. You can write them to guide your evaluation and assessment decisions. Many instructional designers and educators have adopted the ABCD Model to make LOs measurable as well. In this model, each outcome names "the *A*udience of learners . . . specifies the *B*ehavior or capability to be demonstrated and the *C*onditions under which the behavior or capability will be observed . . . [and] the *D*egree to which the new skill must be mastered" (Heinich, Molenda, & Russell, 1989, p. 36). Addressing each element in this model provides a map of how you intend to teach and assess each outcome. We describe each ABCD Model element in detail below.

Audience

This part of the model asks the question, "Who are the learners?" The answer can be as broad as "learners" or "students," or it may describe the audience more specifically: for example, "undergraduate students" or "microbiology graduate students." To make the outcome most useful, the audience description should accurately describe the majority of learners in the workshop.

Behavior

Next, you need to address the question, "What do learners need to demonstrate to show they've achieved the outcome?" In other words, what do you want your learners to be able to do when they leave your workshop? As noted, Bloom's Taxonomy offers vocabulary that can be used to describe optimal student behavior as a result of achieving the LO, and can help you begin to assess student learning. The key here is that the behavior needs to be observable so that it can be measurable. You can't assess what you can't see. For example, instead of writing a LO that says students will understand a concept, ask yourself what the concept of understanding really means to you, and use that word instead. It could be the ability to use a particular feature in a database, or to describe how truncation works. In this case, you would replace the word "understand" with "use" or "describe." If you would like to measure this outcome, consider collecting student work or request to see a sample of the end product, so that you can assess how well your students performed.

Condition

The condition statement is likely the most unfamiliar part of the ABCD Model for most librarians. The question to answer here is "Under what conditions do learners need to perform the behavior?" Another way to think about this step is to consider it as the control statement. An example of a condition statement could be: "…given a list of article databases with descriptions…" The key factor is that the condition specifies that learners will have a list of article databases with descriptions. If the statement omitted the phrase "with descriptions," then the behavior to "identify relevant databases" would imply that learners would need to independently assess the relevance of the databases. The current wording ("…given a list of article databases with descriptions…") specifies that you will assess the behavior of students identifying a relevant database for their topics given a list of databases with descriptions. A thoughtful description of the condition will guide you in how to teach the behavior and how to assess it.

Degree

Finally, you should ask, "To what degree do learners need to perform the behavior?" This part of the model is most applicable when you are assessing learners formally or if you have access to a work product. A degree statement specifies which percentage of the learners should achieve the outcome in order for you to know that the material has been learned. Because most librarians do not have access to student work or other formal assessments after a workshop, many LOs are likely to omit the degree statement. However, if you are teaching a term-long course or see the same students multiple times during a term, you should consider a degree statement.

Here is an example of an ABCD outcome: "Given a research question and a Wikipedia article about the topic of the question, learners will be able to generate a list of at least three keywords or phrases for each concept represented in the question." The audience is *learners*, the behavior is *generate a list,* the condition is *given a research question and a Wikipedia article*, and degree is *at least three keywords or phrases*. To clarify, the condition in this outcome states what the learners are given in the workshop. For example, if the condition statement was more general (e.g., "Given a topic, learners will be able to….") instead of enumerating the specific tools used (e.g., "Given a research question and a Wikipedia article about the topic of the question…"), you would also need to change the assessment method for this outcome. If learners just have the topic, you are implying that they can have any research question and

use any sources to generate their list of keywords. This approach may be fine; however, it will be more difficult to assess whether learners achieve this outcome because you will not know which sources they consulted. When your condition specifies the source, you are guiding and prompting them about where to look for keywords, and you are therefore better able to assess if learners have achieved the outcome.

Kirkpatrick Model

Next, we will discuss how you can use expanded ABCD outcomes with the Kirkpatrick Model to improve assessment. We will use the interaction of these models to argue that what you can reasonably measure depends on how extensive your interactions are with students. By using Kirkpatrick's levels with the ABCD outcomes, you can verify that LOs correspond to the appropriate amount of subject matter to cover in the time you are allotted. The four levels of evaluation will help you examine where the LOs fall with the model. Once you know the Kirkpatrick Level for your outcome, we offer suggestions for the types of assessments you might use with outcomes at that level.

The Kirkpatrick Model is widely used in many industries for assessment and evaluation of training. This model uses four levels of evaluation developed in 1954 by Donald L. Kirkpatrick as a result of his dissertation in philosophy (Kirkpatrick, 1954). The robustness of his framework has been demonstrated by its use in fields as wide-ranging as "business, government, military, and industry" (Watkins, et al., 1998, p. 90). While the model is not widely used in library instruction, it is beginning to be recognized as a useful tool for evaluation (Kaplowitz, 2014). We will explain here how to implement it in information literacy and instruction. Throughout the Model's 55-year history, the descriptions of the four levels have been updated to reflect current evaluation concerns; however, the original four levels remain the same and are still relevant (Kirkpatrick Partners, n.d.). For this paper, we use the following definitions: Level 1 corresponds with satisfaction of the students; Level 2 with what the students learned; Level 3 with what the students applied in practice; and Level 4 with whether the students are information literate as a result. The sections below describe each of the four levels and provide examples of both well-written and incomplete (i.e. non-example) LOs for each level. The image below illustrates Kirkpatrick's four levels, the question for each level, and the types of instruction for which it is recommended (Turnbow & Roth, 2014).

Figure 1 – Kirkpatrick's Four Levels & Library Instruction
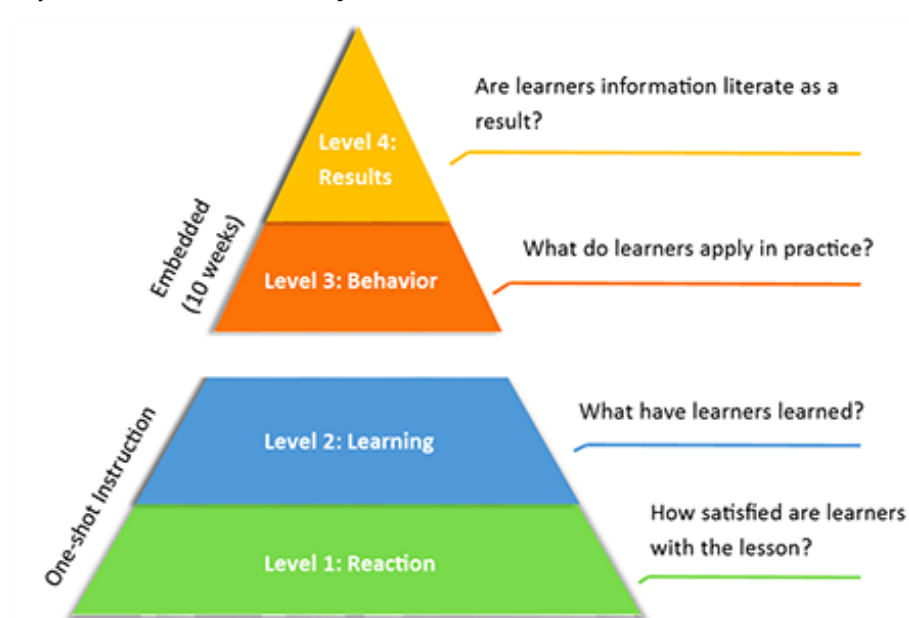
Level 1: How satisfied are your learners?

Level 1 concerns learner reaction. Level 1 assessment allows instructors to ask questions and receive meaningful responses about what the learner feels about a workshop's format, instructor, classroom set-up, etc. Issues of library anxiety and students' confidence in using library resources can also be evaluated here. Examples of common Level 1 assessment techniques include end-of-class evaluations soliciting feedback from our learners.

Table 1 – Examples of Level 1 Assessment

Level 1 Example	B. Level 1 Non-Example
After attending a library workshop, 90% of students will feel more confident than they did prior to attending the workshop because they know where to get help with their research.	Students will get help from the librarian.

Examining these two outcomes through the lens of the ABCD Model, it is clear why Example A is more useful. First, there is a specific condition statement: *"after attending a*

library workshop," which Example B does not include. Second, asking learners to rate their confidence (A) is a measurable behavior, as opposed to the vague behavior *"students will get help"* (B). Finally, Example A includes a degree statement, *"90% of students,"* an established benchmark, which Example B does not include. Using Example A, it is clear that if less than 90% of students feel more confident they know where to get help as a result of your workshop, then the LO is not achieved. (Remember, this is *your* benchmark, so make it whatever feels right to you. If a smaller percentage seems more attainable, then use the smaller number.)

End-of-class evaluations or feedback forms are effective ways to measure success with Kirkpatrick Level 1 issues. Will Thalheimer (2016) is a well-regarded expert on an evaluation called "smile sheets," which he describes as "a set of questions provided to learners after training – or a portion of training – asking for learner's perceptions of the value of the training" (p. 5). You can use a paper or an online evaluation survey to quickly solicit Level 1 feedback, which focuses on learner satisfaction. A simple survey format consists of two or three clearly-labeled replies and space for comment. Examples of Level 1 questions include:

- The presentation was clear and understandable.
- I enjoyed the library workshop.
- The instructor was engaging.
- The classroom set-up and technology facilitated my learning experience.
- I am confident that I know where I can get help with my research.

Appendix A includes an example a Level 1 assessment tool in a library workshop using these questions.

Many educators and librarians are familiar with Likert Scales, which are questions asking the responder to use a rating for their answer, usually on of scale of 1-to-5 or 1-to-10. Thalheimer (2016) observes that, while popular, Likert Scales are problematic as assessment tools for several reasons. To begin, if you are using a five-point scale (with 1 being the lowest score and 5 being the highest), it is almost impossible to understand the difference between each person's rationale for choosing between 1 and 2 or between 4 and 5. More significantly, the kinds of questions you should ask for Level 1 assessment have to do with student satisfaction, which can and should be posed directly. Finally, depending on which tool is used for these questions, the mechanics of the survey layout may make student

responses confusing. As of this writing, the popular and free Google Forms does not allow users to label each point on a Likert Scale. (Using a five-point Likert Scale on a Google Form led one colleague to wonder why half of his students seemed to understand a point that he had students practice in multiple ways, while the other half remained disturbingly fuzzy on it. He discovered that many of the students were confused about which choice was which on the Likert scale.) If you must use a Likert Scale, consider using software such as Qualtrics, which allows you to label each point. If not, consider using pull-down menus, or better yet, radio buttons, which allow you to set up replies with clear labels. In the next section, we will explain how to use questions and any possible answers to get more specific information about what your students have learned.

Level 2: What have students learned?

Kirkpatrick Level 2 assesses student learning. This level is concerned with the knowledge and skills learners have acquired as a result of a workshop. Many of your LOs are likely to fall in this level. The most widely used way to assess knowledge and skill level at the end of a one-shot workshop may be administering pre- and post-tests; however, we think that other options, detailed below, are more instructive.

A well-written LO will guide you in designing formative or summative assessments. Kaplowitz describes formative assessment as learning activities included during your instruction that can be used as mini-assessments (2014). Summative assessments are usually administered after instruction and are meant to "measure the overall effectiveness of instruction once it has been completed" (Kaplowitz, 2014, p. 123). Examples C, D and E all demonstrate Level 2 LOs for one-shot library workshops.

Table 2 – Examples of Level 2 Assessment

C. Level 2 Example	D. Level 2 Non-Example
Given an overview of six search strategies that one can use to modify a search (i.e. Boolean; limits; abstract; database subject and keywords; bibliography/cited references; times cited references; and related records), students will be able to use at least three of them to modify a search in a database of their choice for their topic.	Understand how to use Boolean terms, subject headings, MeSH terms and peer-reviewed journals for advanced searching.

If we examine these two outcomes through the lens of the ABCD Model, it is clear how C is the better of the two. In addition to the condition statement present in Example C, it describes observable behavior that students will need to demonstrate. We can observe students using search strategies; we cannot observe them understanding search strategies. Given the circumstances of the one-shot session (very limited time with the students and no access to student work after the session), we cannot reasonably expect to make this outcome measureable, but at least we can observe the behavior during the workshop (see sample in class activity below). Example C also specifies that students need only use at least three of the six strategies demonstrated. This statement clarifies the degree to which the students need to achieve the outcome. While both Example C and Example D lack degree statements, this type of LO can be assessed in different ways (described below). However, you could include a degree statement and know that achievement would be based on a sample of student work. Alternatively, Example E demonstrates how to rewrite the outcome to include a degree statement and different assessment.

A sample in-class activity for formative assessment (as illustrated in Appendix B) might include a worksheet that asks students to search a database and use three of six demonstrated search techniques. Students would note which technique they used and whether they thought it was useful. These worksheets can be collected by the librarian or turned in to the instructor. If they are turned in to the instructor, you could ask for a sampling of them at the end of the term to assess the knowledge and skills the students gained as a result of the workshop.

A method for assessing student learning summatively might be a search log assignment in which students name the strategy they used and why they used it. You could require them to use only a few of the strategies demonstrated, since not all of them will be applicable to the assignment. If the workshop is a one-shot session during a term-long class, ask students to turn in search logs to the course instructor and request permission to review them. The benefit to this second strategy is that your assessment allows students the time to practice using the new knowledge and skills. As such, it is more reflective of actual learning than an immediate assessment.

There are times when you may not be able to provide an in-class activity as described above and illustrated in Appendix B. In these situations, you can still use smile sheets as a way to conduct Level 2 assessment. The key here is to make sure questions are focused on

performance, not just feedback (Thalheimer, 2016). Example E below is an example of how you could rewrite the LO in Example C to address a performance-based smile sheet.

Table 3 – Example E.

E. Level 2 Example
After attending the library workshop, 80% of students will indicate that they are able to use the search strategies taught (i.e. Boolean; limits; abstract; database subject and keywords; bibliography/cited references; times cited references; and related records), with more practice or at an adequate or proficient level.

An example of an assessment question for this LO might look like this:

As a result of this workshop, **are you able to use** the search strategies (e.g. Boolean;

limits; abstract; database subject and keywords; bibliography/cited references; times cited references; and related records) taught to search a database for your topic?

A. I am NOT ABLE TO USE the search strategies taught in a database for my topic.
B. I have general awareness of the search strategies taught, but I will need MORE GUIDANCE to use them to search a database for my topic.
C. I am able to use the search strategies taught, but I will need MORE PRACTICE to use them well to search a database for my topic.
D. I am able to use some or all of the search strategies ADEQUATELY to search a database for my topic.
E. I am able to use some or all of the search strategies at a PROFICIENT level to search a database for my topic.

The answer choices that learners select for this question are focused on their impression of their ability as a result of your workshop. Our LO is written to say that if 80% of learners indicate options C, D, or E, then our instruction has been successful. Appendix C includes our reasoning for this approach and offers additional guidance on how you might interpret results from this type of question.

A well-written LO will guide you in designing formative and/or summative assessment. It will also help illuminate how you could teach the content students will need in order to demonstrate the knowledge and skills achieved.

Level 3: What do learners apply in practice?

Kirkpatrick's Level 3 focuses on learner behavior. What do learners apply in practice? It is one thing to learn a new skill, but what most instructors are concerned with is whether learners are changing their behavior as a result of instruction. For example, students may have learned and even practiced truncation in your workshop, but are they actually using it when it's appropriate to do so in their searches outside of the workshop?

In our experience, most instructors want to be, and think they are doing Level 3 assessment. We argue that it is difficult, if not impossible to do Level 3 assessment in a one-shot workshop. Changes in research behavior require time and practice. While a one-shot workshop might be well taught, we maintain that it is unlikely to be sufficient for changes of this kind. Example F provides a sample of a Level 3 LO.

Table 4 – Example F.

F. Level 3 Example
Given an overview of six search strategies that one can use to modify a search (i.e. Boolean; limits; abstract; database subject and keywords; bibliography/cited references; times cited references; and related records), students will use appropriate strategies for their topic as determined by a librarian reviewing their search log.

Example F slightly is different from a Level 2 outcome (C); although the behavior is the same, what is being assessed is changed. Instead of asking participants to fill out a handout or complete an exercise as a measure of success, an expert is reviewing a search log. It is significant to note that this outcome focuses on what students are actually doing on their own outside of class. We are measuring change in research behavior: Are students making the decision to use the preferred behavior (i.e. using truncation)?

While Level 3 might not be attainable in a one-shot workshop, it should be considered if you are teaching a term-long course or have multiple contacts with learners throughout a term or program. Contact with students over time allows you to create assessment activities that can reinforce desired skills and measure behavior change.

Level 4: Are learners information literate as a result of instruction?

Kirkpatrick Level 4 is about results and return on investment. In our experience, most instructors want to know if learners are more information literate as a result of instruction. If we had confirmation that this was the case, we would be able to argue that an instruction program and our teaching efforts are producing a solid return on investment of time, energy, and resources.

While instructors want to confirm their effectiveness with this kind of assessment, we argue that it cannot be done at the end of a one-shot workshop. Both Level 3 and Level 4 assessments are better suited for term-long or embedded courses, or for curriculum development. A comprehensive assessment might administer a post-graduation information literacy skills test, survey and/or focus group. While this may not be realistic for all institutions, there are projects that are striving for Level 4 assessment across our field.

We think the depth and scope of the Carleton College "Information Literacy in Student Writing" project is a wonderful application of Level 4 assessment. This project uses a rubric to evaluate multiple sophomore writing samples selected at random for evidence of attribution, communication, and evaluation of sources (Jastram, et al., 2014). It is a process that allows the instruction librarians to consider students' habits of mind in an authentic learning environment. Based on their findings, the program can shape the instruction topics, and it targets the classes that may benefit from additional information literacy instruction.

Another example of Level 4 assessment is Project Information Literacy (PIL), done with the University of Washington's iSchool. PIL coordinates large-scale data samples of students at different campuses across the U.S., studying their information-seeking behavior (Head, n.d.). For example, PIL looked at recent graduates and their employers to compile findings that revealed some significant differences between what employers expected recent college graduates to know, and how those graduates actually conducted their research. The new employees were surprised to find that the pace, amount of ambiguity, and lack of direction in their workplaces was different than what they expected to find (Head, 2013). These findings have implications for what information literacy programs can teach students while they are still in school, and they are unlikely to have surfaced in any summative or formative evaluations conducted in a single workshop or a credit course.

Conclusion: Use the right tools for the job

We have outlined how to combine a number of instructional design approaches and tools not typically used in library instruction; we recommend that you rethink how to structure, evaluate, and assess one-shot instruction, and then deploy these approaches accordingly. The ABCD Model and the Kirkpatrick Four-Level Evaluation Model provide frameworks for you to improve LOs. We have also provided examples of how to evaluate and/or assess the outcomes using various tools, including smile sheets and in-class worksheets. With this knowledge, we urge you to stop trying to do too much in an instructional setting. Librarians know that assessment is important, but we need to be doing the level of assessment that aligns LOs and class format. When teaching a one-shot workshop, you should not expect to conduct Level 3 assessment effectively. Instead, focus on creating in-class activities and performance-based smile sheets that will result in the learning measurable with a Level 1 or Level 2 assessment. You can use student work samples from a workshop (even if it is after the term) to gauge progress toward Level 3. It is also unrealistic to assess every student; just focus on getting a sample. We are confident that the sample will be an excellent way to show your value and to improve your instruction. Remember that learning is a process and takes time. It is unlikely that you will achieve Level 3 assessment unless you are deeply embedded in a department, helping with curriculum/course design, or teaching a term-long course. If Level 4 assessment is what you think (or have been told) is the most important part of your instruction program, then design a study that can accomplish that goal. The fact that it cannot be done in a one-shot instruction session does not mean you failed as an instructor. While you are waiting to conduct those big studies, we encourage you to concentrate efforts on retrieving the data to support and improve instruction. If you follow the models presented in this article, you will be poised to write effective LOs aligned with realistic evaluations, and you will be prepared to assess them using the right tools. Ultimately, this practice will allow you to collect meaningful data that will improve practice and demonstrate value.

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Appendix A – Example of Level 1 Assessment (End of Workshop Survey)

These are good questions to use at the end of a workshop to address material covered and impressions, but not how students put their new skills to work. If your goal is to measure implementation, you should wait a few weeks before sending out your evaluations (Thalheimer, 2016, p. 46-49).

I enjoyed the library workshop.

- ☐ I loved it
- ☐ I liked it
- ☐ I disliked it

Comments (especially if your answer is **dislike it)**:

The instructor(s) was engaging.

- ☐ I was engaged for most of the workshop.
- ☐ I was engaged some of the time.
- ☐ I was almost never engaged for the workshop.

Comments (especially if your answer is **almost never)**:

The classroom set-up and technology facilitated my learning experience.

- ☐ Yes
- ☐ No

Comments (especially if your answer is **No)**:

I am confident that I know at least one way to get help with my research.

- ☐ Yes
- ☐ No

Comments (especially if your answer is **No)**:

Please provide any comments to help us improve this class in the future:

If you have any remaining questions or want a librarian to contact you for help, provide contact information here too. Anonymous questions will be sent to the class.

Appendix B – Sample Level 2 Assessment (In-Class Activity)

Spend a few minutes reading the descriptions for the databases recommended on the Library web guide. Select at least two databases that you could use to search your topic and write about why this one is good for your topic.

1. Database #1:

   Why you selected it:

2. Database #2:

   Why you selected it:

Search one of the databases you selected above using at least three of the techniques presented in the workshop: Boolean operators, limits, abstract, database subjects/keywords, cited references or related records. Describe what you did and whether or not you thought it was useful.

1. Technique #1:

   Description:

2. Technique #2:

   Description:

3. Technique #3:

   Description:

Identify at least one article from your searches that you would like to read. Use [Institution SFX tool] to determine if it is available through the Library. Write the citation in MLA format below and select how you would get the item from the Library.

Citation in MLA format:

Is this item available online, in-print, both or via Interlibrary Loan?

Appendix C: Sample Level 2 End of Workshop Assessment

The example below illustrates how you could assess a learning outcome using an in-class activity and an assessment question.

In our limited experience of using questions like these for end-of-workshop evaluations, it has become increasingly clear that the examples and practice in the workshop should illustrate the complexities or gray areas for a concept; otherwise, students will be over-confident in their ability to do the task. For example, if the learning outcome is for the learner to be able to identify when to use Boolean operators, it isn't enough to just ask them to define "Boolean." Instead, ask what they expect would happen if they used Boolean for a particular search. How would the results differ than if they didn't? Make sure the questions are difficult enough to offer some hesitation or discussion. If they are too easy, students may be over-confident in their ability since all they've experienced are "successes" through instruction. Below is an example of a question that you could ask during a workshop.

Question: Which of the search strategies below would yield the results in red?
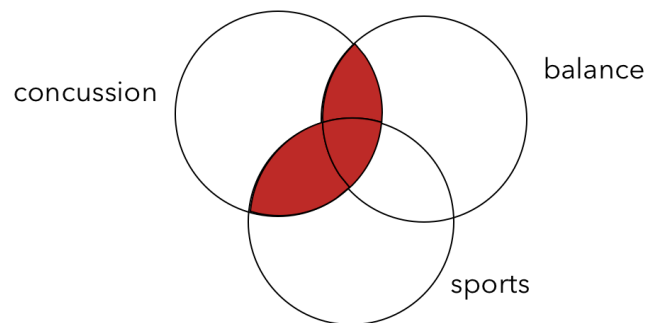
A)   (concussion AND balance) OR sports
B)   concussion AND (balance OR sports)
C)   (concussion OR balance) AND sports)
D)   concussion OR (balance AND sports)

After students have had time to practice the desired behavior (in this case, using Boolean), then you could use a Level 2 assessment such as the one below:

Question: As a result of the library workshop, are you able to use Boolean operators (AND, OR, NOT) as a part of your search strategy?

A. I'm NOT AT ALL ABLE to use Boolean operators as a part of my search strategy.

B. I have general awareness of how to use Boolean operators, but I will need MORE GUIDANCE to use them as a part of my search strategy.

C. I have general awareness of how to use Boolean operators as a part of my search strategy for this assignment, but I will need MORE PRACTICE to use it in future assignments.

D. I am able to use Boolean operators SOME of the time as a part of my search strategy.

E. I am ALWAYS able to use Boolean operators as a part of my search strategy when it is appropriate.

The table below provides guidance on how you could interpret the results of students' answers to the question above. Column A provides the answer options, and Column B is a suggestion of how you could interpret these results.

Column A: Answer Choice	Column B: Proposed Standard
A. I'm NOT AT ALL ABLE to use Boolean operators as a part of my search strategy.	Unacceptable. If students selected this answer choice after one-shot instruction, it would be evidence that the instruction was not successful.
B. I have general awareness of how to use Boolean operators, but I will need MORE GUIDANCE to use them as a part of my search strategy.	Unacceptable. If students selected this answer choice after this one-shot instruction, it would be evidence that the instruction was not successful.
C. I have general awareness of how to use Boolean operators as a part of my search strategy for this assignment, but I will need MORE PRACTICE to use it in future assignments.	Acceptable. If students selected this answer choice after one-shot instruction, it would be acceptable (and expected).
D. I am able to use Boolean operators SOME of the time as a part of my search strategy.	Superior. If students selected this after one-shot instruction, it would be great, although unlikely.
E. I am ALWAYS able to use Boolean operators as a part of my search strategy when it is appropriate.	Unlikely. It is not likely that students will be proficient as a result of one-shot instruction unless they had prior search experience.

Boolean question from Dr. Andy Karduna, Department of Human Physiology, University of Oregon.