Developing a Library and Information Science Cataloging Course with an Interactive Authoring Tool

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Abstract

Library and Information Science (LIS) students, librarians or library staff may not fully understand cataloging and classification in a library setting. As a result, many of these individuals may not be able to perform important cataloging duties when needed. To address this need, instruction was developed to introduce the basics of cataloging and classification. The instruction included an introduction and three modules covering data standardization, cataloging tools, and classification structures. The goal of the instruction was to provide training to LIS graduate students, librarians and library staff to help them grasp basic cataloging and classification knowledge and skills applicable in a library setting. To foster learning, this instruction was designed to create an interactive learning environment, and followed Mayer's (2009) multimedia learning principles. The instruction was assessed for its usability and learning effectiveness by 19 adult participants (n = 19). To evaluate the instruction's usability, one in-person and two online semi-conducted interviews were conducted. To evaluate the instruction's learning effectiveness, Google Forms were used to administer a demographic survey, a pretest, a posttest, and a post-instruction survey. The post-instruction survey asked about the participants' learning experiences with the instruction. The results of the evaluation revealed some discrepancies between the views of the course designer and those of the participants. Through the usability and learning effectiveness testing, participants identified possible future enhancements regarding the instruction's content, delivery, and software development.

Keywords: libraries, cataloging, classification, metadata, multimedia learning, online learning, interactive authoring tool, self-directed learning

Introduction

Cataloging is a process that describes and provides access to library materials by application of established and organized standards. Standardized organization of information optimizes the retrieval of information (Snow et al., 2018). However, LIS students may not grasp cataloging standards and are not able to perform cataloging duties after graduation when there is a need for them to take up cataloging tasks. This presents a challenge for libraries, which could save money and time if their employees have multi-skill sets in library and information science.

Cataloging and metadata play an essential role in information organization. Metadata is "data about data" or information about information (Riley, 2004, p. 5). Cataloging is the process of creating metadata records for information resources. Whether LIS graduate students intend to work in cataloging or not, they should have some basic background in metadata and information organization. It would help them prepare for future careers in information organization or related working environments (Kyprianos et al., 2022). To fill in the gap, this project aimed to develop instruction to provide LIS graduate students, new librarians and library staff with a learning module about cataloging and classification. The purpose of the instruction was to enable learners to acquire basic cataloging standards, apply some cataloging tools for cataloging, and gain some experience.

Problem Statement

Cataloging and classification, a subset of information organization, serves vital functions in the effective organization of library materials. Providing quality bibliographic records is essential in enabling users to discover, select, and locate information that they need. Cataloging and classification are fundamental skills in library and information science. The American Library Association (ALA)'s Core Competences of Librarianship included knowledge of "systems of cataloging, metadata, indexing, and classification standards and methods used to organize recorded knowledge and information" (ALA's Core Competences of Librarianship, 2009, p. 3). However, according to a 2016 study, more and more LIS programs did not list cataloging and metadata as a core course or a graduation requirement (Alajmi & ur Rehman, 2016). Moreover, Snow et al. (2018) stated that courses in information organization offered in

library schools tended to be broader in scope than traditional library cataloging courses. As a result, LIS graduate students may have little knowledge of how to apply cataloging standards and practices in a library setting (Snow et al., 2018). Another study showed that few school librarians used descriptive cataloging standards such as Resource Description & Access (RDA), which provided guidelines for constructing bibliographic data; in addition, school librarians did not value descriptive cataloging or controlled vocabulary as important skills (Engelson, 2019). According to a more recent study, LIS students had difficulties understanding the theory, terminology and tools of cataloging, and did not obtain the knowledge offered by a cataloging course at a satisfactory level (Kyprianos et al., 2022). Kyprianos et al. (2022) suggested that instructors should think of alternative and better ways to engage students in the learning process.

To summarize, the current state suggested LIS graduate students may not grasp the basics of cataloging and metadata skills after graduation. There was a gap between their knowledge and skills needed in library settings. It is desirable for LIS graduate students to possess these skills to apply in a future library work.

Target Audience

The target audience for this instruction was LIS graduate students, librarians and library staff who were interested in learning cataloging and metadata creation. There were a wide range of characteristics of this group. Table 1 indicates some general and common characteristics of the group, which had implications for the instructional design.

Table 1

Audience Analysis

Cognitive Characteristics	Physiological Characteristics
• Ability to read, write and type • Comprehend and follow instructions • Have attention to details • Able to memorize rules • Ability to organize and classify information • Capable of evaluating information resources • Possess analytical and critical thinking skills	• Access to computers/internet • Able to use multimedia • In good physical condition • In good mental health
Affective Characteristics	**Social Characteristics**
• Confident in learning new things • Interest in exploring new tools and technology • Respect for peers and able to cooperate with them • Motivated in self-directed learning	• From a variety of race/ethnicity • From various cultural backgrounds • From a variety of academic disciplines • Different ages • Different sex • Well-educated • Busy with their work, study and life

The target audience comprised individuals who attended a library and information science program or were engaged in the library and information science profession. They possessed broad knowledge of various subjects, and were in the areas of study or positions where technology and systems were constantly evolving and changing. Thus, the target audience was ready to adapt to new technology, tools and systems. They possessed strong organizational skills, and were capable of evaluating resources. Besides, they were able to apply critical thinking and problem-solving skills.

The target audience was in good physical and mental health. In their daily life, they worked with computers, the internet, and multimedia. In general, the target audience had

relatively high emotional stability, and good flexibility. They were able to engage in self-directed learning and could be self-motivated to learn something new, such as new tools, technology and learning strategies. Besides, the target audience was from a wide range of race/ethnicities. They had different cultural backgrounds and a variety of academic disciplines. Generally speaking, they were well educated. A majority of them possessed a bachelor's, a master's, or a Ph.D. degree, and some of them were still in pursuit of another degree. They had many opportunities to work with people. In addition, the target audience was typically very busy with their study, work or life.

Whatever their age and sex, the target audience were motivated to learn new things. Something notable with implications for the design was that the target audience usually had a busy life. This indicated that an easy-to-navigate platform, less overwhelming resources, and a self-directed strategy would be suitable for them. This was important because, as Konstantinos et al. (2022) stated, the knowledge and skills of cataloging were broad; therefore, the design of a cataloging course should not overwhelm them. The implications of the characteristics of the target audience indicated that it was desirable to use an interactive tool to engage them in learning, and save their time.

Literature Review

Before beginning the project's instructional design, a literature review was conducted to explore the education of cataloging and classification in the field of library and information science. Firstly, the need of a basic cataloging and classification course for LIS graduate students was reviewed. Next, the core course content in the basic cataloging and classification was explored.

Cataloging and classification courses

Many professionals in the library and information science field expressed the need for LIS graduate students to gain some fundamental theoretical and practice in cataloging and metadata creation. Here were some opinions and concerns from the library and information science professionals. Joudrey & McGinnis (2014) stated that employers were reporting a

decrease in qualified applicants for cataloging positions. It was desirable that LIS programs developed a curriculum that conveyed the value of standards and cataloging quality to students (Engelson, 2019). Cataloging was not only behind-the-scenes work, but a public service, and everyone working with patrons and systems needed to learn cataloging standards and practices at least on a basic level (Snow et al., 2018). This was echoed by Moulaison & Wiechert (2015) who argued that a fundamental understanding of cataloging practice, such as cataloging records, cataloger's tools, and current practice, was essential.

Libraries must have content and that content needed to be organized at a very basic level (Moulaison & Wiechert, 2015). Cataloging and classification was an integral part of library services. In the library and information science field, technology was changing, and various aspects of cataloging such as cataloging standards and rules were also rapidly evolving. Some understanding of cataloging theory was essential for LIS graduate students or library employees to understand information organization in libraries or similar working environments. For example, in 1998, a conceptual model known as Functional Requirements for Bibliographic Records (FRBR) was recommended by the International Federation of Library Associations and Institutions (IFLA). The purpose of this model was to reconstruct the bibliographic and authority records. It was an entity-relationship model that offered perspectives on the structure and relationship of information resources. The main purpose of the conceptual model was to improve catalog records, as a product, cataloging, as a process, and catalogs, as a technology (Carlyle, 2006). It would be instrumental for LIS graduate students, new librarians and library staff to have a basic understanding of the conceptual models, such as FRBR, work (a distinct intellectual or artistic creation), expression (realization of a work), manifestation (physical embodiment of an expression), and item (singular exemplar or instance of a manifestation). For practical aspects of cataloging, several cataloging procedures were involved in creating a bibliographic record for a library resource, description, subject analysis, classification and authority work (Chan & Salaba, 2016). A balance of theory and practice was essential in a cataloging course (Chen & Joyce, 2019). Thus, this project's instruction encompassed aspects of general metadata concept, descriptive cataloging using cataloging instructions Resources Description and Access (RDA), and commonly used classification systems.

Project Design

Overview

Based on the project's problem statement and target audience analysis, it was crucial for the instruction to employ an easy-to-navigate tool to engage the users in self-directed learning. Some other factors taken into consideration were strategies to attract attention, narrowing down the resources, and streamlining the learning process.

Instructional Goal

The goal of this instruction was to provide training to LIS graduate students, new librarians and library staff, so they could grasp basic cataloging knowledge and skills applicable to a library setting. After completing the course, the learners would be able to perform basic cataloging and classification duties.

Instructional Scope

This instruction covered the basics of cataloging and classification, which included an introduction, data standardization, basic cataloging tools, and classification structures. Some LIS graduate students, new librarians, and library staff may have some prior knowledge of some aspects of these lesson topics, while others may have little to no knowledge. Generally, they were able to follow instructions, organize, and classify information. Due to the project's limited time, budget, and resources, this instruction only covered the very basics of cataloging and classification.

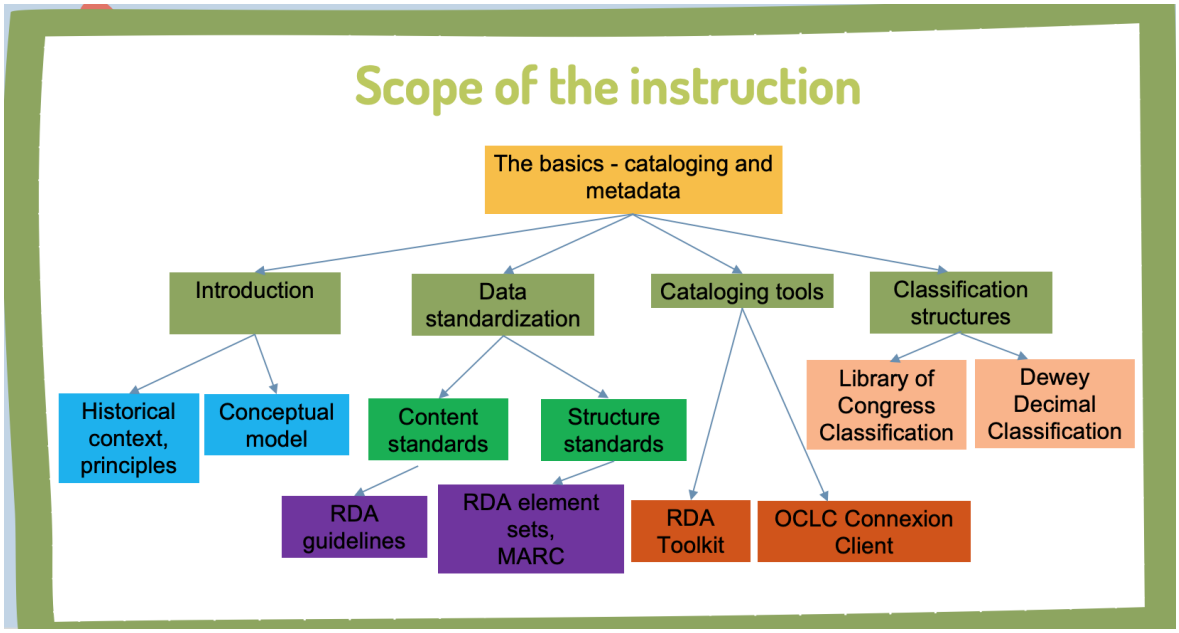
Instructional Breakdown & Sequence

This course was broken down into several topics including an introduction, and three modules covering data standardization, cataloging tools and classification structures. Each module was chunked into several subtopics. The chunks structured topics from general to more specific. In this way, it helped the learners to learn the overview of the topics, and then grasped the depth and details of each topic.

The instruction touched on historical context, principles, and a conceptual model of cataloging and classification. Data standardization comprised content standards and structure standards. More specifically, RDA guidelines, RDA element sets, and MARC format were covered. Basic cataloging tools, the RDA Toolkit and OCLC Connexion client were introduced. For classification structures, the two most commonly used classification systems, the Library of Congress classification (LCC) and the Dewey Decimal classification (DDC), were introduced. Figure 1 showed the scope of the instruction and a breakdown of its sequence.

Figure 1

Breakdown of the Instruction



Instructional Strategy

The instruction employed a combination of direct and indirect instruction to deliver the content. According to Rüütmann & Kipper (2011), direct instruction was effective since it was based on behavioral learning principles, and students learned basic skills more rapidly when they received an adequate portion of their instruction directly from the teacher. A structured overview

of the basics of cataloging and metadata, short lectures, and drill and practice were provided for each module. In addition, some indirect instruction was incorporated into the instruction. In indirect instruction, the concepts, patterns and abstractions of self-regulated learning were taught in the context of strategies that emphasized concept learning, inquiry learning and problem-centered learning (Rüütmann & Kipper, 2011). This instruction incorporated problem-based learning and scenario-based learning as instructional strategies.

Multimedia was one of the main instructional approaches used to foster learning. Multimedia instruction referred to presenting words and pictures to promote learning (Mayer, 2009). Words could be in spoken form such as narration or print form, while pictures could be in static form such as maps or photos, or dynamic form such as animation or video (Mayer, 2017). A learning environment was created with the integration of text, images, audio or video for this instruction. Mayer's (2009) Cognitive Theory of Multimedia Learning was incorporated in this instruction for theoretical guidance. Specifically, the instruction implemented the following principles: coherence principle (eliminating extraneous materials), signaling principle (highlighting the essential material), redundancy principle (a combination of graphics and narration works more effectively than graphic, narration, or on-screen text alone), spatial contiguity principle (corresponding world and pictures should be within adequate space), temporal contiguity principle (corresponding words and pictures should be presented simultaneously), pre-training principle (people learned better when they knew the key names and concept), multimedia principle (people learned more effectively from multimedia than text alone), and segmenting principle (presented course material in user-paced segment rather than as a continuous unit) (Theimer, 2019). In addition to a combination of text, image, audio or video, this instruction utilized interactive videos to enhance the learning experience. In the e-learning environment, students provided with interactive video achieved significantly better learning performance and a higher level of learner satisfaction than those in other settings (Zhang et al., 2006).

Performance Objectives

With the completion of the course, learners would be able to recognize the conceptual models of cataloging. After learning about data standardization, learners were able to interpret RDA cataloging standards, along with MARC standards, and applied those standards when needed. For the module about cataloging tools, learners would be able to navigate and locate information, and further be able to apply the two most common cataloging tools (RDA Toolkit, OCLC Connexion client). By the end of the instruction, learners would be able to identify Library of Congress Classification numbers and Dewey Decimal Classification numbers, as well as constructing the numbers when it was needed. More detailed information about user behavior and performance objectives could be found in Table 2 Performance objectives.

Table 2

Performance Objectives

Objective #	Behavior	Objective
Introduction		
1	Recognize the conceptual models of cataloging	Students will be able to recognize the conceptual models of cataloging and classification
Data standardization		
1	Interpret RDA cataloging standards	Students will be able to interpret RDA cataloging standards
2	Interpret MARC standards	Students will be able to interpret MARC standards
3	Apply RDA cataloging standards	Students will be able to apply RDA cataloging standards
4	Apply MARC standards	Students will be able to apply MARC standards
Cataloging tools		
1	Interact with RDA Toolkit	Students will be able to interact with RDA Toolkit
2	Interact with OCLC Connexion client	Students will be able to interact with OCLC Connexion client

3	Apply RDA Toolkit	Students will be able to apply RDA Toolkit
4	Apply OCLC Connexion client	Students will be able to apply OCLC Connexion client
Classification structures		
1	Interpret the Library of Congress Classification numbers	Students will be able to interpret the Library of Congress Classification numbers
2	Interpret the Dewey Decimal Classification numbers	Students will be able to interpret the Dewey Decimal Classification numbers
3	Construct the Library of Congress Classification numbers	Students will be able to construct the Library of Congress Classification numbers
4	Construct the Dewey Decimal Classification numbers	Students will be able to construct the Dewey Decimal Classification numbers

Quizzes were incorporated in each module to assess whether the learning objectives were met.

Instructional Details

Snow et al. (2018) pointed out that cataloging courses should not only focus on the latest content, but also well-designed instructional courses that helped students grasp the necessary qualifications to become successful information professionals. Snow et al. (2018) also stated that instructors could use different online tools and innovative teaching techniques to engage learners in learning. From this project's context analysis, the implications of the instructional design indicated that an interactive authoring tool to engage users in learning the cataloging standards and performing cataloging practices could be applicable. Interactive authoring tools were applied in many educational environments for teaching and learning. An eLearning interactive authoring tool could be defined as an application that enables designers to create educational resources or course materials by integrating and connecting different objects, and custom content constructed by them (Gordillo et al., 2017). This project utilized an interactive authoring tool known as H5P, which stood for HTML5 Package. The purpose of using H5P was to enhance learners' learning

experience. Most importantly, H5P could be optimized to promote self-directed learning (SDL). Self-directed learning was commonly defined as a process where learners took the initiative to pursue their own learning objectives and evaluate their learning process and outcomes (Knowles, 1975). Sinnayah et al. (2021) stated that the use of H5P online interactive learning tool was essential in developing a physiology course instruction, and promoted self-directed study and learning, which allowed students to perform self-paced learning and take more ownership in their study. The advantage of self-paced modules was that they addressed the heterogeneity of knowledge, experience, and education, as more advanced students would move more quickly through the learning materials, while others took more time to digest (Duggan, 2018).

This instruction employed the features of H5P to facilitate SDL. In this instruction, the users had the opportunity to go through the learning modules through H5P. They would review the pre-recorded videos, and a combination of texts, images, audios or videos, to learn the course content. The users could skip some sections by completing the quizzes and proceed to the next section if they had prior knowledge of that part of the course content. If learners had not mastered the course content, they could go back to review it until they could complete the quizzes. This instruction used formative assessment and immediate feedback from H5P to direct learners to adjust their own learning, and achieved better learning outcomes. Ideally, H5P would help learners to move more toward self-directed learning, taking their time in learning, while instructors were increasingly becoming more like facilitators. In the learning process, learners could reinforce their knowledge by formative learning, possibly improving their attainment.

In this instruction, learners were presented with pre-recorded videos, audios, and presentation slides to acquire each module. The content included an introduction to cataloging and classification, data standardization (RDA and MARC), cataloging tools (OCLC Connexion Client and RDA Toolkit), and classification structures (LCC and DDC). The learners used an interactive authoring tool H5P to go through the modules and be guided to do some quizzes to test their knowledge or skills, and proceed to the next session with self-directed learning with the aid of the learning tools.

For pre-recorded videos, Zoom was used to record the lectures for each module. Zoom was a very easy-to-use and handy tool to record videos. Another advantage was that videos could be downloaded for sharing. For audios, Audacity, a digital audio editor and recording software, was utilized to pre-record the audio content. Audacity was a user-friendly and free tool.

In summary, learners were able to follow instructions, and navigate through the learning module. They could review course content, perform quizzes, and choose to proceed with another section or revisit the course content. The course design enabled learners to take ownership of their learning by utilizing the self-directed learning tool H5P at their own pace.

Project Evaluation

Evaluation Goal

The goal of this evaluation was to assess the usability and learning effectiveness of an interactive authoring tool applied in a cataloging and metadata class for SDL.

Participants

The evaluation of this instruction mainly involved the target audience, which comprised of LIS graduate students, librarians, library staff, and library student workers. In addition, a few participants who were interested in learning the topic also participated, as no prerequisite knowledge was required for learning this instruction.

Evaluation Instruments

To collect demographic data about the participants, a Google Form was created and utilized to gather data from each participant at the beginning of the instruction. The demographic data survey included participants' socioeconomic information such as age group, gender, educational background, career, each participant's frequent use of technology, and knowledge about cataloging and classification. Google Forms was a handy-to-use free web-based tool allowing for easy data collection through well-crafted survey questions.

For the usability testing, the participants were tested on how easily they navigated through the learning tool H5P, found, and located information or resources including audios, videos, and quizzes. This was done through semi-structured interviews. For local participants, an in-person interview was scheduled. For distant participants, a Zoom meeting was utilized. Zoom was cost-free and easy to use. With the recording functionality, participants' voice data were captured for interpreting the usability of the instructional design. Through the usability study, some usability problems were identified. Qualitative and quantitative data were collected, and analyzed to identify the areas for improvement for the course design.

With the assistance of H5P, participants were guided to learn the course content, and followed the integrated quizzes for self-directed learning after each module. H5P was a user-friendly tool for learners to master the course content with self-paced learning, and self-test their understanding of the modules. To evaluate the learning effectiveness of the instruction, pretests, and posttests were administered through Google Forms, measuring the participants's knowledge of cataloging and classification before and after the instruction. An additional Google survey was designed to check how learners evaluated their own mastery of the module.

Implementation Procedure

Email invitations were sent to potential participants to check their willingness and availability to complete the instruction and participate in the evaluations. The potential participants either worked in the library and information science field or were interested in learning cataloging and classification. Below were some specific activities the participants performed.

Before the instruction, participants were requested to fill out a demographic survey. Altogether eight questions in a form were sent to the participants. Participants could fill in the form from anywhere. The survey took about 2-3 minutes to complete. Questions included age, gender, education, the frequency that participants used technology, and their experience with library use, cataloging and classification. Please see Appendix A Survey consent form and demographic data survey for more details.

The course designer conducted a semi-structured interview through Zoom to proceed with the usability testing. Participants were provided with the information about the interview procedures and survey questions. The semi-structured interview took about 45 minutes to one hour. Participants navigated through the learning modules and answered a few questions. The interviews were recorded for interpretation.

In addition, five specific tasks were assigned for the usability study, plus four general questions. Participants navigated through the instruction, and performed the tasks. Please see Appendix B for the complete usability testing protocol. The specific tasks for the the usability testing included the following:

1. How do you navigate to the “Cataloging tools” page from the home screen?
2. How do you navigate to the “Dewey Decimal Classification” page?
3. How would you find the “Library of Congress Classification” quizzes?
4. How would you find the RDA lecture?

5. How would you locate and use the RDA Toolkit?

The general questions included the following:

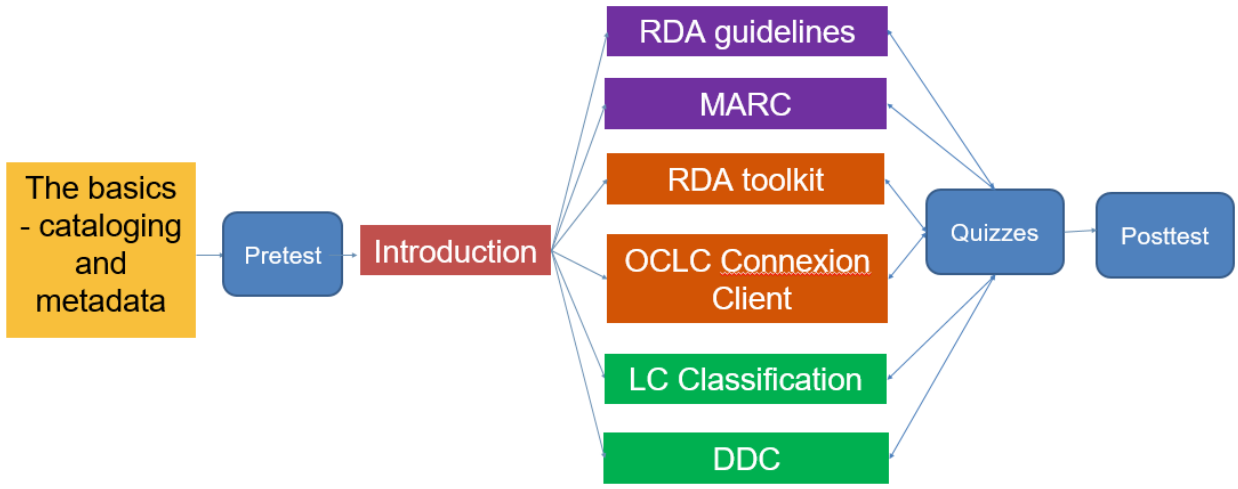
6. On a scale of 1 to 5, with 5 representing very easy and 1 representing very difficult, how would you rate your experience for today's testing?
7. Please think of other tools you have used before for this instruction, and express the advantages and disadvantages of this learning tool.
8. After participating in this study, would you recommend H5P as a self-directed learning tool to any instructors? Why?
9. What are your suggestions for improving the design of this instruction?

To evaluate the learning effectiveness of this instruction, quizzes were integrated in H5P in each module for users to go through for self checking. Figure 2 showed the procedure flowchart. Altogether, there were three modules: data standardization, cataloging tools, and classification structures, with two quizzes for each module. Each learning module took about 30 minutes, with 15 minutes of lecture, and 15 minutes for the quiz. A pretest and posttest were designed to collect the learners' pre-instructional and post-instructional knowledge of the subject matter. In addition, a set of questions via Google Forms were sent to participants, with which learners self-evaluated how well they mastered the course modules. The self-evaluation took about 10 minutes.

Figure 2

Procedure flowchart

Procedure Flowchart



To protect participants' privacy, the surveys collected participants' information anonymously. All surveys were submitted without participants' names or emails. The data collected were not placed in public computers or other public devices, nor in the cloud, but in a personal computer to keep data safe and secure, and were deleted permanently after the project was done.

Data Analysis

Evaluation data were captured through Google Forms and Zoom video recordings. The course designer also made note of the data and made an analysis. Charts were generated to make data more visible.

Demographic information of the participants, including age ranges and educational background, was converted into charts for quantitative analysis. Qualitative data, including the quotes from the participants, were analyzed. Similarly, the quantitative data from the usability testing, such as accessibility, navigation, and clarity of the H5P learning modules were presented in charts. Qualitative data, including the quotes and participants' suggestions for improvement of the H5P platform, were presented in a table. In addition, quantitative data from summative assessments including pretests, and posttests were recorded. The data gave participants an

overview of how they mastered the course content. Both quantitative and qualitative data from participants' input and feedback about how they mastered the course content via Google Forms were made into charts and tables.

Results

Usability

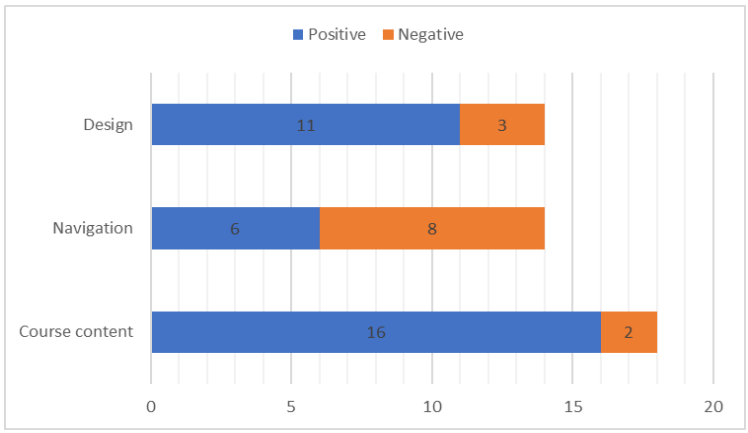
Altogether three rounds of usability testing were conducted, with two online (around 1 hour, and 40 minutes respectively) and one in-person (around 45 minutes). The testing was conducted at Hamilton Library at the University of Hawai‘i at Mānoa. Demographic data were collected through Google Forms. All three usability testing rounds were recorded. Data were captured and analyzed through note-taking and recordings.

All three participants were over 25 years old, with at least one graduate degree. They frequently used technology. The participants consisted of two males, and one female. Even though they were not librarians or library staff, they were interested in learning about the topic.

Figure 3 shows the ratio of positive and negative comments reported by the participants. The comments fell into three categories: design, navigation, and course content.

Figure 3

Participants' Comments on the Instruction by Category and Sentiment



After conducting the usability testing, participants provided valuable feedback on how to improve the course's usability. Participants suggested several improvements to enhance navigation and functionality of the platform, including adding an introduction video or road map to illustrate how the entire module was structured. Participants further recommended providing a cheat sheet to assist users in navigating through the course, and adding main buttons to the primary modules to access the course's key sections more easily. They also suggested adding a "Back button" to the pages and buttons to find the three main sections of the course to help students navigate more efficiently. Additionally, participants suggested embedding the course content into Google Sites or a public site accessible to all without requiring a UH email login. Other recommendations included replacing a distorted image file at the quiz session, enlarging fonts in some videos, spelling out some acronyms, explaining certain terms, and correcting errors to improve users' experience with the platform.

Something interesting or unexpected was that the course designer's original intention was for learners to navigate through each module in sequence until they mastered each one and exited. However, participants frequently wanted to go back to the previous module to check the

course content. This made navigation less smooth. This revealed a gap between the course designer's expectations and the learners' needs. To address this issue, improvements were made to enhance the ease of navigation.

Based on the usability results, the following revisions were made to make the instructional content:

- course content embedded into the Google Sites so that the participants did not need a UH email account to get access to the course content
- an introductory page about what the module was about and how users would use the course added since it was important to get users familiar with the module and the tool
- some acronyms spelled out so that users who were not familiar with the course content could understand the names and navigated through the module much easier
- more words added to the navigation buttons or introduction of the modules so that users knew where they were and how or where they could go next
- most of the "back buttons" enabled, so users could go back to the previous pages to view the course content; users often would like to review the course content when they went through the modules, especially the quizzes
- some explanations added for some terms for those who were new to the field
- a few errors corrected for some quiz sections

In general, the usability participants were satisfied with the course which had a combination of videos, audio, presentation slides, and interactive quizzes. They appreciated short and easy-to-understand videos. The main issue that was identified from this usability testing was the navigation of the course. Based on the usability results, most of the revisions focused on improving navigation, such as making it easy to access previous pages and the main sections of the instruction. In addition, some acronyms were spelled out for better understanding.

Learning Effectiveness

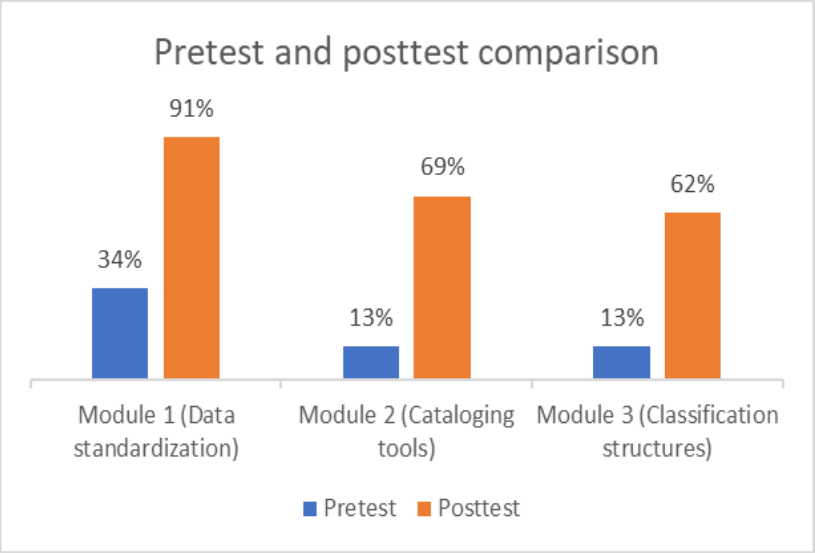
Altogether eighteen adults participated in the learning effectiveness test. Three participants participated in person, while the remaining fifteen participants worked online at their own pace. All of the participants received instructions and survey links through emails. It took about one and a half to two hours to complete the instruction.

Four surveys embedded in a Google Site were sent to each participant: a demographic survey (see Appendix A), a pretest (see Appendix C), a posttest (see Appendix D), and a survey of learning experiences (see Appendix E). Something interesting was that even though more than 56% (9 out of 16) of the participants were librarians, library staff, or LIS students, only around 19% (3 out of 16) indicated that they had much experience with library cataloging. In addition, none of the 16 participants indicated having much experience with library classification systems.

Comparison of the pretest and posttest scores revealed that the participants made significant improvement in their learning after completing the instruction. Specifically, participants' scores for module 1 (data standardization) increased from 34% to 91% . For module 2 (cataloging tools), participants' scores increased from 13% to 69%. Finally, for module 3 (classification structures), participants' scores increased from 13% to 62%. Figure 4 showed the comparison of the pretest and the posttest scores.

Figure 4

Pretest and posttest scores comparison



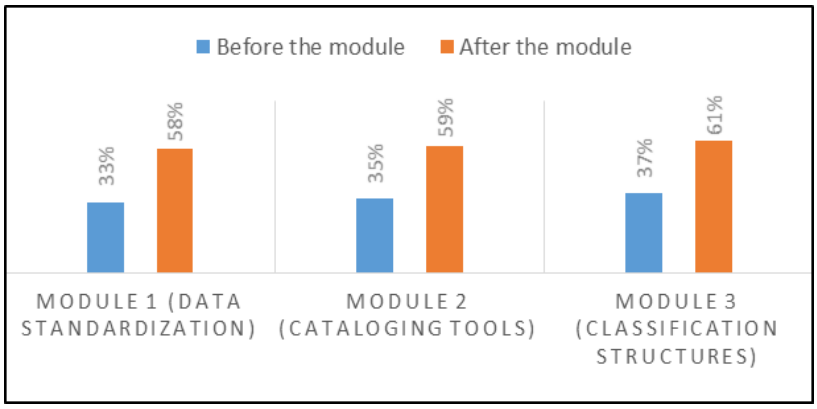
The results suggested participants grasped the course content after reviewing the course content. Module 1 consisted of some basic terminology of data standardization, and participants

seem to easily master the course content. The results indicate that Module 3 would take participants more time to digest and become familiar with. Taking into the consideration that the participants had limited time to complete the three modules, the designer could see that the modules were somewhat effective in helping the participants, who had minimal knowledge of cataloging and classification, learn some basics of the subject.

In a separate survey titled, "Surveying your learning experiences", questions were designed to check what participants thought about the modules before and after they reviewed the course. The participants' self-evaluation of their mastery of the course content went from 33% to 58% for module 1 (data standardization), from 35% to 59% for module 2 (cataloging stools), and from 37% to 61% for module 3. These values were converted from a five-point Likert-scale (1 = least knowledge, 5 = most knowledge). Figure 5 showed the comparison.

Figure 5

Participants' self-evaluation of their confidence in mastering the modules' content (n = 16)



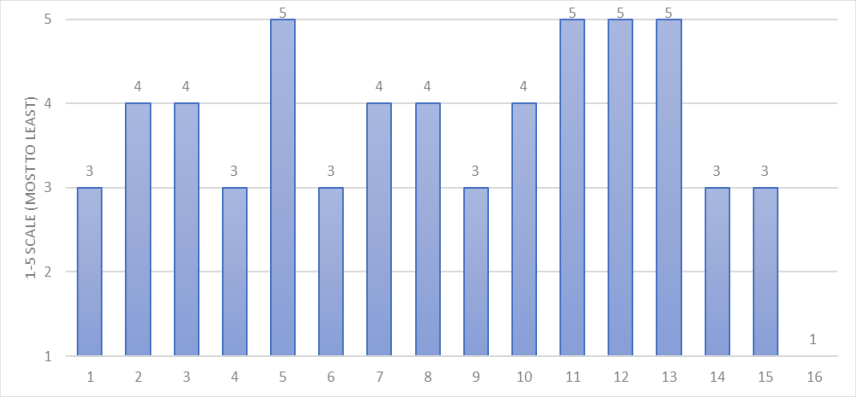
The participants' self-evaluations revealed that they felt the instruction enhanced their knowledge to a certain degree.

Regarding the tools used in the the learning modules (see Figure 6), fifteen out of sixteen participants (around 94%) provided a rating of 3 or above when asked about the future application of such a tool for teaching and learning. Seven out of sixteen (around 44%) participants rated 3. The data also made sense since the participants expected some improvement

in the features of the platform, particularly in navigation. Figure 6 below shows participants' evaluations of the interactive authoring tool.

Figure 6

Participants' Ratings for Future Use of Tool (n = 16)



In sum, the instruciton's learning modules were effective in some ways as measured by the learning effectiveness data. From the open-ended question data, it was revealed that the participants liked the short videos, texts, and interactive quizzes. One participant commented, "This course helped me to go over various concepts and knowledge for cataloging." Another participant stated, "You have made a difficult topic easier to be learned.".

One area that could be improved upon was the audio and video quality of the instruction. Some participants reported that the volume levels of the audio and vidoe were too low and that the quality could be enhanced. Another aspect was that the learning pathway needed improvement. Some participants reported wanting to see their progress and have a better sense for how to navigate through the system. This was mainly due to the limitation of the interactive authoring tool. There were prospects for future improvement for the course quality and software enhancement.

Discussion

Based on the results of usability testing, it was revealed that the course content and design were workable. Usability testing indicated that participants generally were satisfied with the easy-to-understand course content. They liked the combination of audio, video, and text, as well as the interactive quizzes. Generally, the participants were able to follow the modules, and view the course presentations in various formats. For improvement, one major would be to address the navigation through the course modules. There was a gap between the course designer and the learners in terms of navigation. The initial thought was to use the platform for learners to do self-study. When the learners mastered the course content, they could test out, and if not, they could re-study the course content. It turned out that during the learning process, the learners often wanted to go back to the course presentations and to navigate through different modules.

The positive results from the learning effectiveness survey suggested that this instruction was effective in achieving the desired learning outcomes in some ways. This was evidenced by a considerable increase in the participants' knowledge of the subject matter from the pretest to posttest. In addition, by comparing the participants' self-evaluation of their mastery of the course content before and after the instruction, it was clear participants increased their confidence of mastering the subject matter. They also increased their ability to apply the knowledge after going over the course modules. On the other hand, the participants did not earn very high test scores. These results were reasonable, since it was not easy to grasp the course content in such a short amount of time. In addition, one positive aspect of this instruction was that the learners were able to work at their own pace.

Something that worked well for this instruction was that the course design made a complex subject matter simple. This could be evidenced by the comparison of participants' pretest and posttest ratings along with their responses to the open-ended questions. This instruction broke down the course content into three manageable modules, and presented it in a clear and concise manner. The instruction's design followed a pattern that gradually led learners from theory to practice, and from simple to more complex concepts. This strategy seemed to help learners grasp the basics of the subject matter. Another strategy that worked well was that the

instruction incorporated some examples to help learners understand how the concepts they were learning were applied in practical settings. This made learning the course content logical. In addition, the instruction utilized short audios, videos, and interactive quizzes to engage learners and help them solidify their understanding of the course content.

The feedback integrated into the learning tool instruction was also instrumental in the learners' learning process. There were several meaningful comments, such as, "I like the interactive feature of the course design and also the quizzes" and "I enjoyed the videos and how they were quick and to the point." Another particpant shared, "I like that you added you tube [YouTube] video. Video and text are good way to learn the information."

Something to be noted was that the interactive authoring tool provided a self-paced learning platform, enabling the learners to proceed through the course content on their own. Because learners' learning preferences and characteristics were different, providing them with the flexibility to progress through the course content at their own pace gave them autonomy to meet their learning needs based on their abilities. One participant commented, "I enjoyed how I could try multiple times to complete a question without being penalized." Learners who grasped the course material faster could move forward quickly, while those who needed more time to absorb the course material could take time to digest, and not feel overwhelmed.

In general, the instructional design was effective. However, there were certain areas that needed improvement. One area that needed enhancement was to add more feedback in the interactive quizzes. This could be done so that the learners could identify areas for improvement as they went through the modules. More detailed information could be added, such as hints on correct or incorrect answers, or specific information that might help learners understand the course content better. Another area that needed improvement was the navigation through the interactive authoring tool. The inflexibility of the navigation made learners' learning pathway difficult. This hindered the learning effectiveness to a certain degree. The course designer made some effort to improve the navigation such as adding "Back" buttons to the pages and inserting links to certain pages. However, there was room for further development of the tool, so that it could be more robust. Other tools might be needed to to make the system more navigable.

Another potential improvement of the system could be its analytics. One participant commented, “I wish I could see my progress.” Analytics could help learners keep track of their own learning progress and identify areas for improvement.

Conclusion

Upon reflecting on the educational issue, the designer could see that LIS students, librarians or library staff may lack sufficient knowledge of cataloging and classification in a library setting. In turn, this might hinder their ability to perform cataloging duties when needed. Given this challenge, the objective of this project was to help those individuals acquire fundamental knowledge and skills to be competent in cataloging when called upon. This project’s instructional goal was to bridge this gap. The instruction in some way enhanced the learners’ knowledge in cataloging and classification. It was discovered that the majority of participants had minimal to no knowledge of cataloging and classification. However, after reviewing the instructional materials, the participants' knowledge in this area increased, which was evidenced by the test results and the learners' self-assessment of their mastery of the three modules’ content.

This instruction was the starting point of the design. It was not able to cover all aspects of the subject matter due to time constraints and limited resources. Given more time, the course designer would like to expand the course content, and make it a complete course. Based on the feedback received from usability and learning effectiveness testing, the course designer identified some areas for improvement. First of all, the course designer would like to explore more advanced software options that could offer better navigation capabilities. For example, one approach could be to integrate H5P into a website, which might help make each section of the course more accessible and navigable. Secondly, the course designer might incorporate participants’ constructive feedback into improving the course. This might be done by enhancing the navigation of the course, making the instruction’s language more understandable, and streamlining the design workflow.

Throughout the course design process, the designer found that the ADDIE (Analyze, Design, Develop, Implement, and Evaluate) model was an effective instructional design framework. It guided the course designer throughout the design process to achieve high-quality and effective learning outcomes. Instructional design as a process was valuable in many ways. First of all, instructional design played a crucial role in creating effective learning experiences. The design process helped the course designer learn about the learners' needs and preferences, break down complex subject matter into manageable chunks, select suitable tools, and present the instruction in an adequate format to meet the learners' needs. In this way, the course designer was able to design a course that met learners' needs and achieve desirable learning outcomes. Secondly, instructional design was not a one-size-fits-all process. It required continuous improvement based on learners' feedback and through testing. The goal was to close gaps between the course designer and the learners. Thirdly, the instructional design process involved collaboration between course designers, instructors, and learners to achieve the desired learning outcomes. The instructional design process required constant feedback and adaptation to ensure that course materials remained relevant over time, the learning tools were up to date, and the learning strategies were effective in keeping learners engaged and self-motivated.

In conclusion, instructional design provided a systematic approach to creating instructional materials that were engaging, effective, and relevant to learners' needs. It inspired the course designer to think, experiment, and change throughout the process. Instructional design was not a one-time effort, but an ongoing process of revision and improvement based on the changing needs of the learners, the learning objectives, and the changing environment.

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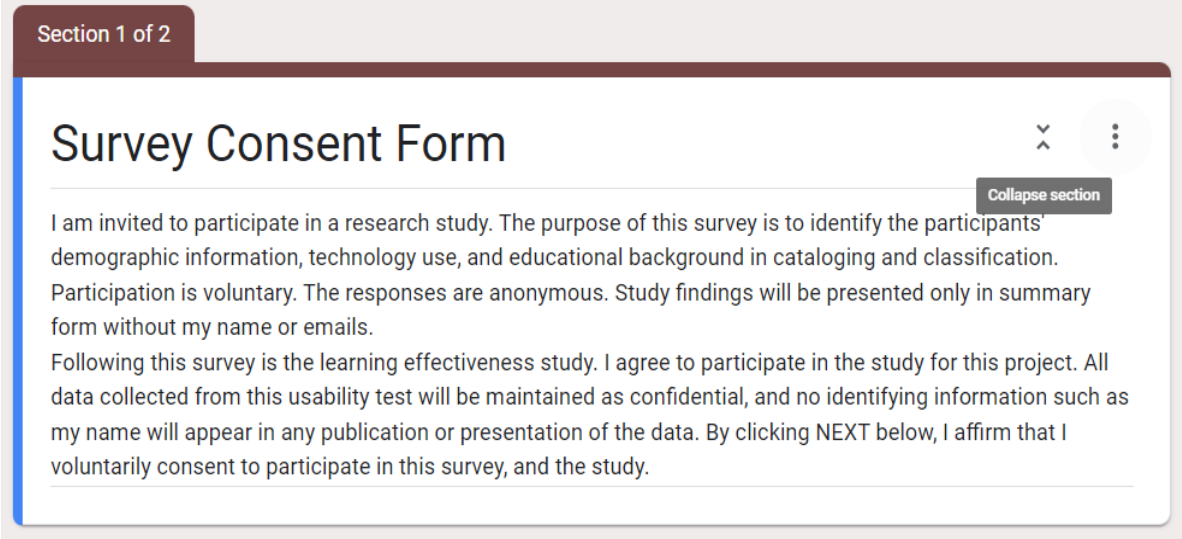
Appendice A

Survey Consent Form and Demographic Data Survey



Section 2 of 2

Demographic data

The goal of this survey is to identify the participants' demographic information, technology use, and educational background of cataloging and classification.

Thank you very much for taking the time to fill out the form.

Please write down the access code: *

Short answer text

1. Age *

- 25 and under
- over 25

2. Gender *

1. Male
2. Female
3. Transgender
4. Other

3. Education *

- Bachelors or below
- At least one graduate degree or higher

4. How frequent do you use technology? *

- ◯ Daily
- ◯ Weekly
- ◯ Monthly
- ◯ Yearly
- ◯ Other (please specify)

5. What type of libraries do you work at? *

- ◯ Academic libraries
- ◯ Public libraries
- ◯ Special libraries
- ◯ LIS student
- ◯ I do not work at a library (please specify)

6. I have much experience in cataloging and classification. *

- ◯ Strongly agree
- ◯ Agree
- ◯ Neutral
- ◯ Disagree
- ◯ Strongly disagree

7. I have much experience in cataloging *

- Yes
- No

8. I have much experience in library classification *

- Yes
- No

Appendix B

Usability Protocol

Modified from Usability Script- Rocket Surgery Made Easy © 2010 Steve Krug

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Preparation before the usability testing

Set up a day before the meeting

1. Login to the Email account
2. Send the meeting information to the participant including the time of the meeting and URL of the platform

Set up at least 1 hour before the meeting:

1. Set up the computer, and make sure the microphone is working
2. Make sure the computer is connected to the Internet
3. Login to the Email account
4. Find the email that was sent to the participant with the meeting invite link
5. Click on the Zoom meeting link
6. Once in the meeting, click on the three dots on the lower right hand side of the screen and select “Record on this Computer”
7. Contact the participant and ask if the participant’s computer is set up, and she/he is ready

After the participant has joined the meeting:

1. Run a test with Zoom to ensure that screen sharing, microphone, speaker and recording are all working
2. Ask the participant to navigate to the platform H5P
3. Ask the participant to share their screen by clicking the “Share Screen” button at the bottom of the screen

<u>After the meeting:</u>

1. End the recording and the meeting
2. Access the recorded files automatically sent to the computer to view the meeting video

Usability test scripts

- ❑ ***START Zoom Meeting***

Hi, [Participant’s name]. My name is [Facilitator’s name], and I’m going to be walking you through this session today.

Before we begin, I have some information for you, and I’m going to read it to make sure that I cover everything.

We’re asking participants to learn a basic cataloging and classification course. We would like to see whether it works as intended. The session should take about 40 minutes.

First, we’re testing the *platform*, not you. You can’t do anything wrong here.

As you use the platform, I’m going to ask you as much as possible to try to think out loud: to say what you’re looking at, what you’re trying to do, and what you’re thinking. This will be a big help to us. We’re doing this to improve the platform, and would like to hear your honest thoughts.

Please ask questions as we go along. I may not be able to answer them right away, since we're interested in how people do when they don't have someone who can help. But if you still have any questions when we're done, I'll try to answer them then.

You may have noticed the microphone. With your permission, we're going to record what happens on the screen and our conversation. The recording will only be used to help us figure out how to improve the platform, and it won't be seen by anyone except the people working on this project. And it helps me, because I don't have to take as many notes.

If you would, I'm going to ask you to sign a simple permission form for me. It just says that we have your permission to record you, and that the recording will only be seen by the people working on the project.

If you need to take a break at any time, please let me know.

Do you have any questions so far?

- ❑ ***Send participants URL for the platform to be evaluated:***

Send the participant a message through Zoom with the URL for the platform to be evaluated. Ask the participant to open the URL.

- ❑ ***Ask participants to begin the screenshare:***

Please start Screenshare by clicking on the "Share Screen" button at the bottom center of your screen. Navigate to H5P platform.

- ❑ ***Have participants do a narrative of the platform's overall appearance:***

If this were your first time visiting the platform-a basic cataloging and classification class, what would you think this is about and who it would be for?

- ❑ ***Ask participants to complete a few specific tasks based on their scenarios sheet:***

Thanks for doing that. Now I'm going to ask you to try doing some specific tasks. I'm going to read each one out loud.

Unless otherwise stated, we ask that you do a few tasks. We'll learn a lot more about how the platform works.

Tasks for Usability Study:

- How do you navigate to the "Cataloging Tools" page from the home screen?
- How do you navigate to the "Dewey Decimal Classification" page?
- How would you find "Library of Congress Classification" quizzes?
- How would you find RDA lecture?
- How would you locate and use RDA Toolkit?

Allow the user to proceed from one task to the next until you don't feel like it's producing any value or the user becomes very frustrated. Repeat for each task or until time runs out.

Thanks, that was very helpful!

We are done with the main questions, but I have a few more general questions to ask you.

1. On a scale of 1 to 5, with 5 representing very easy and 1 representing very difficult, how would you rate your experience for today's testing?
2. Please think of other tools you have used before for learning, what the advantages and disadvantages of this learning tool?
3. After participating in this study, would you recommend H5P as a self-directed learning to any instructors? Why?
4. What's your suggestions for improvement for design of the learning modules?

Do you have any questions for me, now that we're done?

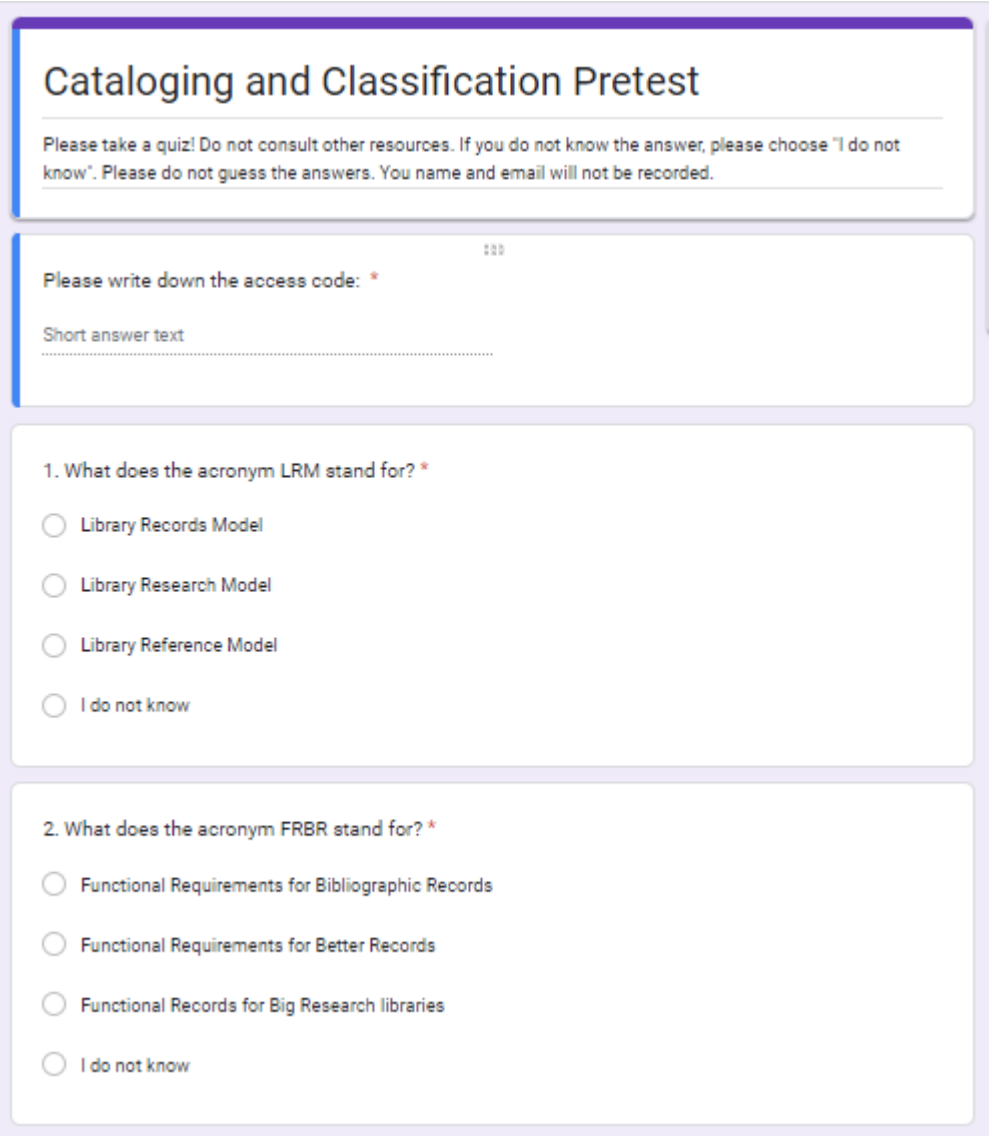
Remind the participant to end the screenshare by clicking on the "Stop Share" button at the top of the screen.

Stop the screen recorder of the session and save the file.

Thank the participant and then end the meeting (I want to thank you for your time and willingness to be a participant in this study)

Appendix C

Cataloging and Classification Pretest



Cataloging and Classification Pretest

Please take a quiz! Do not consult other resources. If you do not know the answer, please choose "I do not know". Please do not guess the answers. You name and email will not be recorded.

Please write down the access code: *

Short answer text

1. What does the acronym LRM stand for? *

- Library Records Model
- Library Research Model
- Library Reference Model
- I do not know

2. What does the acronym FRBR stand for? *

- Functional Requirements for Bibliographic Records
- Functional Requirements for Better Records
- Functional Records for Big Research libraries
- I do not know

3. What does 246 represent in MARC 21? *

- ○ Title statement
- ○ Varying form of title
- ○ Publication information
- ○ I do not know

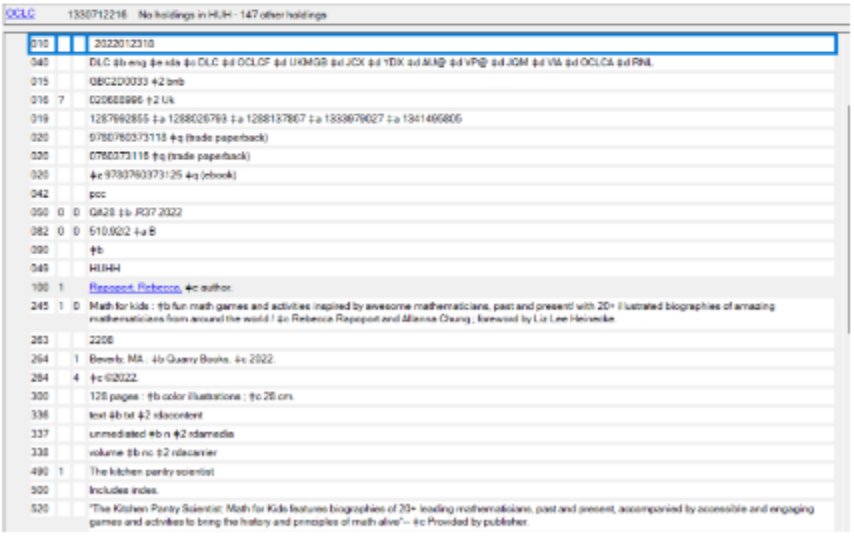
4. Resource Description and Access (RDA) is an encoding standard for descriptive cataloging. *

- ○ True
- ○ False

5. Which section will you find the instruction for guidance on *Capitalization* in the RDA Toolkit? *

Short answer text

6. Please find the OCLC number for this record. *



Short answer text

7. Which main class will you look for if you are looking up a DDC number for the book "Learning French from Spanish and Spanish from French"? *

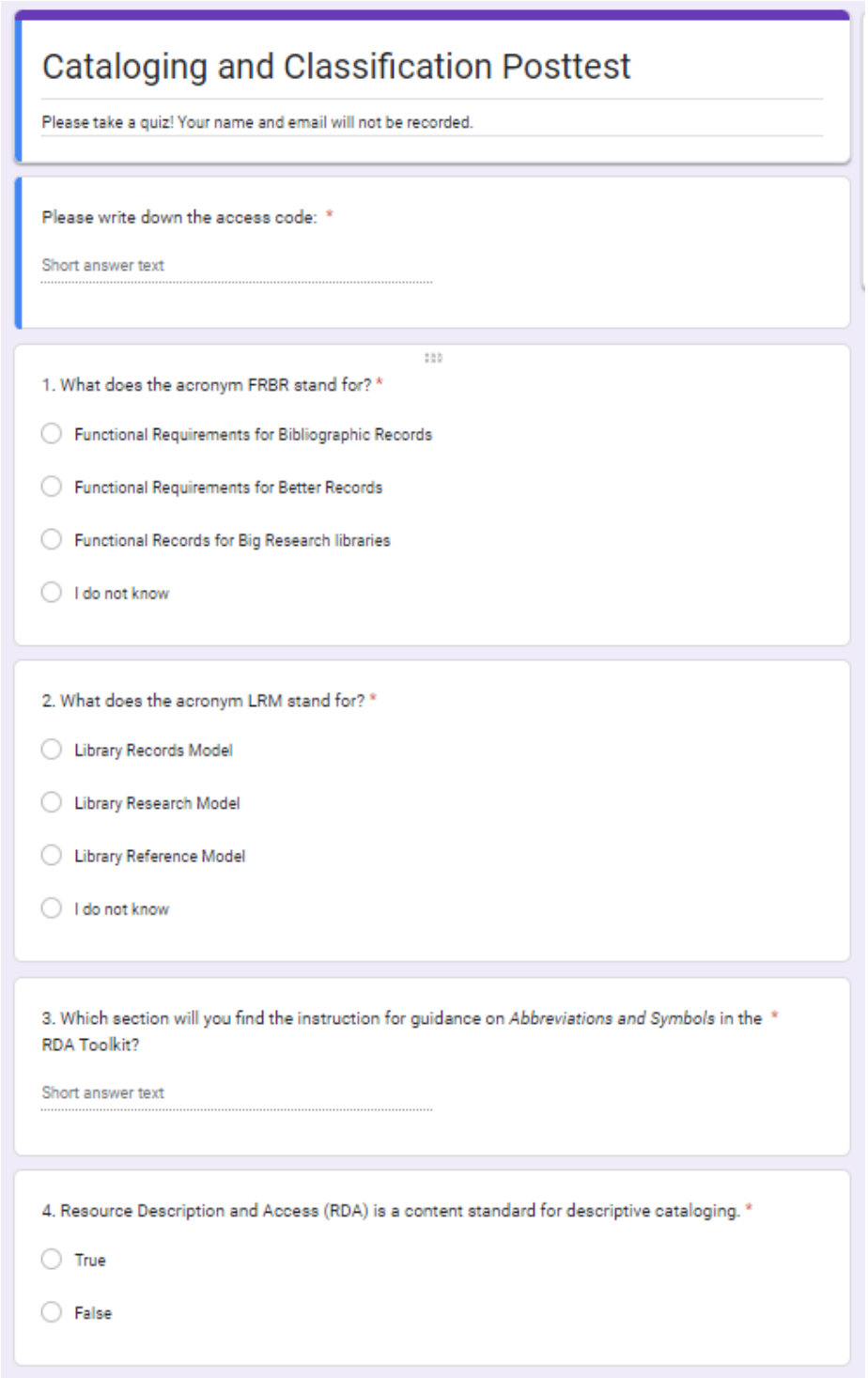
- 100
- 200
- 300
- 400
- 500
- I do not know

8. Which main class will you look for if you are looking up a LCC number for the book "Learning French from Spanish and Spanish from French"? *

- B
- D
- G
- N
- P
- I do not know

Appendix D

Cataloging and Classification Posttest



Cataloging and Classification Posttest

Please take a quiz! Your name and email will not be recorded.

Please write down the access code: *

Short answer text

1. What does the acronym FRBR stand for? *

- Functional Requirements for Bibliographic Records
- Functional Requirements for Better Records
- Functional Records for Big Research libraries
- I do not know

2. What does the acronym LRM stand for? *

- Library Records Model
- Library Research Model
- Library Reference Model
- I do not know

3. Which section will you find the instruction for guidance on *Abbreviations and Symbols* in the RDA Toolkit? *

Short answer text

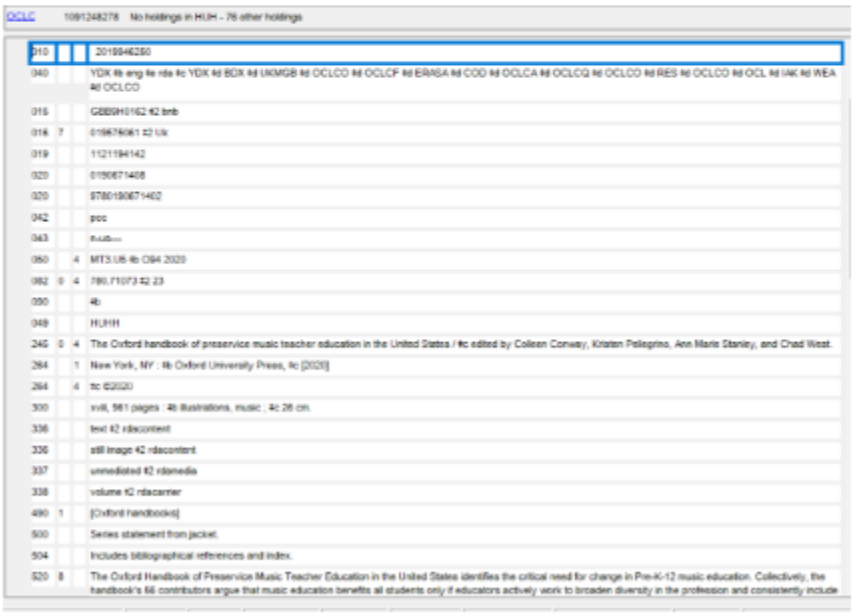
4. Resource Description and Access (RDA) is a content standard for descriptive cataloging. *

- True
- False

5. What does 250 represent in MARC 21? *

- ○ Title statement
- ○ Publication information
- ○ Edition statement
- ○ Content type
- ○ I do not know

6. Please write down the OCLC number for the following record. *



Short answer text

7. Which main class will you look for if you are looking up a DDC number for the book "Classic baseball : timeless tales, immortal moments"? *

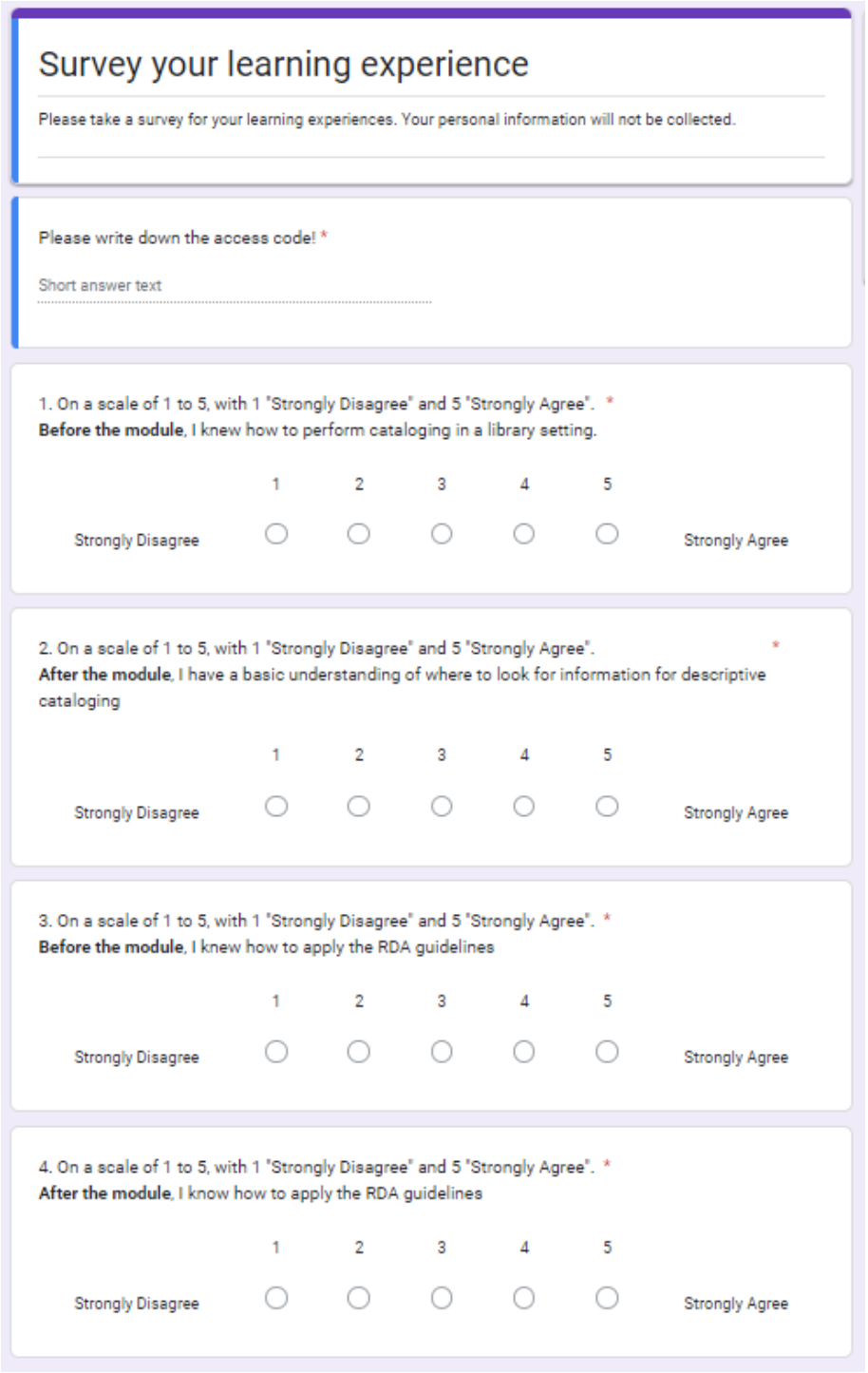
- 200
- 300
- 400
- 500
- 600
- 700
- I do not know

8. Which main class will you look for if you are looking up a LCC number for the book "Classic baseball : timeless tales, immortal moments"? *

- B
- D
- G
- N
- P
- I do not know

Appendix E

Surveying Your Learning Experience



Survey your learning experience

Please take a survey for your learning experiences. Your personal information will not be collected.

Please write down the access code! *

Short answer text

1. On a scale of 1 to 5, with 1 "Strongly Disagree" and 5 "Strongly Agree". *
Before the module, I knew how to perform cataloging in a library setting.

	1	2	3	4	5	
Strongly Disagree	○	○	○	○	○	Strongly Agree

2. On a scale of 1 to 5, with 1 "Strongly Disagree" and 5 "Strongly Agree". *
After the module, I have a basic understanding of where to look for information for descriptive cataloging

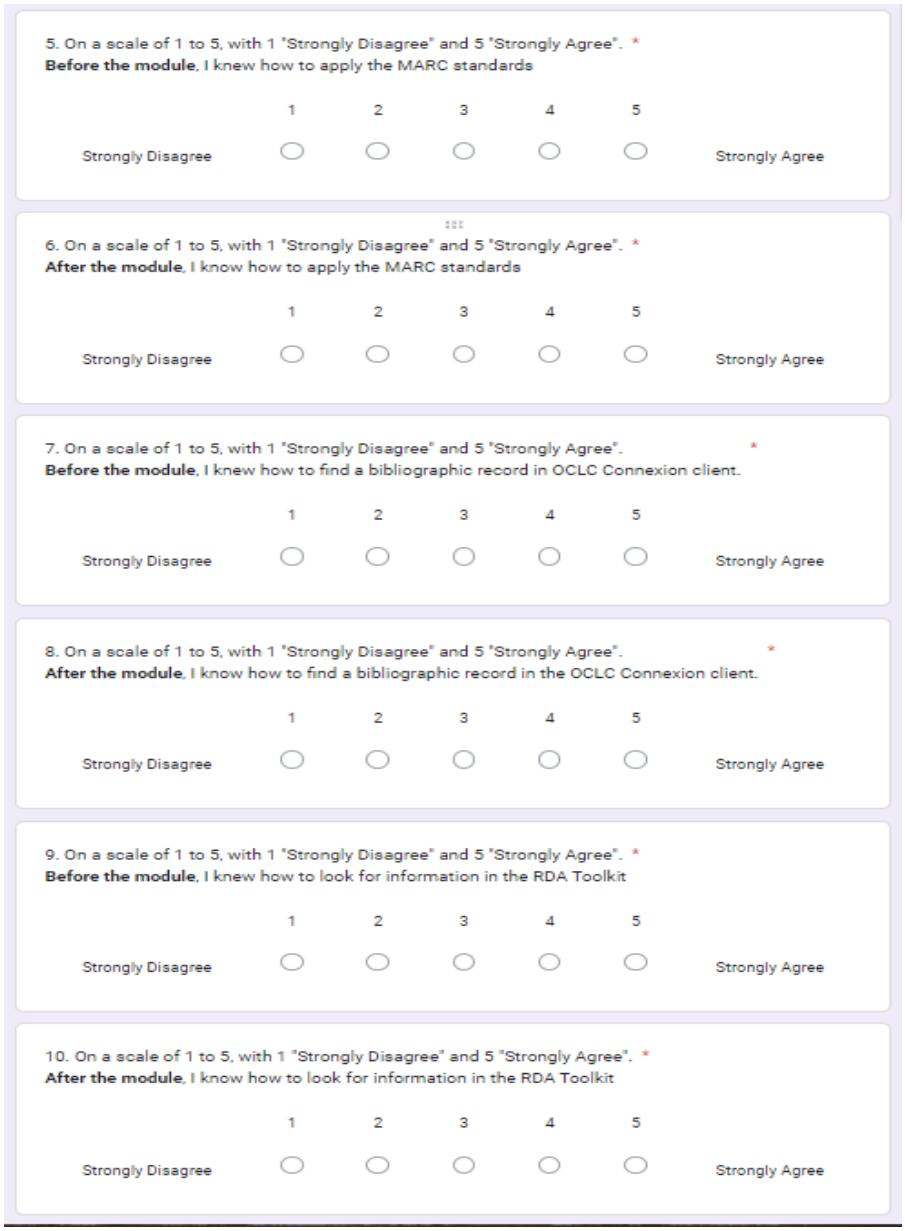
	1	2	3	4	5	
Strongly Disagree	○	○	○	○	○	Strongly Agree

3. On a scale of 1 to 5, with 1 "Strongly Disagree" and 5 "Strongly Agree". *
Before the module, I knew how to apply the RDA guidelines

	1	2	3	4	5	
Strongly Disagree	○	○	○	○	○	Strongly Agree

4. On a scale of 1 to 5, with 1 "Strongly Disagree" and 5 "Strongly Agree". *
After the module, I know how to apply the RDA guidelines

	1	2	3	4	5	
Strongly Disagree	○	○	○	○	○	Strongly Agree



5. On a scale of 1 to 5, with 1 "Strongly Disagree" and 5 "Strongly Agree". *
Before the module, I knew how to apply the MARC standards

	1	2	3	4	5	
Strongly Disagree	○	○	○	○	○	Strongly Agree

6. On a scale of 1 to 5, with 1 "Strongly Disagree" and 5 "Strongly Agree". *
After the module, I know how to apply the MARC standards

	1	2	3	4	5	
Strongly Disagree	○	○	○	○	○	Strongly Agree

7. On a scale of 1 to 5, with 1 "Strongly Disagree" and 5 "Strongly Agree". *
Before the module, I knew how to find a bibliographic record in OCLC Connexion client.

	1	2	3	4	5	
Strongly Disagree	○	○	○	○	○	Strongly Agree

8. On a scale of 1 to 5, with 1 "Strongly Disagree" and 5 "Strongly Agree". *
After the module, I know how to find a bibliographic record in the OCLC Connexion client.

	1	2	3	4	5	
Strongly Disagree	○	○	○	○	○	Strongly Agree

9. On a scale of 1 to 5, with 1 "Strongly Disagree" and 5 "Strongly Agree". *
Before the module, I knew how to look for information in the RDA Toolkit

	1	2	3	4	5	
Strongly Disagree	○	○	○	○	○	Strongly Agree

10. On a scale of 1 to 5, with 1 "Strongly Disagree" and 5 "Strongly Agree". *
After the module, I know how to look for information in the RDA Toolkit

	1	2	3	4	5	
Strongly Disagree	○	○	○	○	○	Strongly Agree