Calculating the REACH of Engaged Librarians: A Lesson in Poka-Yoke Error Proofing

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Abstract

Purpose: Consistent capture and recording of data facilitates analysis saves individuals tasked with assessment a considerable amount of time and frustration. This paper illustrates the application of poka-yoke principles to the design of The Ohio State University Libraries' REACH database, a system used to centrally gather the instructional and programming activities of the university's liaison librarians and determine the success of the libraries' engaged librarian initiative. Poka-yoke is a Japanese term for error proofing and is a concept applied in LEAN manufacturing to ensure that a process or procedure cannot be performed incorrectly. Applied in the service sector, poka-yoke functions to make a "product or process resistant to factors beyond its control."[1]

Design/Methodology/Approaches: The REACH database uses branching logic to collect data related to four essential engaged librarian activities: credit course instruction, where a librarian is the instructor of record for a full semester; course-related instruction, where a librarian is invited to give a guest lecture for a class; library-sponsored programs and workshops; and library orientations or tours not affiliated with a specific Ohio State class. To achieve poka-yoke, the assessment librarian engaged database stakeholders early in the design process to reduce librarian reporting burden by first identifying ways to simplify the data collection form and then identifying mechanisms to join existing university systems, such as the master schedule of classes, to the database.

Findings: Each class taught at the university is assigned a unique five-digit class code. Poka-yoke was achieved by requiring librarians to enter the five-digit class code when recording credit course and course-related instructional activities. The REACH database not only simplifies, but also facilitates more accurate and robust reporting, as librarians no longer need to input information such as the approximate number of students enrolled in a course or the primary instructor of record for a course. This information may now be pulled directly from other information systems on campus and joined with the database. Reporting burden has also lessened as poka-yoke allowed university libraries to aggressively simplify its data input forms from approximately 45 fields to five to fourteen fields depending on the activity selected.

Value and Impact: Ohio State's engaged librarians have several diverse responsibilities and are frequently pulled in many opposing directions throughout their day. This means recording data regarding their daily activities is often a challenge and an afterthought. The application of poka-yoke principles has yielded a twofold benefit for this project, by reducing librarian's reporting burden and by improving the accuracy and quality of the data collected.

Purpose

Anyone who regularly works with library instruction and engagement data understands that data is inherently messy and that a data collection system is only as strong as the integrity of its inputs. Opportunities to inconsistently interpret data collection fields and incorrectly enter data persist, even after library faculty and staff collaboratively establish definitions for these fields, receive training on the system, and practice entering data into the system for over a year. These inconsistencies cost individuals tasked with assessment a considerable amount of time and frustration as data must be cleaned and the intent of individuals entering data must be confirmed before analysis can begin.

To facilitate the consistent capture and recording of library instruction and engagement data, and thus analysis, The Ohio State University Libraries applied poka-yoke principles to the design of the REACH database, a locally established system used to centrally gather the instructional and programming activities of liaison librarians and determine the

success of the libraries' engaged librarian initiative.[2] Poka-yoke is a Japanese term for error proofing and is a concept applied in LEAN manufacturing to ensure that a process or procedure cannot be performed incorrectly. Applied in the service sector, poka-yoke functions to make a "product or process resistant to factors beyond its control."[3]

Poka-yoke is achieved in several ways. For example, if a machine must be manually calibrated to produce a specific output, a company may require the equipment operator to calibrate the machine using a specific part or sequence of steps. This will allow the machine operator to quickly and accurately reset the machine. An inaccurately reset machine will automatically shut down to prevent an error—whether minor or catastrophic—from occurring. We regularly encounter poka-yoke in our daily lives as engineers design products to keep us safe. If you fail to place your car in park before turning your car off, you will not be able to take your key out of the ignition. When you turn on the self-cleaning feature of an oven, it will lock. Poka-yoke principles not only error-proof systems, they also improve the quality of work output, and reduce the time wasted on reworking, rejecting, or replacing incorrectly manufactured products.

Poka-yoke principles in the service sector can both improve customer satisfaction and customer interactions by minimizing errors made by both service providers as well as customers. Poka-yoke fail-safes may be applied both prior to and after a service encounter, addressing potential errors in performing a task, the treatment of the customer, or the tangible elements of the service.[4] In a library environment, tangible elements of a service might include providing quiet study spaces, or an appropriate number of group study rooms for students to reserve during peak hours. When a fine approval process is inconsistently managed, a task error may occur. Another library task error might occur when an interlibrary loan request for an online journal article that is already owned by the library is not promptly denied or is denied without providing the patron a direct link to the available content. Correctly handling the ILL process saves both the library money and the patron time. Treatment errors happen when interactions between library staff and patrons break down. Failure to respectfully de-escalate conflict with an angry patron represents one treatment error libraries may address by training staff. Such training may be provided using a combination of scripts and other cues, to help library staff better discuss sensitive topics with patrons and avoid miscommunication.

Chase and Stewart note that "while the 'customer is always right,' he or she is also frequently error-prone." Errors occur when customers fail to adequately prepare ahead of time for the service encounter; during the encounter, because of "inattention, misunderstanding, or simply a memory lapse"; and following the encounter, when evaluating their experience and providing feedback.[5] Reference librarians coach students to forward a copy of their syllabus, an assignment, and any research already completed prior to a consultation to proactively address preparation errors. Having possession of this information before an appointment allows a librarian to research the topic and adjust the reference interview. A prepared librarian is better positioned to assist the patron with un-surfacing the information he or she will need to complete a project. Encounter poka-yokes include everything from the buzzing sound that reminds retail consumers to remove their credit card from a chip reader, to phone menus that use branching logic to ask customers a series of questions and then forward them to the service provider who is best equipped to handle their transaction. University libraries train circulation employees to request a university e-mail address and other information when a driver's license rather than an official university-issued ID is used to check out books. This training ensures that the correct patron record is used for the transaction. Post encounter, or resolution poka-yokes in libraries include systems to promptly and properly acknowledge donors, solicit feedback, and follow up on feedback provided.

Design/Methodology/Approaches

The REACH database represents university libraries' second attempt to record library liaisons' instructional and programming activities. It succeeded the TEACH database and the PROGRAM database, two independent systems the libraries introduced in July 2012 and January 2013 respectively. The TEACH and PROGRAM databases were intended to simplify the gathering of ARL and AAHSL instructional statistics across the institution and also collect data that administrators anticipated would inform the libraries' engagement activities (Appendix A and B). TEACH asked librarians and staff to answer a series of 31 open- and closed-ended questions for five defined instructional activities: course-related instruction, credit courses, online learning object or programs, orientation or tours,

and workshops (Table 1). PROGRAM captured information documenting programs, exhibits, and non-instructional tours planned and given by library employees. This system included fourteen questions ranging from the number of program attendees or tour participants to whether a program supported one of the libraries' vision statements and the university's "Excellence to Eminence" values or "Discovery Themes."[6]

Table 1. Definitions of activity types listed in TEACH and PROGRAM databases

Database	Type of Activity	Definition
TEACH	Course-related instruction session	• One-time bibliographic instruction sessions for credit courses taught by others • Assignment-based instruction sessions
TEACH	Credit course	• Entire course for which the librarian is the instructor of record
TEACH	Online learning object or program	• Established instructional content or assignments that can be repeatedly used in courses. (e.g., NetTutor online tutorials or Make the Leap program)
TEACH	Orientation/Tour	• Examples: first-year or international student orientations to library resources, tours in the Thompson library, sessions for new graduate students in a specific discipline
TEACH	Workshop (continuing education)	• Session that was developed for a group (internal to OSU or external), but is not related to a credit course offering. (e.g., Refworks Basics Workshop)
PROGRAM	Program	• Independent library program not associated with a specific class
PROGRAM	Exhibit	• Library sponsored exhibit or display
PROGRAM	Tour	• Library tours not associated with a specific class

By October 2013, it was clear that confusion over where and how to record data persisted among library faculty and staff and that streamlined reporting was needed to improve the quality of the data collected. The libraries' assessment coordinator, in partnership with the head of the teaching and learning department, designed an assessment project with the intent to simplify and align reporting requirements by redesigning the TEACH and PROGRAM databases. After obtaining sponsorship from the associate director for research and education for the project, volunteers were recruited from the libraries' teaching and learning committee to serve on the redesign team, along with a representative from the libraries' IT department. Team members were asked to:

- Identify reporting requirements and questions of interest
- Identify opportunities to leverage pre-existing university data
- Determine mechanisms to combine TEACH and PROGRAM database fields
- Develop a prototype for a revised data collection mechanism
- Solicit feedback from the teaching and learning committee
- Revise the prototype and work with IT to identify the best platform for the database
- Share the redesigned TEACH and PROGRAM database with faculty and staff and solicit feedback
- Incorporate feedback and suggestions into the redesign

- Launch the redesigned database

The team reviewed each field in the TEACH and PROGRAM database installations, and quickly recognized an opportunity to apply poka-yoke principles to the project. Data input into several TEACH and PROGRAM database fields was either not used for analysis, or could be sourced more consistently and accurately from other central university systems. Some data, such as instructional focus of a session, was determined to be more effectively gathered and followed up on using other techniques, such as curriculum mapping. The team also questioned whether requiring data be input for online learning objects and programs constituted double reporting, since these numbers were often pulled from systems such as Google Analytics and then re-entered into TEACH. Since library faculty and staff functioned both as service providers and as internal customers of these tools, several task, encounter, and preparation errors could be addressed during the project.

Through discussion, and the design of multiple prototypes, the team addressed task and encounter errors by reducing the number of activity types librarians and staff were asked to provide data for in both database systems from eight to four:

- Credit course
- Course-related instruction session
- Library program or workshop
- Orientation or tour

This change could improve consistency of reporting by combining fields and reducing the granularity of definitions for activity type. The team then further explored reducing task errors and simplifying data collection using branching logic. Branching logic directs flow through a survey or other data collection system based on how a respondent answers a question. Many of the questions in the original TEACH and PROGRAM databases were not relevant for all activity types. Several fields did not require a response. By not requiring information for select activity types, such as a credit course number for course-related instruction, data could be missing, or entered incorrectly, compromising analysis. Incorrectly input data was particularly an issue after the university changed its course numbering system from three digits to four following a quarter to semester conversion project. By applying branching logic to the redesigned database, librarians and staff would only view those questions that were relevant for the selected activity type. Branching logic offered designers the opportunity to further reduce their reporting burden, as well as establish required fields as appropriate for each activity type.

The team noted an additional opportunity to reduce task errors occurring when credit course and course-related instruction sessions data was collected after recognizing that data for questions such as the number of learners, or whether the course was a distance learning, freshman seminar, or honors course could be harvested from existing university systems. Each course section at the university has a uniquely assigned class number that is listed in the master schedule of classes.[7] If the redesigned database required librarians and staff to provide the unique five-digit class code for credit course and course-related instruction sessions, instead of the course number, the libraries would be able to centrally pull elements such as the name of the primary instructor of record for a course, and join this information to the data entered by a library employee (Figure 2). Having this information would further reduce reporting burden, as librarians and staff would then only need to provide data for five to seven fields, rather than 31, depending on whether the credit course or course-related instruction activity type was selected.

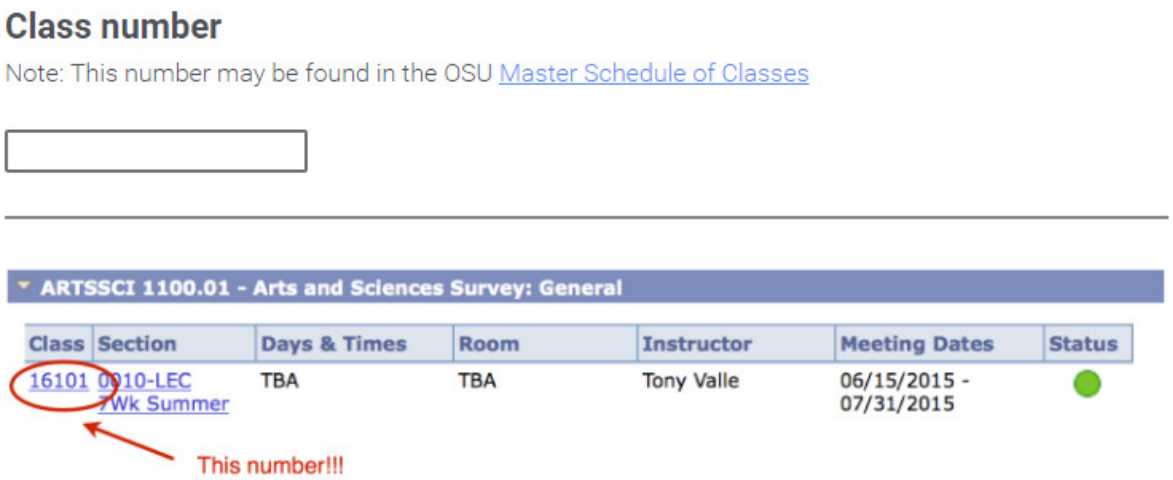
Figure 2. Example of class number for Arts and Sciences 1100.01, a freshman survey class with several sections taught by various instructors each semester

Once the team finished gathering requirements and testing prototypes, it worked with the libraries' IT department to determine whether existing platforms could be used to host the revised database, or if programmer time was needed to implement the team's vision. IT suggested using a Qualtrics survey to gather the data, since Qualtrics offers branching logic and the ability to export data in .csv format. The assessment coordinator could then harvest the collected data quarterly and combine it with relevant data hosted in other central university systems using Access, Tableau, and other tools. The project team accepted this solution, and recommended the revised database be renamed REACH, to reflect that the data gathered was intended to help the libraries articulate the impact of its instructional and programming outreach across the campus. The assessment coordinator then set up the survey and created a Tableau dashboard to summarize and push the raw data back to librarians and staff[8] (Appendix C).

Findings

The REACH database achieved poka-yoke using several techniques, such as simplifying the data collection instrument and requiring librarians and staff to enter the five-digit class code when recording credit course and course-related instructional activities. The redesign addressed several task, preparation, and encounter errors that occurred when librarians and staff input data into the previous two systems. As REACH was configured in Qualtrics, additional fail-safes, such as adding a direct link to the university's master schedule of classes to the field requesting a class number, were identified per the suggestion of the project team. A screen shot showing which number to enter in this field was also added and the assessment coordinator set Qualtrics to both force a response and require exactly five characters for the class number field (Figure 3). These three actions not only addressed task and preparation errors that occurred when using the previous data gathering systems, but nearly eliminated the need to clean data before analysis.

Figure 3. Qualtrics survey question for class number, with direct link to the master schedule of classes and a screen shot showing the number librarians and staff need to enter into this field



REACH now facilitates more accurate and robust reporting. Librarians and staff no longer need to guestimate the number of students enrolled in a class, as this number is now harvested from other central university systems. Critical information about an instructional session may no longer be omitted or errantly input. This saves the assessment coordinator valuable time by virtually eliminating the need to clean data. Using poka-yoke, the project team significantly reduced reporting burden, by aggressively simplifying its data-input form from 45 to five to fourteen fields, depending on the activity type selected.

Value and Impact

Ohio State's engaged librarians have several diverse responsibilities and are frequently pulled in many opposing directions throughout the course of their work. Recording data regarding their daily activities is often a challenge and an afterthought. Poka-yoke offers the assessment community several principles and techniques for improving the quality

and accuracy of data collected from librarians and staff. Poka-yoke applied to data collection systems facilitates analysis and may help libraries better articulate their impact. Poka-yoke also has the potential to improve the experience of individuals tasked with collecting library data, by simplifying their data entry experience and reducing their reporting burden.

Poka-yoke principles and techniques may be applied to any library system or service. By introducing fail-safes to product or service design, much frustration can be avoided and a better quality product or result may be achieved. Poka-yoke applied to data gathering systems in particular can effectively address data input errors, facilitate downstream analysis, and improve reporting. While "designing poka-yokes is part art and part science," the time required to investigate and address both service and customer errors is a valuable investment.[9]

Notes

1. Richard B. Chase and Douglas M. Stewart, "Make Your Service Fail-Safe," *MIT Sloan Management Review 35*, no.3 (April 15, 1994), http://sloanreview.mit.edu/article/make-your-service-failsafe/.

2. The Ohio State University Libraries, "A Framework for Engaged Librarianship: Building on Our Strengths," accessed September 21, 2016, https://carmenwiki.osu.edu/download/attachments/37010332/Engaged+Librarian+Document.pdf?version=1&modificationDate=1362663472574.

3. Chase and Stewart, "Make Your Service Fail-Safe."

4. Ibid.

5. Ibid.

6. The Ohio State University, "Ohio State Vision, Mission, Values, and Goals," accessed September 21, 2016, http://oaa.osu.edu/vision-mission-values-goals.html; The Ohio State University, "Discovery Themes," accessed September 21, 2016, http://discovery.osu.edu/.

7. The Ohio State University, "Master Schedule of Classes," accessed September 21, 2016, https://courses.osu.edu/psp/csosuct/EMPLOYEE/PUB/c/COMMUNITY_ACCESS.CLASS_SEARCH.GBL.

8. The Ohio State University Libraries, "REACH Database," accessed September 21, 2016, http://go.osu.edu/REACH-Dashboard.

9. Chase and Stewart, "Make Your Service Fail-Safe."

Appendix A. Screenshot of TEACH Database Data Input Form

Type of activity* — Select a value
Other

Description, reflection

Partners / collaborators

Number of sessions

Number of learners

Course Subject, College or Unit

Credit course number

Credit course title or program name

Credit course details
- Distance learning
- Elective
- Freshman seminar
- Freshman survey course
- GEC course
- Honors course
- Required for graduate/professional program
- Required for undergraduate major/program
- Service learning course

Sponsor name

Sponsor email

Learning outcomes*
- How to define / refine research question
- Types / formats of information sources (scholarly, primary)
- Availability of various library collections, services
- Choose the best research tools for the topic / discipline
- Use appropriate search terms, system commands
- Extract, record, manage information efficiently
- Evaluate information sources critically
- Select information that provides evidence for the topic
- Use content creation tools effectively
- Legally obtain, use text, data, images, sounds
- Understand plagiarism, how to document sources
- Other (describe below)

Describe other learning outcomes

Engagement score — Low engagement / Attentive, involved

Session evaluated?*
- No
- Yes, feedback/survey from students
- Yes, feedback/survey from course instructor
- Yes, pre/post test
- Yes, review of student research product
- Yes, SEI for credit course
- Yes, other (describe below)

Describe other evaluation method

Is evaluation data available? Please indicate location, how to acquire.

Semester / month* — Select a value

Activity length* — Select a value

Activity location*
- In library space
- In classroom/campus building
- Online
- Off campus

Primary audience* — Select a value
Describe non-OSU

Mode of instruction* — Select a value

Instructional focus*
- Intro to library/facilities
- Intro to research (general)
- Assignment specific
- Overview of subject/topic
- Advanced research techniques

Teaching methods*
- Lecture / demonstration
- Hands-on activity
- Small group discussion
- Class discussion
- Gaming or simulation
- Individual student project or presentation
- Team project or presentation
- Problem-based or case study
- Independent or self-directed study
- Other (describe below)

Describe other teaching method

Instructional technology*
- Carmen course site
- Email listserv (separate from Carmen)
- Social media (Twitter, Facebook, blogs, etc.)
- Mobile device (iPad, tablet, smartphone, etc.)
- Digital audio recorder or camera
- Audience response/polling devices (clickers)
- SMART podium or interactive whiteboard
- Audio or video recording played in class
- Streaming audio or video
- Wiki, including CarmenWiki
- Document camera in classroom
- Videoconferencing
- Not applicable

Prep hours

Online object usage

Title of online learning object or program

Type of online learning object or program
- Carmen quiz or assignment
- Carmen Library Link page
- Subject or resource guide (web-based)
- Tutorial
- Movie/screencast
- Game
- Other (describe below)

Describe other type of learning object

Appendix B. Screenshot of PROGRAM Database Data Input Form

Name*

Program/Exhibit/Tour Name*

Program/Exhibit/Tour Type* ○ Program ○ Exhibit ○ Tour

Number of attendees*

Program Date*

Program Time

Program Location

Did the program have a co-sponsor ○ yes ○ no

If yes, please list your co-sponsor(s)

Did your program support the **OSUL Vision**:
- ☐ Advance student and faculty success
- ☐ Deliver distinctive content
- ☐ Foster intellectual connections

Which **Excellence to Eminence** value(s) did your program support?
- ☐ Excellence
- ☐ Collaborating as One University
- ☐ Acting with Integrity and Personal Accountability
- ☐ Openness and Trust
- ☐ Diversity in People and Ideas
- ☐ Change and Innovation
- ☐ Simplicity in Our Work
- ☐ Empathy and Compassion
- ☐ Leadership

Did your program support a university **Discovery Theme**? If so, which one?
- ☐ Health and Wellness
- ☐ Energy and Environment
- ☐ Food Production and Security
- ☐ Not applicable

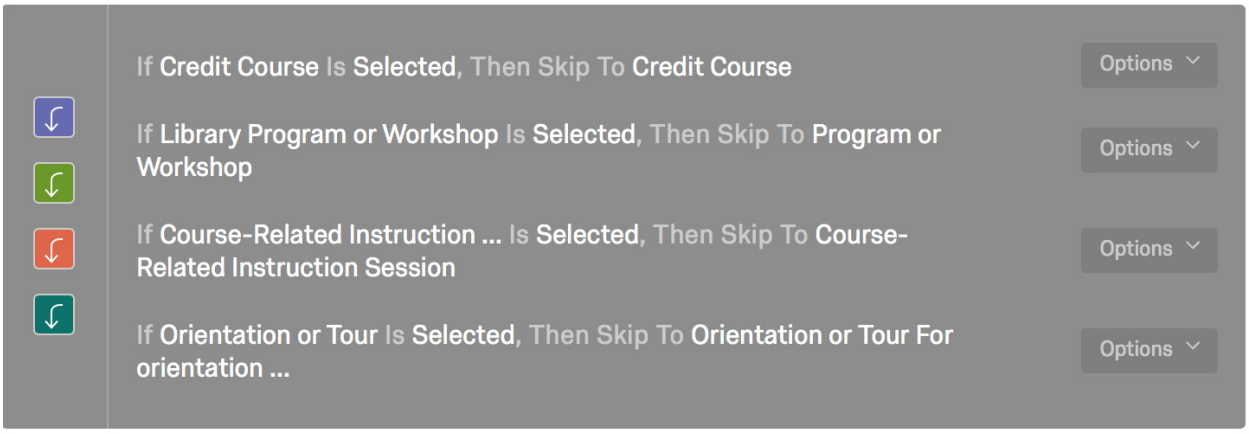
How was the program/event promoted?
- ☐ library.osu.edu
- ☐ OSU Today
- ☐ onCampus
- ☐ Printed flyer or invitation
- ☐ Listing in area event calendars
- ☐ listservs
- ☐ Facebook
- ☐ Twitter
- ☐ Newsnotes
- ☐ OSUL staff intranet

Appendix C. REACH Database

1. Your OSU email address
Such as name.12345@osu.edu

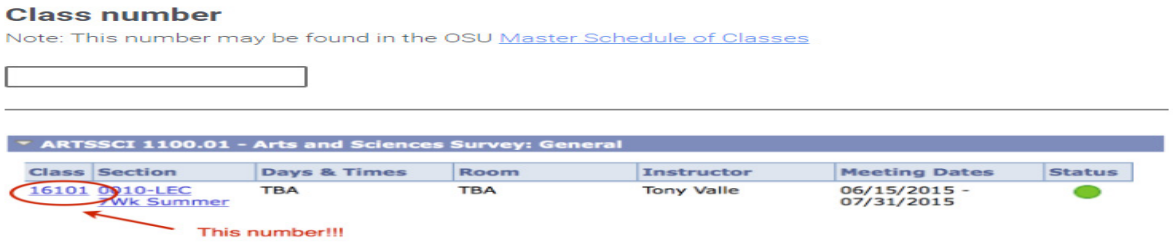
2 Select one

- Credit Course
- Course-Related Instruction Session
- Library Program or Workshop
- Orientation or Tour



Credit Course
1. Class number

This number may be found in the [OSU Master Schedule of Classes](). For four-digit class numbers, insert a '0' before the first number (e.g., 1234 = 01234).



2. Location

Displays a list of library classrooms. This list also includes Online, as well as Other Classroom or Facility as options.

Display This Question:
If **Location Other Classroom or Facility Is Selected**

3. If other, where was this activity taught?

Please list the building and room number.

4. Did you co-teach this activity with another library employee?

Please submit only one record per co-taught activity

- Yes
- No

If **Yes** Is **Selected**, Then Skip To **If yes, please provide an email for t...** Options

If **No** Is **Selected**, Then Skip To **End of Survey** Options

5. If yes, please provide an email for the individual you co-taught this activity with?

If **If yes, please provide an e...** Is **Displayed**, Then Skip To **End of Survey** Options

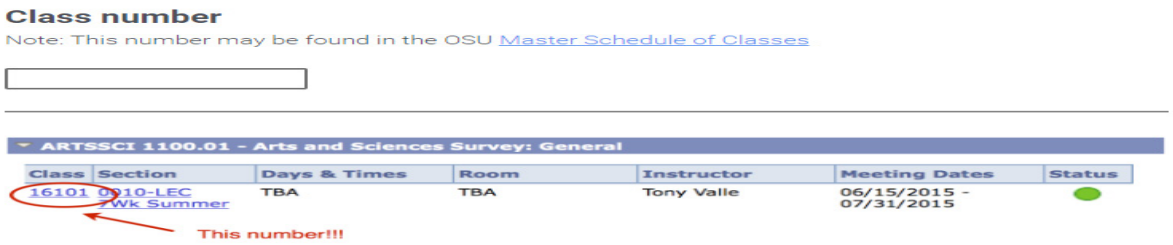
Course-Related Instruction Session
1. Date of instruction session

mm/dd/yyyy

If multiple sessions were taught, please provide one entry for each session. If you were an official instructor for the course, please stop and use the credit course section of the database to record your information.

2. Class number

This number may be found in the OSU Master Schedule of Classes. For four-digit class numbers, insert a '0' before the first number (e.g. 1234 = 01234).

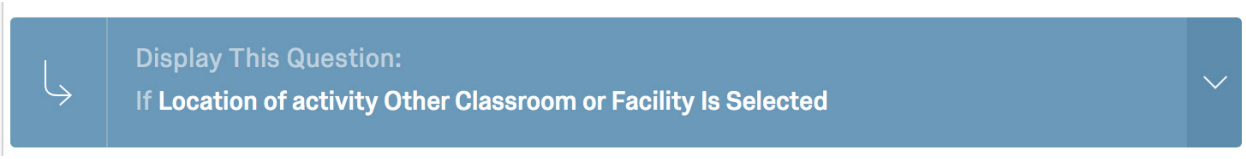


3. Length

- 25% of the class session
- 50% of the class session
- 75% of the class session
- 100% of the class session

4. Location of the activity

Displays a list of library classrooms. This list also includes Online, as well as Other Classroom or Facility as options.



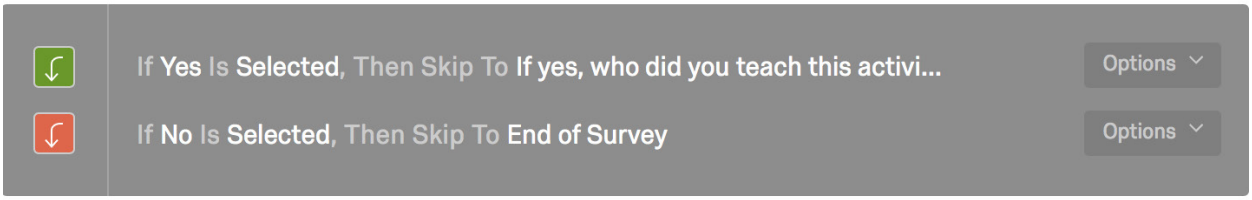
5. If other, where was this activity taught?

(Please list the building and room number)

6. Did you co-teach this activity with another library employee?

Please submit only one record per co-taught activity

- Yes
- No



7. If yes, who did you teach this activity with?

If If yes, who did you teach t... Is Displayed, Then Skip To End of Survey Options

Program or Workshop
1. Are you entering data on behalf of a library committee, unit, or individual sponsoring this program or workshop?

- Yes
- No

Display This Question:
If Are you entering data on behalf of a library committee, unit, or individual sponsoring this progr... Yes Is Selected

2. Please enter the name of the library committee, unit, or individual who sponsored this program or workshop.

3. Title of program or workshop

4. Date of program or workshop - mm/dd/yyyy

If a multiple day program, or event, please provide one entry for each day of the program or event

5. Number of attendees

6. Location

Displays a list of library classrooms. This list also includes Other Classroom or Facility as options.

Display This Question:
If Location of activity Other Classroom or Facility Is Selected

7. If other, where was this program held?

If on campus, please list the building and room number

8. Did this program have a co-sponsor?

- Yes
- No

Display This Question:
If **Did this program have a co-sponsor? Yes Is Selected**

9. If yes, please list your co-sponsors

Please place a ; between co-sponsors

10. Which Vision of University Libraries did your program support?

(Select all that apply)

- Advance student and faculty success
- Deliver distinctive content
- Foster intellectual connections

11. Which University Values did your program support?

(Select all that apply)

- Commitment to Excellence
- Collaboration as One University
- Acting with Integrity
- Personal Accountability
- Openness and Trust
- Diversity in People and Ideas
- Change and Innovation
- Simplicity in Our Supporting Processes
- x Not applicable

12. Did your program or workshop support a University Discovery Theme? If so, which one?

(Select one)

- Energy and Environment
- Food Production and Security
- Health and Wellness
- Humanities and Arts
- x Not applicable

Display This Question:

If **Did your program or workshop support a University Discovery Theme? If so, which one? (Select one) Energy and Environment Is Selected**

And **Did your program or workshop support a University Discovery Theme? If so, which one?(Select one) Food Production and Security Is Selected**

And **Did your program or workshop support a University Discovery Theme? If so, which one?(Select one) Health and Wellness Is Selected**

13. Did your program or workshop support a University Discovery Theme Focus Area? If so, which one?

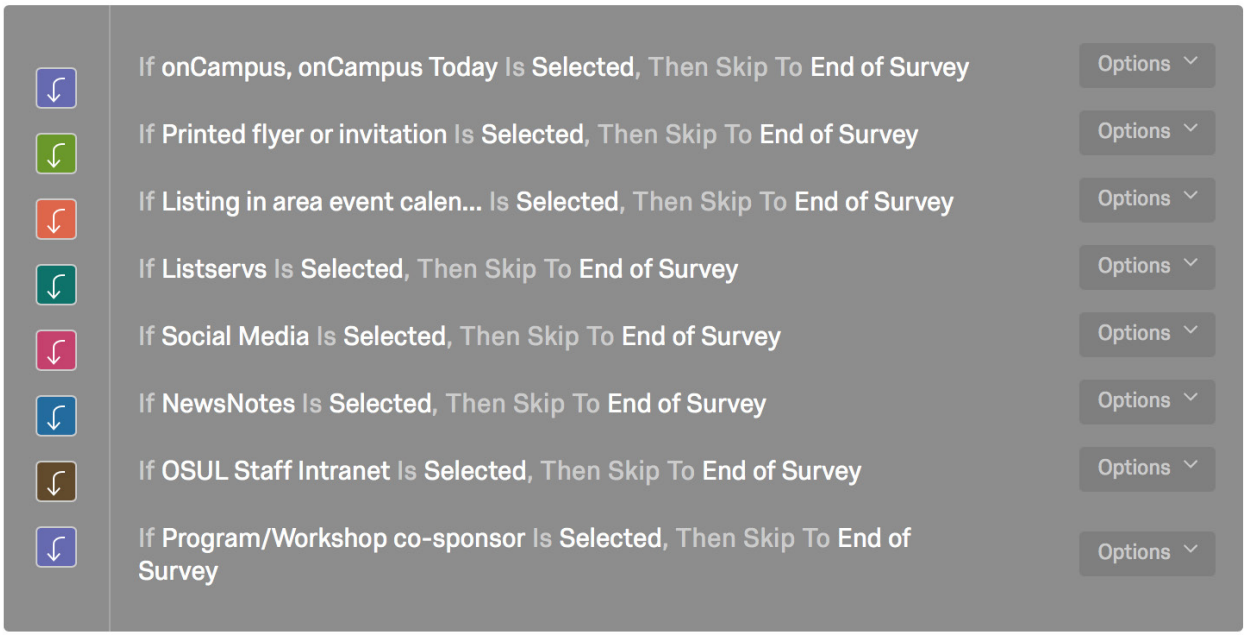
(Select one)

- Brain Injury
- Data Analytics
- Foods for Health
- Food and Agricultural Transformation
- The Humanities and the Arts
- Infectious Diseases
- Materials and Manufacturing for Sustainability
- Sustainable Materials and Resilient Economy

14. How was this program or workshop promoted?

(Select all that apply)

- OnCampus, OnCampus Today
- Printed flyer or invitation
- Library website
- Listing in area event calendars
- Listservs
- NewsNotes
- OSUL Staff Intranet
- Program/Workshop co-sponsor
- Social media



Orientation or Tour

For orientation or tours for general groups (e.g., orientation for new graduate students in the College of Veterinary Medicine or International Student Orientation). If you give a tour for a specific class, please record this tour under one-shot instruction.

1. Date of orientation or tour

mm/dd/yyyy

2. Name of individual or group requesting orientation or tour

3. Please provide an email for the primary individual or group who requested the orientation or tour.

4. Primary audience

- OSU Undergraduate
- OSU Graduate
- OSU Faculty/Staff
- Non-OSU

5. Number of participants

6. Location of orientation or tour

Displays a list of all OSU library locations.

Display This Question:

If **Location of orientation or tour Other location Is Selected**

7. Please note the location of the orientation or tour

8. Length of orientation or tour

- Less than 30 minutes
- 31 to 60 minutes
- more than 60 minutes