Evidence Based Library and Information Practice

Gathering Evidence of Learning in Library Curriculum Center Spaces with Web GIS

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Volume 15, Number 3, 2020

URI: https://id.erudit.org/iderudit/1088766ar
DOI: https://doi.org/10.18438/eblip29721

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Publisher(s)

University of Alberta Library

ISSN

1715-720X (digital)

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Cite this article

Stoddart, R. & Godfrey, B. (2020). Gathering Evidence of Learning in Library Curriculum Center Spaces with Web GIS. *Evidence Based Library and Information Practice*, *15*(3), 21–35. https://doi.org/10.18438/eblip29721

Article abstract

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Methods – The researchers used observation data gathered with a Web GIS tool to examine space usage within the library's curriculum center.

Results – The pilot study found that student usage of the curriculum center was mainly associated with two campus learning outcomes: (1) Communicate and (2) Learning and Integrate. The evidence also indicated possible design improvements that may make the curriculum centers spaces more functional for students.

Conclusions – The Web GIS tool proved to be a useful tool to gather evidence of student space usage within the library environment. The mapping of individual spaces to learning activities further enhanced the usefulness in interpreting how students are using library spaces. Leveraging the space usage data within learning outcomes statements created another means for the library to communicate its learning impact with campus stakeholders.

Evidence Based Library and Information Practice

Research Article

Gathering Evidence of Learning in Library Curriculum Center Spaces with Web GIS

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Received: 29 Jan. 2020 **Accepted**: 18 May 2020

DOI: 10.18438/eblip29721

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Introduction

Academic libraries offer diverse learning spaces for students and researchers. These spaces can range from the traditional quiet study areas to more dynamic technology-infused spaces such as data visualization labs or makerspaces. While this variety of library spaces demonstrate the evolving efforts academic libraries have undertaken to be responsive to student and researcher needs and expectations, the core mission of academic libraries remains the same – to support the learning needs of the communities they serve. Academic libraries advance their learning mission through the development of resource collections that support their institution's curriculum and research needs. Libraries also offer library instruction, workshops, and tutorials that aid in research productivity, information literacy, and workplace skills. In addition, libraries create spaces that are conducive to student learning and engagement.

This pilot research project focused on one aspect of the library's learning mission – learning spaces. As Van Note Chism (2006) suggested about learning spaces:

> Institutions of higher education are charged with fostering specific kinds of learning: higher-order thinking abilities, communication skills, and knowledge of the ways of disciplinary experts, to name a few. Educators must create structures that support this learning. Space can have a powerful impact on learning; we cannot overlook space in our attempts to accomplish our goals. (p. 2.2)

Academic libraries are prime locations for the types of learning Van Note Chism highlighted by offering dedicated spaces for students to gather, study, and learn. As a result, libraries have been taking a more active role in designing and thoughtfully thinking about the physical environment they provide for their patrons. Van Note Chism pointed to Monahan's (2002) idea of a "built pedagogy" as one way to think about this idea of intentionally designed learning space.

However, as libraries create and cultivate these diverse learning environments, they remain challenged to assess and evaluate what types of learning activities occur in these spaces – especially if the learning activity, such as studying, is self-directed by students. This article reports on a research project for which researchers gathered usage statistics in specifically designated library learning spaces using a Web-based Geographic Information System (GIS). These learning spaces were then mapped to expected learning activities that would occur in these areas based on its intention or design. In this way, the library staff could begin to associate the usage of a space with different types of learning.

This work builds on previous research by the authors that detailed the technical, technology, and some methodological aspects of this project that focused primarily on data gathered in the main library (Godfrey & Stoddart, 2018). This current article reports on a different dataset concentrating on one specific library space, the Curriculum Center, which is embedded in the university's College of Education. In addition, this article focuses more directly on mapping usage data to campus learning objectives.

Objective

Documenting learning in libraries has always been a challenge. Gate counts capture the number of patrons who walk through the door but do not illuminate where in the library patrons go, or what learning activities patrons undertake when in the library. Traditionally, libraries are viewed as a space for students to study, which can also be seen as a form of self-directed learning. Self-directed learning is an essential form of learning that often occurs outside of the classroom. Many libraries now offer additional spaces such as computer labs where students apply, create, and integrate knowledge through completing homework assignments, writing papers, or interacting with online learning management systems. Libraries also often offer group spaces where students can collaborate in teams to complete projects or study. Additionally, libraries have begun to build dynamic spaces such as audio/visual labs or makerspaces where students can create or apply knowledge in a hands-on technology-rich environment. Within all these possible library spaces, simple gate counts are an insufficient measure to adequately express how learners interact with the library and leverage these spaces for learning or other activities.

Recently, the University of Idaho completely remodeled the College of Education building, including its Curriculum Center, which is staffed by library personnel. The new Curriculum Center space includes a collection area of five shelving units for materials, a service point for circulation and research assistance, a bank of five computers for printing and writing, a group table for study and collaboration, and various soft seating elements for study, relaxation, and gathering.

This article focuses specifically on data and observations captured at the Curriculum Center in these newly designed spaces using GIS, and how this data might inform the reporting of the library's contributions to campus learning outcomes. The intended goal of this research is to be able to gather evidence that would support statements connected to relevant campus learning outcomes similar to the one articulated below:

> Curriculum Center Learning Outcome Statement: Communicate
> *The Curriculum Center supports the campus learning outcome of* ***Communicate*** *by offering spaces, such as computer stations and a public demonstration space, that encourage acquiring, articulating, creating, and conveying meaning. In 2017, the Curriculum Center recorded* **X#** *interactions in these* ***Communicate*** *supporting spaces and observed* **X#** *patrons using these resources.*

Method: Evidence-based Research

Koufogiannakis and Brettle (2016) outlined an evidence-based framework based on Booth's collaborative model (2009) to guide researchers and practitioners. This evidence-based cycle is as follows: *Articulate. Assemble. Assess. Agree. Adapt*. This model is used by researchers and practitioners to assist in developing their evidence-gathering for research projects and decision-making. The evidence-based framework also helped construct the pilot project methodology detailed below and was embedded within the traditional research paper structure of Introduction, Objective, Literature Review, Methods, Results, Discussion, and Conclusion.

Articulate the Question

The development of guiding questions for this study was intended to determine if students are using the new furniture and spaces in the Curriculum Center, as well as an attempt to map this usage to related campus student learning outcomes. The research questions were as follows:

> *What is the student usage of the new Curriculum Center spaces/furniture?*
>
> *Can this usage data be mapped to campus learning outcomes?*

Assemble the Evidence

The evidence gathered for this pilot project consists of internal evidence available from local data sources, external evidence available from the literature, and evidence gathered from research associated with the Web GIS pilot project. In combination, these sources of evidence informed the research direction for this pilot project.

External Evidence (Literature Review)

Libraries have been quick to embrace exploring various design elements to expand the learning opportunities available to their patrons. This is evidenced by the rise in redesigned library spaces such as learning commons, makerspaces, and ideation rooms that allow for flexible interaction with design elements and technology. Evaluation of these spaces has been a challenge for some libraries. Ferria et al. (2017) noted "There is a growing concern for universities to evaluate their library facilities, services, technology, and information resources to determine the impact on student learning and how library supports the research and public service mission of the institution" (p. 20).

One significant development for library space evaluation has been the work undertaken by Casden et al. (2020), researchers at North Carolina State University. Using their SUMA tablet-based space assessment tool, they investigated library space usage, activities, and transactions. This mobility to gather evidence using a tablet and manipulate the data into visualizations or dashboards was an inspiration for the authors to undertake their own research in this area. However, this particular study leveraged locally available GIS expertise and Web GIS instead of deploying a SUMA software application installation or building other technology evaluation options from scratch. The study was a continuation of the work undertaken previously by the authors (Godfrey & Stoddart, 2018) that demonstrated the feasibility of using Web GIS as a means to capture and articulate library space usage. The research is also built upon the previous GIS library space work such as that by Bishop and Mandel (2010), Coyle (2011), Elliott (2014), Given and Archibald (2015), Mandel (2010), and Xia (2004, 2005) that all explored the connections of GIS and library space evaluation.

In addition to gathering data on space usage, the authors were interested in exploring the possibility of more direct ways to connect activities that occur in library spaces to campus learning outcomes. After all, these newly reimagined spaces were intentionally designed to facilitate certain types of activities associated with learning. For example, learning commons areas where students research and write papers is associated with knowledge creation; or collaboration spaces, such as group study rooms, contribute to communication and teamwork development. Monahan (2002) suggested the term *built pedagogy* as the way the design of learning environments influences what forms of learning might be accessible to students interacting in such spaces. An example of this *built pedagogy* would be a room of unmovable study carrels which would convey a pedagogy of conformity. This sort of design has built-in parameters on the types of learning that could effectively occur in such a space constraining learning actions to individualized studying and limited interaction from peers.

Conversely, a learning environment that has moveable tables and chairs suggests a pedagogy of freedom, collaboration, and discovery. Scholars such as Jonassen and Land (2000), Oblinger (2006), and Savin-Baden (2008) also put together works examining the theoretical and functional aspects of learning spaces that influenced the thinking behind this pilot research project. In particular, Mathews and Soistmann's recent work (2016) about responsive, flexible design concepts and learning environments inspired the research as exemplified by their suggestion that "space imparts action" (p. 30). We also believed that thoughtful library designed space might influence the act of learning in beneficial ways.

Evidence-based librarianship offers a useful framework to begin connecting space usage data to campus learning outcomes. Evaluation of library spaces and evidence-based research are not strangers to each other. Recent examples include evidence-based library space research undertaken by Asher (2017), who examined a library's learning commons, as well as Ferria et al. (2017) who investigated in what ways students are using library spaces for learning and social engagement. The researchers for both of these studies used a mixed-methods approach. Still, other evidence-based methodologies for library space evaluation have included photographic research methods (Bedi & Webb, 2017), longitudinal observation (Fox & Doshi, 2013), and ethnographic investigation (Tewell et al., 2017).

In summary, this study leveraged the methodology processes and research assembled by the research base of evidence-based librarianship, GIS library space evaluation, and purposely designed learning spaces.

Internal Evidence

While library staff can capture gate count data from the main library's electronic security gates, they do not have that option for the Curriculum Center because of its open design. Circulation data on collection use was available, but it only reflected usage in one area of the Curriculum Center and did not take into account browsing or other activities. To remedy this lack of space usage data, the Curriculum Center staff began keeping observational statistics in an online spreadsheet. However, this spreadsheet was not designed or intended as a sophisticated data instrument. Spreadsheet usage data was organized simply by observed activity such as browsing or studying and did not include elements such as location or time of day. Therefore, inferences can only be made about how patrons were using the Curriculum Center but not where within the multiple potential learning spaces available such activities were occurring. In order to begin gathering this different level of detail, a new method was needed to fully capture learning activities within the Curriculum Center.

A good starting point to begin to understand how the Curriculum Center spaces might impact student learning was to examine the center's layout to reveal the intentionality of its design more clearly. A map of the Curriculum Center was created based on various attributes such as seating, study tables, or collections – as well as available technology such as computer terminals (see Figure 1).

Once a detailed map of the Curriculum Center was created, the next step was to connect this map to potential learning outcomes or activities that might occur within these areas. The *Learning Space Taxonomy*, part of the Learning Space Toolkit (https://learningspacetoolkit.org/space-types/learning-space-mind-map/index.html), was used to map activities associated with the Curriculum Center (see Figure 2). Data collectors were asked to record comments if observations were outside expected space activities. The taxonomy groups activities into five broad categories:

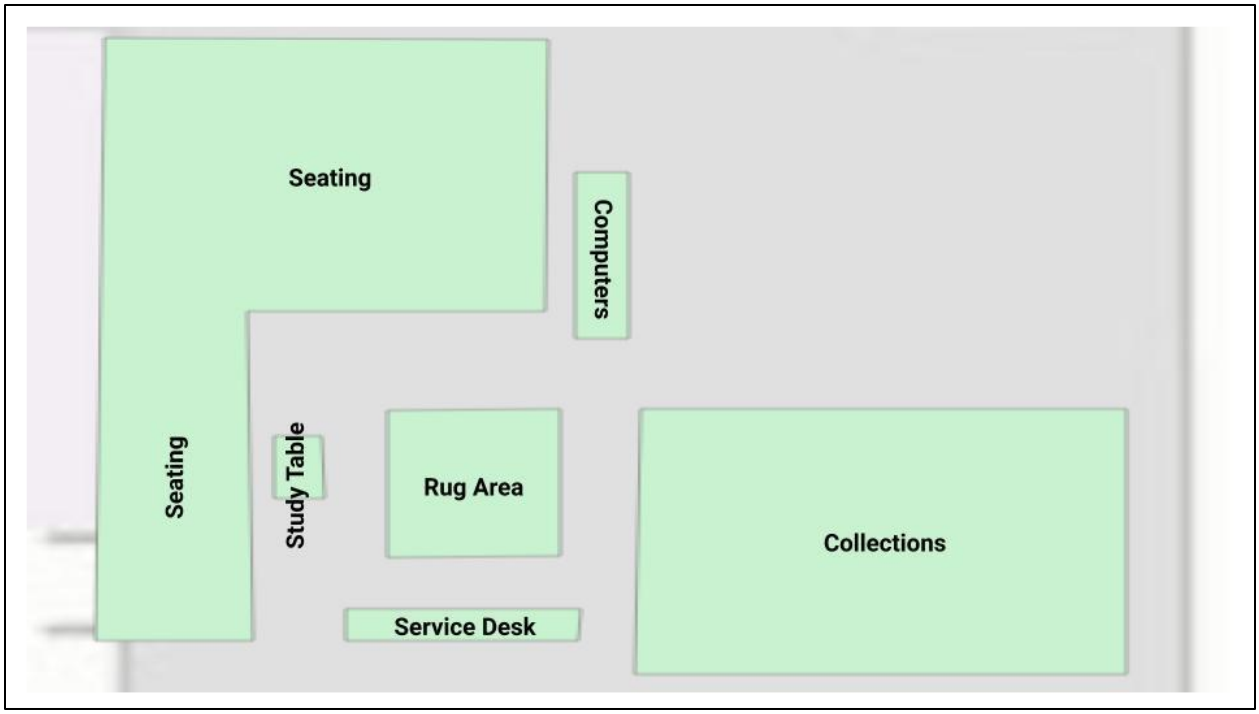

Figure 1
Curriculum Center spaces.

- **Focus** (listening, studying, meditating, viewing, etc.)
- **Create** (designing, editing, writing, producing, etc.)
- **Collaborate** (brainstorming, demonstrating, discussing, meeting, presenting, etc.)
- **Share** (assessing, teaching, tutoring, advising, etc.)
- **Socialize** (eating/drinking, gaming, networking, etc.)

These learning taxonomy categories are then mapped to corresponding university learning outcomes (see Table 1).

Once spaces on the map of the Curriculum Center spaces were assigned, the authors met and discussed the types of taxonomy activities that would most likely occur in these areas (see Table 1 and Figure 2). For the seating areas identified in the Curriculum Center, it was thought that studying would be the most appropriate activity, so the researchers associated this area with *focus*. The Curriculum Center collections area, which encompassed the available stacks of books, was also associated with *focus* as patrons used this area to view or browse materials. For the computer area, the authors associated this with *create* as this was the place where writing and editing most likely would occur. The study table was associated with *collaborate,* as this was the most prominent group space in the Curriculum Center. While the front desk in the Curriculum Center is a service point to check out materials, it is also a place to ask questions or seek assistance. With this in mind, the front desk was associated with *share* for the teaching and advising aspect that occurs there. *Share* was also associated with the rug space as this area is envisioned as a place where story times or informal teaching opportunities might happen. Based on the learning space taxonomy that was being used for the study and the associated spaces in the Curriculum Center, the researchers were able to crosswalk these space usage criteria to the campus learning goals (see Table 1).

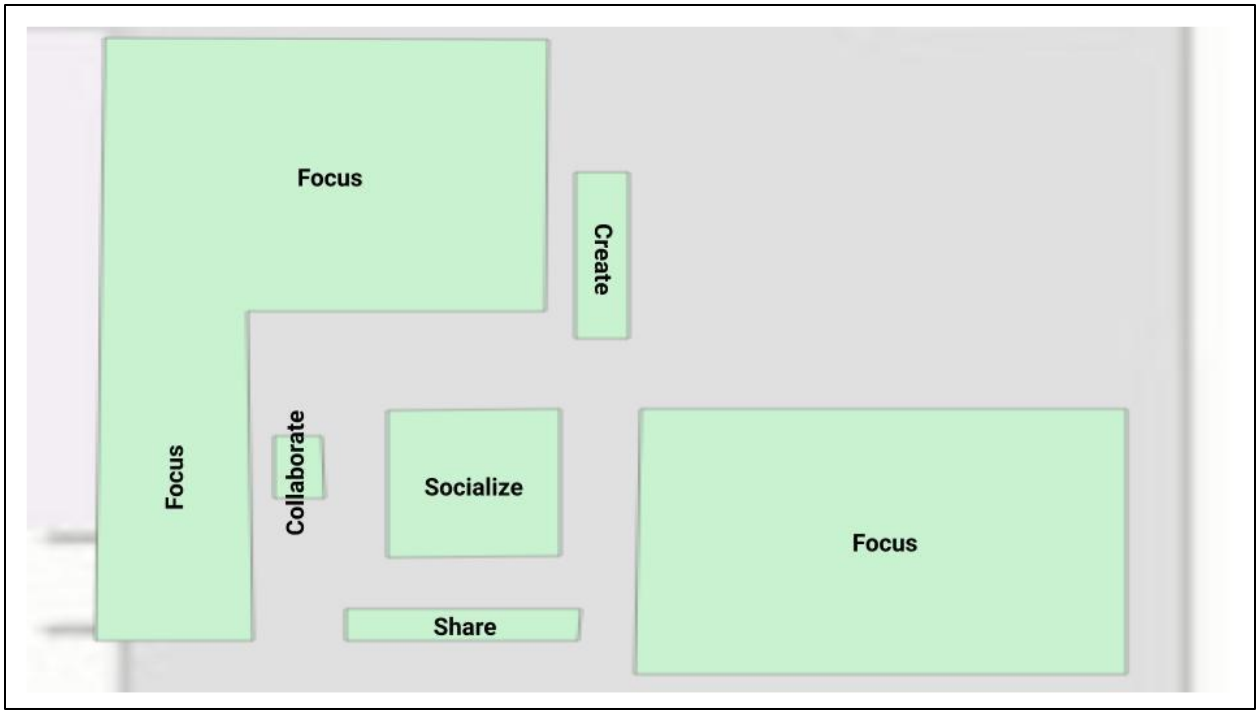

Figure 2
Curriculum Center learning taxonomy.

Table 1
Curriculum Center Learning Spaces Taxonomy

Learning Taxonomy	Learning Outcome	Activity	Space
Focus	Learn & Integrate	listening, studying, meditating, viewing	Seating, Collections
Create	Communicate	designing, editing, writing, producing	Computers
Collaborate	Learn & Integrate	brainstorming, demonstrating, discussing, meeting, presenting	Study table
Share	Learn & Integrate	assessing, teaching, tutoring, advising,	Front Desk
Socialize	Communicate	eating/drinking, gaming, networking,	Rug space,

This mapping did not indicate that Curriculum Center space usage was a direct measure of a particular learning outcome, rather this research was intended to gather evidence to better communicate to stakeholders how libraries contribute to supporting learning on campus. Additionally, every single campus learning outcome would not be captured by the learning taxonomy assigned within the Curriculum Center spaces (see

https://www.uidaho.edu/learningoutcomes for a full list of learning outcomes). Similarly, there might be multiple learning outcomes associated with activities occurring in library spaces. For the simplicity of this research project, a primary learning outcome was assigned to each taxonomy. Thus, this study created an indirect assessment of potential learning activities that might be occurring in Curriculum Center spaces. This study relied heavily on the assumption that the spaces were designed appropriately to facilitate and enhance specific types of learning (i.e., built pedagogy). Ultimately, the data gathered was intended for the Curriculum Center to begin to evaluate the effectiveness of these intentionally designed spaces. Also, this evidence acts as another data point from which to construct new narratives on campus regarding the role libraries and the curriculum play in contributing to student success and learning.

Capturing Data with the GIS Pilot Project

These maps articulating the learning spaces within the Curriculum Center were useful to understand how patrons might operationalize these areas for their learning development. However, without capturing the actual usage of the spaces, it was uncertain if and when these learning spaces were utilized for their intended purposes or even other activities not envisioned by the designers. Because of their previous familiarity with this technology, the authors wondered if a Web-based GIS application would be an appropriate tool to capture detailed patron space usage data in the Curriculum Center. In addition to obtaining location-specific information, a Web GIS data-gathering tool would afford a flexible means to begin gathering usage data without a significant expenditure of library resources or technical training.

After some preliminary investigation of Web GIS tools, the researchers selected Collector for ArcGIS (https://www.esri.com/en-us/arcgis/products/collector-for-arcgis/overview) as the most appropriate application to gather data via a desktop computer that directly observed the Curriculum Center. There were many advantages of using Web GIS for this research project. A support network and infrastructure was already in place to work with Web GIS on campus. There was direct access to expertise from a dedicated GIS librarian as part of the research team. The researchers were able to use off-the-shelf technology and Web GIS software that was already available on campus and relatively easily installed on library computers. Additionally, there was the potential to engage student workers with Web GIS as an experiential learning activity they might be able to put on their resume. There was also the future potential to collaborate on similar library spaces projects with regional libraries that already had GIS expertise on their campuses. The authors' previous study (Godfrey & Stoddart, 2018) outlined in more detail the technology and technical specifics of using Web GIS for space assessment. The researchers and trained staff gathered data by observation during the operating hours of the Curriculum Center. Observation data were inputted into Collector for ArcGIS, a mobile-data collection application installed on the desktop computer used at the Curriculum Center circulation desk service point. Data-gathering occurred when observed as opposed to randomly assigned times or via a specified schedule. Staff were instructed to input the number of patrons in predefined areas and to include written notes in an open data field regarding activities occurring. During an observation, a patron might be seen traversing between different Curriculum Center spaces. For example, a patron might be seen looking for books in the Curriculum Center stacks and then taking these items to sit down and read. In such instances, when multiple actions were occurring by the same patron(s) across different learning spaces within the Curriculum Center, each item was recorded as a distinct observation in Collector for ArcGIS. As such, the data recorded is more concerned with activities occurring within spaces rather than patrons themselves.

Limitations with the GIS Pilot Project

While Collector for ArcGIS offered a ready-made tool for gathering data about space usage in the Curriculum Center, the project did encounter some issues as it rolled out. One of the first issues encountered was accessibility issues with the GIS application related to campus computers. Collector for ArcGIS needed to be installed on the curriculum service point computer, as well as be made accessible via all workplace computer Curriculum Center accounts when they signed in. This required campus IT staff to become involved in installation and access of the software but also to resolve staff access issues when computer updates created unexpected problems. The IT staff response time to resolve application and account issues often resulted in delays in data-gathering. While campus IT delays were at times a limiting factor, Collector by ArcGIS was already a campus approved form of software, which meant that other software might have taken even longer to support and install.

Additionally, data fidelity issues arose from staff interrater reliability complications associated with the first iterations of the GIS survey instrument. Earlier iterations of this pilot project asked data collectors to not only indicate the number of users in a specific place but to select from a list of patron activities observed. For example, for a patron viewed in the computer area working on a homework assignment, the data collector might select *composing a paper* from a list of activities provided in the survey instrument. Activities in the list were then mapped to official university learning outcomes (https://www.uidaho.edu/learningoutcomes) such as *communicate*, *think and create*, and others. However, based on feedback from the Curriculum Center staff participating in the pilot project, inputting this extra datapoint from the dropdown list was too burdensome to gather within the time constraints of recording each observation. Staff also admitted confusion between learning activity items like *using library computers* and *individual studying* as being similar. In some cases, these learning activities were too subjective for accurate interpretation without being overly intrusive to the patrons (e.g., looking over a patron's shoulder). With this constructive feedback in mind, the methodology associated with data-gathering was refined and simplified to only capture usage in designated spaces. The GIS observation form only asked the observer to indicate the number of people in a given area and to make a notation if the observed activity was not congruent with the learning intention behind the space design. For example, if staff observed a single student by the library computers working on a paper, they would note on the GIS form that one student was in the library computer area and nothing else because the student was using the space as intended. However, if a group of students was observed around a computer, the staff person might indicate on the form the number of patrons by the computer area, but also include a notation that the observation was more akin to group study. This approach simplified data entry for staff and also captured if spaces were being used as intended or in unintended ways.

Thus, the dataset reported in this article for the Curriculum Center did not require data collectors to assign observed patron activities but instead pre-assigned learning taxonomy activities to spaces (see Figure 2 and Table 1).

Results: Assess Evidence

Once the evidence has been assembled, it must be assessed within the context of the research question(s) as they have been articulated. This pilot project gathered evidence to help answer *What is the student usage of the new Curriculum Center spaces/furniture?* and *Can this usage data be mapped to campus learning outcomes?*

What is the Student Usage of the New Curriculum Center Spaces/Furniture?

The GIS space assessment tool was successful in documenting space usage in the Curriculum

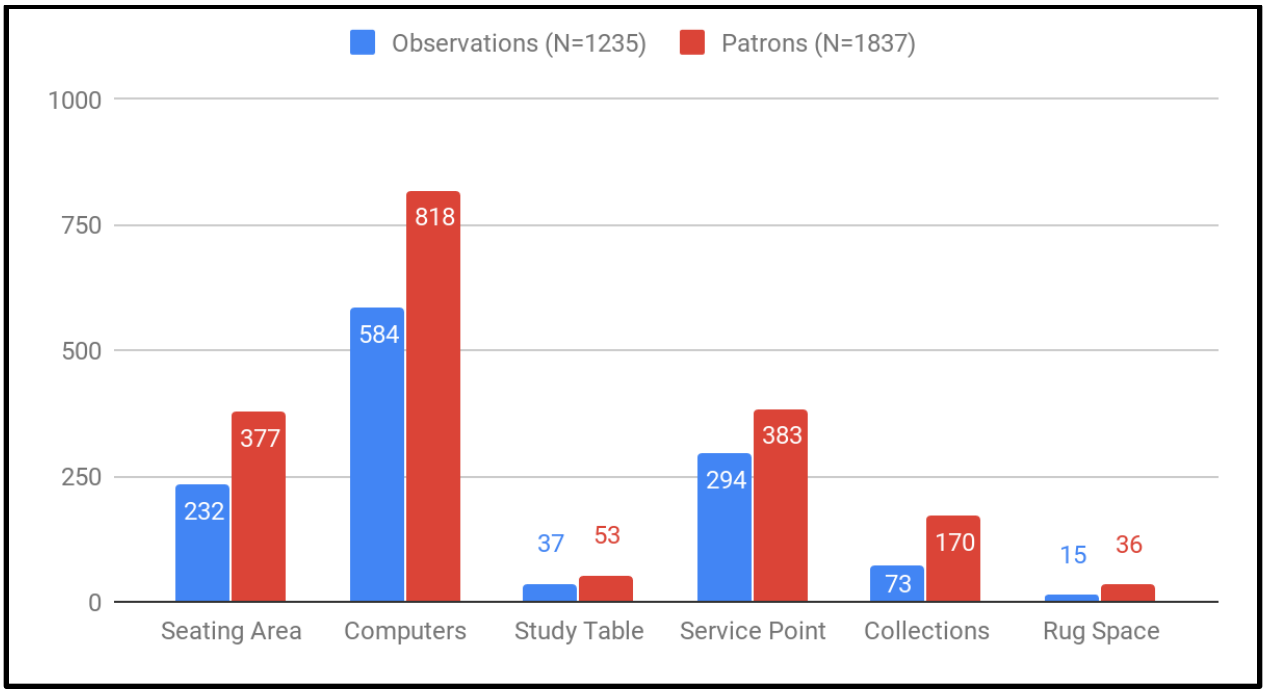

Figure 3
Curriculum space usage – Fall 2017.

Center and offered evidence about how patrons were using this new space. Staff recorded 1,235 observations using the GIS instrument during the Fall 2017 data collection period (see Figure 3). In total, there were 1,837 patrons observed using the Curriculum Center, either individually or in groups.

The data indicated that the area patrons used most in the Curriculum Center was the bank of computers. Staff observed 584 interactions in this space, comprised of 818 patrons. These results were not surprising as many students stopped by to print course materials or homework assignments before class. However, what is striking about usage in this space is that these computer stations were designed for individual usage. Still, data and staff observations indicated that many students gathered around these computers in groups. This is supported by the evidence that 818 patrons were observed using this space, while there were only 584 interactions, which indicates that 234 students were gathering in groups. This finding suggests that this computer space might need to be re-envisioned to be more conducive for group work.

Conversely, the large study table area, which was intended as a student collaboration space, only saw limited group usage as evidenced by 53 patrons using this space during 37 interactions, indicating that only 16 students used this space for group work. Compare this data with the seating area, which saw 377 patrons using this space from 232 observations, suggesting that 45 students gathered in groups in this seating space, which is an intended function of this flexible area. These group table findings are open to further study or interpretation as they might suggest that patrons are uncomfortable sharing table space or that further promotion of these spaces as collaboration areas might be needed.

The Curriculum Center collection was another area that saw students gathering in groups, which might be unexpected to some. However, this can be attributed to the various library instruction classes and education courses that

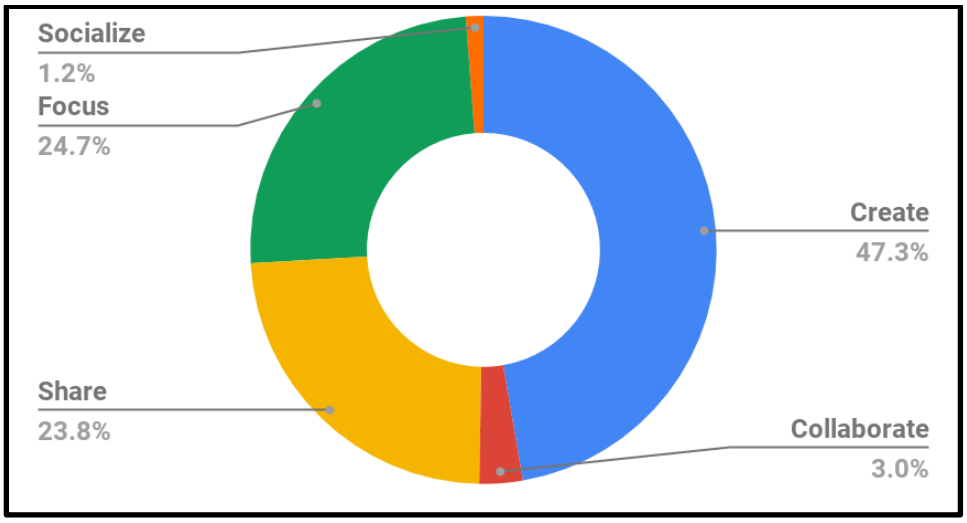

Figure 4
Curriculum Center learning taxonomy – Fall 2017.

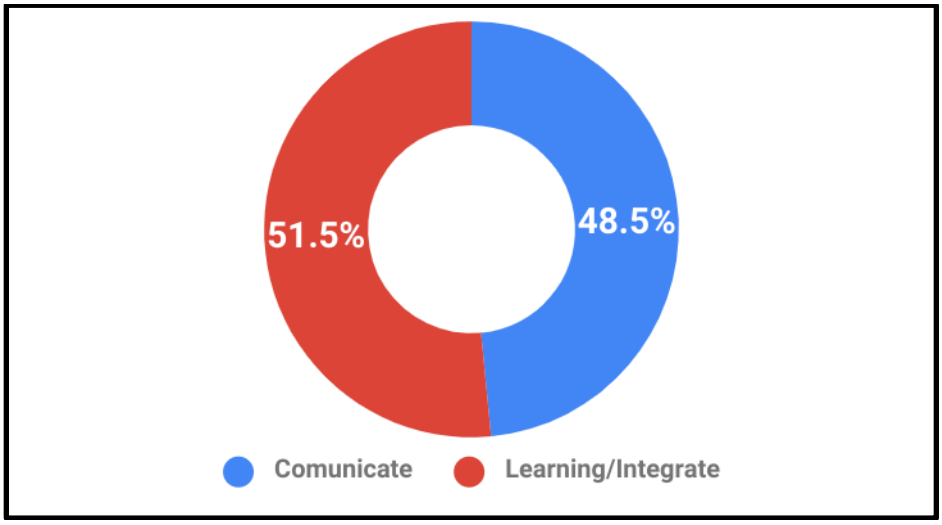

Figure 5
Curriculum Center campus learning outcomes – Fall 2017.

required usage of the Curriculum Center collections for class assignments. Students were often given class time to visit the Curriculum Center in groups to locate materials.

Can this Usage Data be Mapped to Campus Learning Outcomes?

Beyond capturing a snapshot of how the Curriculum Center spaces were used by students during the term, this research project also wanted to explore how such evidence might be mapped to campus learning outcomes. As previously discussed, the Curriculum Center spaces were assigned to a learning space taxonomy and then cross-walked further to campus learning outcomes. This mapping to outcomes allows for viewing library spaces not only in terms of usage but also within the greater overall context of a learning environment.

The most used space in the Curriculum Center was the computers, which were associated with the learning space taxonomy descriptor *create* (47.3%) (see Figure 4). This was followed by *focus* (24.7%) as mapped to the Curriculum Center seating area and collections and then *share* (23.8%), which was assigned to the combined circulation/reference help service point. Mapping and attaching usage data in this manner allow the Curriculum Center to not only state that they offer computers, a study table, seating, and computers, but also spaces that promote creating, sharing, focus, and collaboration.

Additional mapping to the campus learning outcomes is another way to indicate to campus stakeholders how the Curriculum Center supports learning on campus. Based on this mapping, the pilot study space usage observation data suggested that the Curriculum Center spaces mainly supported two campus learning outcomes with its spaces, collections, service point, and technology (see Figure 5). The campus learning outcomes that the Curriculum Center supported are Learning/Integrate (51.5%) and Communicate (48.5%).

The campus learning outcomes associated with the Curriculum Center are stated in more detail below and are intended for "students to be able to…":

> **Learn and integrate**
> *Through independent learning and collaborative study, attain, use, and develop knowledge in the arts, humanities, sciences, and social sciences, with disciplinary specialization and the ability to integrate information across disciplines.*
>
> **Communicate**
> *Acquire, articulate, create and convey intended meaning using verbal and non-verbal methods of communication that demonstrate respect and understanding in a complex society.*

These two learning outcomes align with the information literacy, research, and educational mission of both the library and Curriculum Center at the University of Idaho. Therefore, it was not surprising that the Curriculum Center spaces aided in supporting these learning outcomes. However, what has not always been available is usage statistics and evidence that demonstrates the ongoing contribution libraries and curriculum centers make in supporting such outcomes.

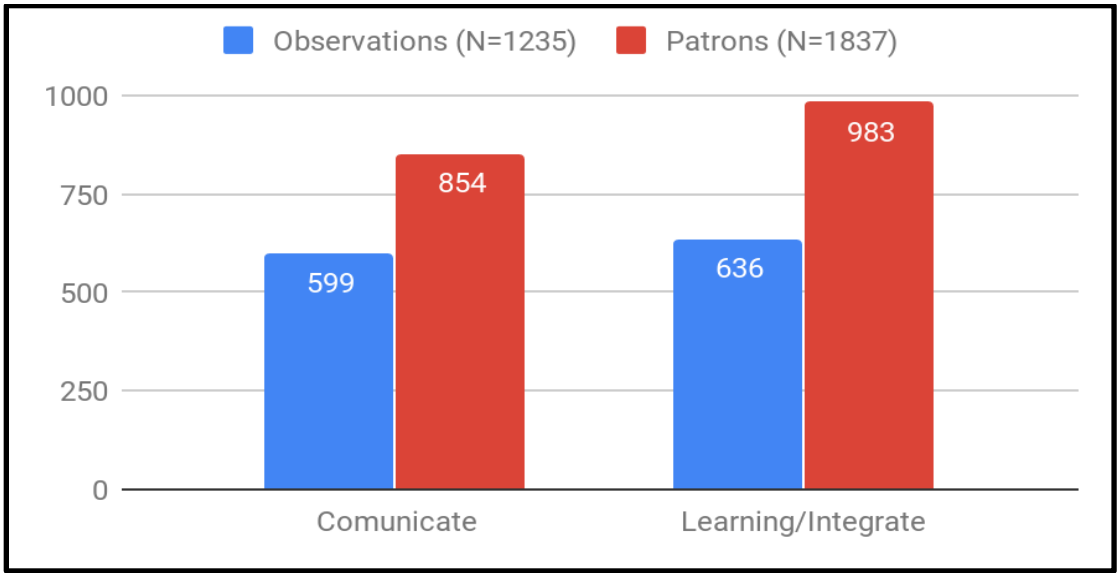

Figure 6
Observations/patrons to learning outcomes – Fall 2017.

Creating Learning Outcomes Statements

By leveraging the space usage data and mapping to campus learning outcomes, it is now possible for the Curriculum Center to make stronger statements about how library spaces support learning on campus. Using both observation and patron count data, the Curriculum Center can create prepared statements suitable for stakeholder reporting and public promotion the campus-wide learning outcomes of Communication and Learning and Integration (see Figure 6). Examples of such learning outcomes-oriented statements for the Curriculum Center are shared below:

> Curriculum Center Learning Outcome Statement: Communicate
> *The Curriculum Center supports the campus learning outcome of **Communicate** by offering spaces, such as computer stations and a public demonstration space, that encourage acquiring, articulating, creating, and conveying meaning. In 2017, the Curriculum Center recorded **599** interactions in these **Communicate** supporting spaces and observed **854** patrons using these resources.*
>
> Curriculum Center Learning Outcome Statement: Learning and Integrate
> *The Curriculum Center supports the campus learning outcome of **Learn and Integrate** by offering spaces, such as discipline-specific collections, flexible seating, and a group study table that encourage independent learning and collaborative study to develop knowledge and integrate information across disciplines. In 2017, the Curriculum Center recorded **636** interactions in these **Learn and Integrate** supporting spaces and observed **983** patrons using these resources.*

Once learning outcomes specific statements are created, they can be used as templates for future reporting needs, enhanced with periodically updated data as necessary. It also may be possible to create a dynamic real-time dashboard using the GIS application to fill in data fields automatically.

Discussion

Agree

The authors agree that the Web GIS pilot study proved useful in gathering data to articulate space usage and map data to learning outcomes. The Collector for ArcGIS application demonstrated its utility as an instrument for library space assessment. The mapping of specific library spaces to learning outcomes also showed merit in conveying library value beyond simple gate-counts. If viewed as a proof-of-concept methodology from both a technological and data reporting viewpoint, this research project was successful.

The authors admit there are both technological and training improvements that are required to strengthen the data collection aspects of this research. Some changes would be needed if this project were to move from a pilot to a more formal assessment undertaking. First, there needs to be ongoing refinement of the GIS instrument to ease and clarify aspects of data collection by staff. The application is being updated quarterly and suggested enhancements can be contributed to ArcGIS Ideas. While there remains a slight learning curve associated with data collection for users, this was not insurmountable and remained no different than using most any other new piece of software. However, anything that could be done through technological design to make data-gathering smoother for staff would be welcomed. Second, the continued and ongoing reinforcement of data collection training would be necessary to increase the interrater reliability of the observations captured. Overall, the pilot project was successful in achieving its objectives to demonstrate how an off-the-shelf application could capture space usage evidence and map these to campus learning outcomes.

Adapt

Lessons learned from this project included the need to consider adding collaborative computer seating in the Curriculum Center to accommodate students who work in groups. Additional promotion of Curriculum Center spaces such as the group study table might also be necessary.

Typically, the authors would list the next steps to transition this pilot project toward a more established library assessment program. Some ideas have included a real-time data dashboard, adding more descriptive survey questions to the GIS instrument to capture student activities, partnering with other institutions to gather similar space usage data for peer comparison, and leveraging the location-specific aspects of GIS to pinpoint which areas within library spaces are preferred by students. However, despite agreement by the researchers about the positive outcomes and potential of this pilot project, library administration did not see a suitable venue to report out the project data and felt that resources and staff time would be better spent elsewhere. Despite this, there remains untapped potential for Web GIS applications such as Collector for ArcGIS to assist with capturing student usage in library spaces.

Conclusion

While the pilot project did not capture direct measures of learning within the Curriculum Center, the evidence demonstrated active student engagement within these learner-centric design spaces. Additionally, these data suggested potential design improvements that might be needed in such areas to make them more functional to students. The research indicated that Web GIS applications, such as Collector for ArcGIS, offer a practical and flexible tool for library space assessment. The mapping of specific library areas with a learning space taxonomy provided an opportunity to more clearly connect library efforts to learning outcomes that might more strongly resonate with stakeholders compared to traditional library usage statistics. Articulating the learning value of library spaces to stakeholders demonstrated that money is not wasted and that libraries have a positive impact supporting student success.

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