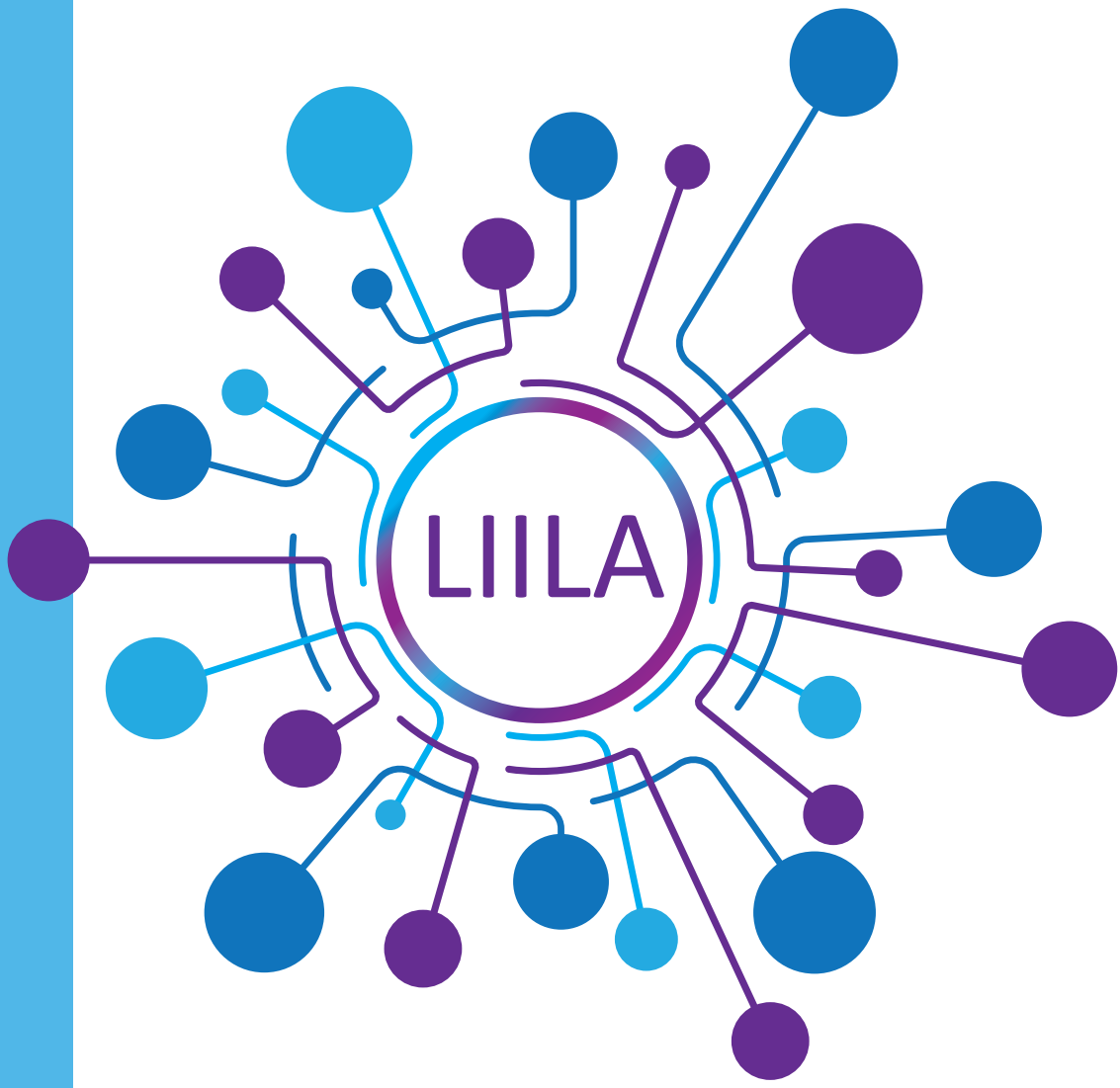

Library Integration in Institutional Learning Analytics

November 15, 2018

Megan Oakleaf

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EXECUTIVE SUMMARY

Learning analytics is rapidly proliferating throughout academia as a strategy for understanding and promoting student learning and success.[1] Indeed, virtually all sectors of higher education are engaged in learning analytics initiatives—all, that is, except libraries. Libraries are essential to the mission of higher education institutions, and librarians have long been dedicated to supporting and increasing student learning and success. Nevertheless, most academic libraries are not currently engaged in learning analytics initiatives at the institutional level. Based on their historical and persistent commitment to students, it seems likely that librarians will choose to participate in the maturing conversations about learning analytics in higher education and guide the ethical use of learning analytics to improve student success outcomes. But what should library integration into learning analytics look like? How might library engagement in learning analytics change the ways in which students interact with the library? How might it highlight the value and impact of library services, resources, and facilities on student learning? And most importantly, how might library involvement in institutional learning analytics increase student learning and success?

To address these questions, the Library Integration in Institutional Learning Analytics (LIILA) project, funded by the Institute of Museum and Library Services, convened three meetings with academic library administrators, reference and instruction librarians, systems librarians, library technology administrators, library association leaders, and IT administrators as well as learning analytics, library vendor, and learning standards representatives to increase academic library participation in higher education learning analytics and prepare academic librarians to engage in this important use of data to support student learning and success.

The LIILA project sought to achieve four goals:

1. To increase librarian awareness and engagement in learning analytics;
2. To craft a plan for integrating academic libraries into learning analytics initiatives that support student learning and success;
3. To develop sustaining partnerships and collaborations among academic librarians and learning analytics lynchpins, institutional and library systems professionals, and library vendor communities; and
4. To explore, design, and develop library use cases and data profiles that can be used with learning analytics standards to integrate library data with institutional data stores.

The results of the LIILA project are detailed in the document to follow. Because institutional learning analytics is a nascent field for librarians, the LIILA project developed a number of strategies for supporting the initial engagement of librarians.

First, eight strategies were identified and deployed to help librarians and interested institutional partners envision library involvement in learning analytics including:

- identifying problems to solve and stakeholders to support (section 3.1);
- articulating questions about library impact on student learning and success support (section 3.2);
- imagining learning analytics-enabled decision-making and action-taking (section 3.3);
- ideating librarian roles in institutional learning analytics (section 3.5);
- conceptualizing scenarios to convey what library involvement in learning analytics might look like in the future (section 3.6);
- inventorying existing library data that may contribute to the understanding and improvement of student learning and success initiatives (section 3.7); and
- brainstorming and prioritizing user stories that could be used to integrate libraries into institutional learning analytics efforts (sections 3.8-4.2).

Second, LIILA project results encompass both facilitators of (section 3.4) and obstacles to (section 5.0) library involvement in learning analytics. Facilitators include intersecting pressures that either propel or enable higher education institutions to commit to learning analytics initiatives, including:

- responsibility to provide quality experiences for students, support student learning and success, and demonstrate the value students receive in exchange for their investment of time, energy, and resources;
- stakeholder concerns about student non-completion and skyrocketing student debt;
- accreditation and other accountability obligations;
- competition among institutions;
- budgetary pressures;
- student tolerance of data use, particularly in exchange for support, benefits, or advantages;
- technology developments to enable analytics; and
- emergence of positive results documented by learning analytics early adopters.

Librarians themselves may also serve as facilitators of library engagement in institutional learning analytics. Because of their history of data gathering, knowledge of data practices, commitment to ethical data use, ability to collaborate across institutional silos, potential role as lynchpins in student interventions focused on information use, and emerging corpus of research demonstrating the contributions of library interactions to student learning and success, librarians can become essential partners in learning analytics at an institutional level.[2]

A number of obstacles to library involvement in institutional learning analytics surfaced as well, such as privacy concerns (section 5.2); data concerns related to quality, granularity, and access (sections 5.3-5.5); and organizational culture (section 5.6).

Finally, the LIILA project yielded ten "next steps" for moving forward in this arena (section 6.0). These next steps include:

1. increasing awareness of and discussion about the role of libraries in institutional learning analytics both within the academic library community and among institutional participants in learning analytics;
2. investigating current library data practices and committing to transparent communication about the ways in which data is gathered, maintained, stored, secured, and used within libraries;
3. communicating and negotiating data rights with library vendor and institutional partners;
4. situating learning analytics among other assessment approaches as a tool for student learning and success support;
5. including libraries in learning analytics conversations at the institutional level;
6. identifying and analyzing questions or problems that require a learning analytics approach;
7. envisioning the contributions that library data makes to developing a holistic picture of student learning and success;
8. exploring interoperability standards that enable disparate information systems to connect in real time;
9. identifying and prioritizing user stories linking libraries and student learning and success that merit further development; and
10. pursuing pilot studies that investigate the feasibility of developing library user stories into achievable integrations of library data into institutional learning analytics.

This document closes with a series of discussion questions and resources useful for continuing the conversation, including a short reading list, relevant privacy resources, and brief descriptions of pioneering efforts in this space. It is hoped that this report will stimulate discussions about the unique role libraries may play in institutional learning analytics, ultimately enabling libraries to take their place among institutional partners using learning analytics to support student learning and success.

1.0 INTRODUCTION

Should academic libraries engage in institutional efforts to use data to support student resources? If so, how?

Across the United States, higher education faces a completion crisis. More students are enrolling in post-secondary education to achieve personal and professional goals: to learn, to engage and contribute in society, to secure gainful and meaningful employment, and to improve their lives. First-year students at four-year colleges report their top reasons for going to college as: getting a better job (85%), learning about interesting things (84%), training for a specific career (78%), gaining a general education and appreciation of ideas (75%), and making more money (73%).[3] With 6-year graduation rates mired below 60%,[4] more students are also leaving college without acquiring the learning they seek, transferring successfully to another institution, obtaining desired credentials, or completing degrees. Concurrently, student debt levels are rising as are delinquency rates.[5] This is particularly problematic for students who do not acquire credentials that enable them to earn enough to repay their debt[6] and disproportionally impacts students from low-income families[7] and students of color.[8] Students are not alone in feeling the effects of uncompleted programs and degrees—employers lament the lack of an educated workforce,[9] government officials decry the consequences of unpaid student loans,[10] and local and global communities forgo the benefits that a more educated citizenry could offer. These are real problems that exist on a macro-scale.

On a micro-scale, the results of non-completion can be even more devastating. At an individual level, students who do not persist to completion are thwarted from achieving their goals. These goals include extrinsic motivators like educational achievement, career aspirations, financial security, and socioeconomic mobility, to be sure, but also encompass more intrinsic—and oftentimes more important—motivators such as gaining knowledge, achieving self-actualization and feelings of accomplishment, and becoming a part of a community.[11] When students are not able to persist in their post-secondary education, they—both as individuals and as part of their families and larger social fabric—feel the effects of lost opportunities.

Not surprisingly, the disparity between student aspirations for their engagement in higher education and the reality of non-completion results in questions about the effectiveness and value of higher education. In short, the completion crisis has inspired a "quality crisis" in which students, parents, employers, government officials, and communities ask hard questions about the quality of higher education: Are universities, colleges, and community colleges providing a quality experience for students? What is happening (or not happening) that is causing students to fall short of their goals? What more can and must be done to support student learning and success?

Questions like these have gained prominence and urgency in recent years, but they are not new. In fact, questions about student non-completion have inspired half a century of research into retention and persistence. A number of theories, models, and practices intended to identify and ameliorate contributors to the problem of non-completion have been conceptualized and deployed throughout academia, with varying degrees of success.[12] Several foci have been embraced as the reasons or remedies for lack of retention including: pre-entry student attributes; institutional characteristics; student involvement and engagement (particularly in the first year); participation of faculty in student life in and out of the classroom; cultural, economic, and social forces within and outside of the institution; issues of equality and the lack thereof; external events in student lives; and others.[13] There is no question that understanding what leads to non-completion is critical to helping students persist. And yet, as Vincent Tinto writes, "It is one thing to understand why students leave; it is another to know what institutions can do to help students stay and succeed…knowing why students leave does not tell us, at least not directly, why students persist. More importantly it does not tell institutions, at least not directly, what they can do to help students stay and succeed."[14] He continues, "We need to know more about the nature of [student] experiences in [their] institutions, the ways those experiences influence persistence, and more importantly the sorts of…actions that enhance their success in higher education."[15] In short, if higher education institutions seek to support students as they persist toward their academic and personal goals, then what is known about student retention must be augmented by what has yet to be learned about student interactions with and within their institutions and how those interactions lead to (or away from) success. When institutions can pinpoint student actions that align with learning and success, they can take concrete steps to ensure that each student experience can be utilized, maximized, or changed to support students in pursuit of their goals.

Concerned by the challenges students face and inspired by the sincere desire to support student learning, higher education professionals have become increasingly committed to understanding the experiences and behaviors that enable student success and acting upon that knowledge. While institutions have long collected data for a variety of administrative purposes including required reporting, accountability initiatives, and business process improvement, in recent years a new focus for data use has emerged: student learning and success support. Throughout higher education, academic departments, institutional research offices, student affairs divisions, and information technology units are using data to record student learning markers, make data-driven decisions to support students as individuals and in the aggregate, and study student academic progress throughout their institutions, efficiency in earning their desired credentials, and career and other post-graduation outcomes.[16]

Based on their longstanding commitment to students, it seems likely that librarians will choose to participate in the maturing conversations about learning analytics in higher education and guide the ethical use of learning analytics to improve student success outcomes.

Indeed, nearly the entire academy is engaged in using data as a tool to support student learning and success. Defined as the "collection and analysis of usage data associated with student learning…to observe and understand learning behaviors in order to enable appropriate interventions,"[17] this growing emphasis on "learning analytics" has been recognized as a top trend in higher education in both the 2018 *Horizon Report* and ECAR's *Higher Education's 2018 Trend Watch and Top 10 Strategic Technologies.*[18]

Most academic libraries have not yet participated in this effort; increasingly, they are among the only areas of their institutions not to contribute data to institutional efforts to understand, analyze, and act in the interest of student learning and success. Based on their longstanding commitment to students, it seems likely that—in order to facilitate learning, improve assessment, partner with other educational organizations, help higher education institutions respond to the challenges of improving student learning and increasing student success, and remain contributing and valued partners in the lives of their institutions—librarians will choose to participate in the maturing conversations about learning analytics in higher education and guide the ethical use of learning analytics to improve student success outcomes. Consequently, the time has come for librarians to consider the path forward. The Library Integration in Institutional Learning Analytics (LIILA) project builds upon the long tradition of academic library participation in advancing the goals of higher education, assessing the contribution of libraries to those goals, and building upon the past success of both efforts by engaging two questions: Should academic libraries engage in institutional efforts to use data to support student success? If so, how?

1.1 Higher Education, Assessment, & Libraries

Higher education exists to educate and empower students to expand their horizons, achieve their goals, engage in their communities, participate as a member of an informed electorate, and work toward positive personal and societal change. Toward these ends, academic faculty, professionals, and staff focus on enabling students to participate in and benefit from access to impactful experiences that result in academic learning, personal development, and indicators of success.

As active contributors to the educational mission of their institutions, academic librarians are well positioned to support student learning and success. Librarians can expand student access to learning, ensure students are able to persist and attain their goals, and scaffold student experiences to aid attainment of independent learning capacity. They can teach information literacy as well as disciplinary and general learning outcomes. They can support students as they develop productive self-awareness, metacognition, and self-actualization in a variety of contexts, including their immediate learning environments, the broader community, and the world around them. In short, librarians can help students learn, develop, and achieve.

Librarians *can* fulfill these educational roles; however, to *ensure* that they do, they must engage in assessment. Librarians who practice assessment participate in "triple-loop" learning, thereby exploring whether they're providing library services, resources, and facilities in the "right" ways, for the "right" reasons, and whether those "right" reasons align with their professional convictions about information, education, and the role of libraries in higher education.[19] In the context of student learning, assessment answers questions about the achievement of student learning goals. Are students learning? Are they exploring new ideas? Are they achieving their dreams? Are they becoming productive, responsible, and ethical members of their communities? Are they ready to work toward the greater good?

As responsible educators, librarians have embraced the challenge of learning assessment for many years. Early on, librarians used surveys to gauge students' satisfaction, confidence, and self-efficacy. More than a decade ago, librarians invested heavily in a variety of homegrown, vendor-supplied, and IMLS-funded information literacy tests including Project SAILS and TRAILS.[20] In the last ten years, many librarians have embraced the use of rubrics to assess artifacts of students' information literacy learning, due in large part to the IMLS-funded RAILS project.[21] And since the 2010 publication of the ACRL *Value of Academic Libraries* report[22] and subsequent IMLS-funded library value studies, library research correlating student library interactions with student learning surrogates has proliferated.[23] Though these assessments, librarians have 1) gained insights into the needs, goals, and values of their learners; 2) designed learning experiences that meet students where they are, engage them in meaningful ways, and enable them to attain greater agency in their own lives; and 3) reflected and improved each iterative teaching cycle, ultimately increasing the value of education for their present and future learners.

Now, as higher education commits to the next wave of assessment capability in the form of learning analytics, it is time for librarians to engage with emergent institutional learning analytics tools, systems, and strategies as well. In many ways, the trajectory from librarian engagement in learning assessment to involvement in learning analytics is logical. Past learning assessments and new learning analytics methods share a number of common values that librarians espouse. Both approaches demonstrate the importance librarians place on students' opinions, positive affect, confidence, self-efficacy, attainment of learning outcomes, commitment to growth and improvement, and ultimate success—whether that success is represented by learning evidenced on an assignment, achievement in a course, retention in a program, minimized time to degree, GPA or similar attainment measure, speedy and appropriate employment, lifelong learning, or other long range goals. Given these shared values, librarians will likely find learning analytics an intriguing and worthwhile next step of engagement in the development and assessment of student learning.[24]

1.2 Learning Analytics in a Nutshell

Learning analytics has been described as "the measurement, collection, analysis, and reporting of data about learners and their contexts, for the purposes of understanding and optimizing learning and the environments in which it occurs."[25] It has also been defined as the "collection and analysis of usage data associated with student learning. The purpose of [learning analytics] is to observe and understand learning behaviors in order to enable appropriate interventions."[26] In short, learning analytics employs data to improve learning contexts and help learners succeed.

Learning analytics employs data to improve learning contexts and help learners succeed.

To accomplish these goals, learning analytics systems input data from a variety of sources and output descriptive information about student populations and cohorts; this information is employed to discover behaviors, characteristics, or other attributes that appear to lead to student difficulties or successes. Learning analytics systems attempt to predict which students are "at risk" based on known attributes so that educators can intervene quickly. Interventions emanating from learning analytics systems include notifications to students, advisors, or faculty; recommendations or requirements for students to meet with support services, changes to institutional processes or policies; or other actions intended to support improved student outcomes delivered in real time.[27] Essentially, learning analytics seeks to: 1) help educators discover, diagnose, and predict challenges to learning and learner success; 2) enable instructors to identify and enact necessary changes to improve and customize educational content, delivery; 3) empower learners with insights into their own learning;[28] and 4) point the way to successful and active interventions that benefit students, especially those who may be less familiar with the unwritten rules of higher education, including first-generation students, community college students, students of color, students with disabilities, and veterans. Used in this manner, learning analytics can provide an especially valuable tool to support the success of students of diverse populations.

Institutional leaders are cognizant of the national dialogue about higher education value (or the lack thereof). They are mindful of stakeholder expectations that students will persist from one academic period to another; complete courses, programs, and degrees in a timely fashion; achieve learning outcomes; and graduate ready to gain appropriate employment and contribute to their communities. They are aware that their institutions are increasingly asked to demonstrate that they deliver valuable learning experiences for students, assess those learning experiences effectively, and intervene to assist struggling students when necessary. Institutional leaders know they are expected to steward the tuition dollars they accept, and that they need to reduce costs while maintaining high standards.[29] To achieve these goals, they need to streamline processes, demonstrate accountability, make data-driven decisions,[30] increase organizational productivity, and respond rapidly to challenges.[31] Learning analytics initiatives are intended to address and support the achievement of all these goals; however, the core foci of learning analytics are to 1) increase student learning and 2) improve institutional contexts and practices associated with student success.

The learning analytics landscape is growing and fast changing; it is difficult to obtain a census of all the options. Learning analytics systems come in a variety of forms and draw from a wide range of data sources. Many are "home grown" by individual higher education institutions, and even more are offered by vendors either as single offerings or suites of learning analytics "solutions." In general, learning analytics tools tend to be clustered into or across the following system categories: enrollment management, relationship management, business intelligence/reporting, learning management system activity/achievement monitoring, integrated planning and advising, early-alert warning, and degree mapping. Typically, the data used by learning analytics systems comes from student information systems, learning management systems, clickers, publishers, video-streaming and web-conference tools, surveys, and co-curricular and extracurricular involvement systems.[32] At this time, library data is generally omitted from learning analytics systems. However, librarians are actively working to determine how (or whether) to close this gap.

1.3 Impetus to Act

While librarians have increasingly monitored student success issues in higher education and engaged in the use of library data to study student success, most have not pursued institutional learning analytics initiatives. However, because participation in learning analytics may enable librarians to facilitate learning, improve assessment, partner with other educational organizations, influence institutional ethical data policy and practice, and expand their role as contributing and valued partners in the lives of their institutions, librarians should determine whether to embrace the ethical and responsible use of learning analytics to improve student success outcomes, and if so, what library engagement in institutional learning analytics might look like.

Librarians should determine whether to embrace the ethical and responsible use of learning analytics to improve student success outcomes, and if so, what library engagement in institutional learning analytics might look like.

Library involvement with learning analytics represents a natural evolution of library efforts to assess student learning. Librarians have always sought to determine the impact of library services and resources on student learning. Librarians have used surveys to query students about their satisfaction with library learning experiences or the self-efficacy or confidence that may result from learning information literacy skills. Librarians have administered knowledge tests to students and assessed artifacts of their learning using rubric-based approaches. More recently, librarians have linked student use of libraries to success markers like retention, grades, completion or graduation, and initial career placement or salary information. All of these approaches seek to determine whether or not students are learning from their interactions with the library, all of them are intended to yield clues to what librarians can do to increase their impact on student learning, and all of them offer strengths and weaknesses in their ability to enable librarians to accurately gauge their impact and continuously improve library services and resources to support students.[33] For example, surveys and knowledge tests enable librarians to gauge information literacy skills of large groups of students; performance assessments and ethnographic approaches provide deep, detailed understanding of individual student information behaviors; and correlation approaches link library interactions to learning and success markers at the institutional level—these are strengths represented by the current cannon of library assessment methods. At the same time, these methods tend to be episodic rather than longitudinal, limited to information held within the library organization rather than a full view of the student experience, and focused on the past rather than anticipating the future. In short, there is room in the library assessment toolbox for more approaches that fill the gaps left by existing assessment methods.

Despite the common intent to understand, assess, and improve the library's contribution to student learning and acknowledgement of the limitations of current library assessment approaches, shifting from learning assessment and correlation research to institutional learning analytics is a substantial change for libraries—one that presents a new opportunity discover and expand library impact on student learning and success. Past assessment approaches have generally been relatively small in scope, controlled by librarians, and limited in the amount of individual-level data captured and used. Learning analytics, in contrast, is larger in scope, may or may not have complete librarian control and oversight, and involves the collection and use of individual-level data.

Because most librarians are new to learning analytics, envisioning library involvement in learning analytics is difficult. Librarians can't know definitively what library engagement *could* look like because the dialogue about what it *should* look like is only beginning. The consideration of an inceptive approach to understanding and supporting student learning may lead to a host of librarian concerns. At the same time, the inclusion of library data in institutional learning analytics initiatives offers renewed hope that librarians will discover new connections—and perhaps uncover missing links—that can inform, enable, and empower librarians to make decisions and take actions to reinvigorate or even revolutionize the ways in which libraries can support and generate student learning and success. The potential benefits of linking libraries and institutional learning data are numerous, but so are the potential risks of such an approach. Both the risks and the rewards of library integration into learning analytics must be explored before librarians attempt to determine whether, how, and to what extent they will become involved in this emergent approach to student support. Ultimately, librarians must engage in determining a path forward for libraries and learning analytics. If librarians do not, others may—without the knowledge, intent, practices, and values inherent in the library community.

2.0 LIILA

In 2017, the Institute of Museum and Library Services awarded Syracuse University funding to prepare for and convene a 3-part National Forum on Library Integration in Institutional Learning Analytics (LIILA) to increase academic library involvement in higher education learning analytics and prepare academic librarians to engage in this emerging and important use of data to support student learning and success.

LIILA sought to achieve four goals:

1. To increase librarian awareness and engagement in learning analytics;
2. To craft a plan for integrating academic libraries into learning analytics initiatives that support student learning and success;
3. To develop sustaining partnerships and collaborations among librarians and learning analytics lynchpins, institutional and library systems professionals, and library vendor communities; and
4. To explore, design, and develop library use cases and data profiles that can be used with learning analytics standards to integrate library data with institutional data stores.

The three National Forum meetings took place at the EDUCAUSE Annual Conference in Philadelphia (November 2017), the Coalition for Networked Information (CNI) Fall Meeting in Washington, D.C. (December 2017), and the CNI Spring Meeting, San Diego (April 2018).

At the first meeting, academic library administrators, reference and instruction librarians, library association leaders, and other learning analytics thought leaders met to discuss, envision, spearhead, and articulate: the role of learning analytics in discovering, describing, analyzing, predicting, and ensuring student success; the value that academic libraries can demonstrate by integrating library data in learning analytics; and the active role librarians can play, by leveraging institutional learning analytics, in maximizing student learning, intervening in learning trouble spots, and supporting the teaching role of faculty. At this initial meeting, participants focused on *what could or should be done* in terms of integrating library data into institutional learning analytics. One of the outputs of this meeting was a prioritized set of "user stories" that articulated some ways in which the integration of library data in institutional learning analytics could impact student learning and success.

At the second meeting, academic library administrators, systems librarians, IT administrators, and other learning analytics leaders addressed the question of *what can be done* to integrate library data into institutional learning analytics initiatives. Using the refined set of user stories from the first meeting as a starting point, participants analyzed the feasibility of enacting those user stories based on existing systems and structures, strategies for ameliorating known challenges (privacy, data ownership, etc.), as well as the potential value the user stories could provide to student learning and success efforts. Participants also brainstormed and described additional potential user stories, analyzing the data implications of each based on the accessibility and transferability of data between systems. Outputs of this meeting include a revised set of user stories aligned with specific data sources; a list of potentially relevant data points with corresponding collection techniques or processes; and draft depictions of the gaps between what data is needed and what data is currently generated, captured, or made accessible.

The third meeting was attended by library technology administrators as well as learning analytics, library system vendor, and learning standards representatives. This group engaged the question of *how* to integrate libraries into institutional learning analytics initiatives by exploring, designing, and developing library data profiles that can be used with learning analytics standards to integrate library data with institutional data stores. Participants exchanged information about related projects currently underway and considered how to move forward in implementing one or more user stories from the prior meetings.

The following document represents a compilation of the outputs of these three meetings.

3.0 ENVISIONING LIBRARY ENGAGEMENT WITH LEARNING ANALYTICS

What might the integration of library data into institutional learning analytics look like? Certainly, there is no predetermined path or "right way" to integrate libraries into learning analytics. Future work in this area may result in a variety of outcomes existing along a continuum from near status quo to a significant change in the ways in which libraries gather, use, retain, use, and analyze data (see Figure 1).

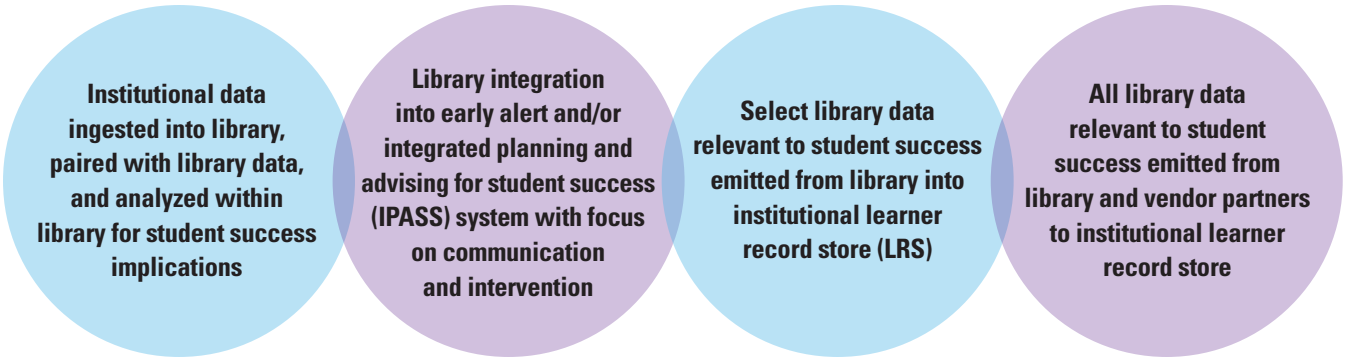


Figure 1. Example Future States of Library Involvement in Learning Analytics

Ingest Institutional Data for Library Analysis

One possible future state may involve libraries developing or amplifying their efforts to systematically and seamlessly ingest institutional data into library-controlled systems, linking that data with library data, and analyzing relationships between the two on a real-time, longitudinal basis in an effort to learn more about library contributions to student learning and success and transform that learning into improved library services, resources, facilities, and so on. The University of Minnesota Libraries offers a pioneering model for this approach.

Integrate Libraries and Librarians into IPASS Systems

Another option may be to integrate librarians fully into early alert and integrated planning and advising for student success (IPASS) systems. IPASS systems offer an "integrative approach to student success that promotes shared ownership for educational progress among students, faculty, and staff. [IPASS systems] help students formulate and advance toward educational goals, including advising, counseling, progress tracking, and academic early alerts. IPASS technologies can contribute by documenting and tracking students' educational plans, improving data analysis, offering self-service resources that reduce advisor workloads, and triggering interventions based on student behavior or faculty input."[34] By integrating into IPASS systems, librarians can strengthen their partnerships with institutional student success professionals; reach out to and develop relationships with students who seek learning support; and communicate with student success professionals, students, and faculty about student progress. DePaul University is an early adopter of this approach.

Contribute Pre-Selected Library Data to Institutional Learner Record Store

As a third possible future state, libraries may choose to share data at the institutional level, emitting a pre-selected set of student learning and success-related library data from library-controlled systems into an institutional data warehouse or learner record store. In this case, library data can be analyzed to determine which data points are relevant and what level of detail is necessary to make a meaningful contribution to understanding student behaviors and interactions that contribute to learning and success.

Contribute Library and Vendor Data to Institutional Learner Record Store in Real Time

Finally, librarians in the future may determine that a more effective strategy is to share both library- and vendor-controlled data with institutional data stores in real-time in order to create a holistic academic dataset that could provide a unified representation of students and their educational environments. This effort could enable a more comprehensive analysis of the ways in which libraries support students and accelerate the identification of areas in which improvement, customization, or personalization might be advanced in order to make greater contributions to student learning and success.

These four examples represent possible future states of library integration into institutional learning analytics; however, the actual trajectory of library involvement in learning analytics is unknown. Throughout their involvement in the LIILA project, participants employed a number of strategies to envision library engagement with learning analytics, including:

1. identifying problems to solve and stakeholders to support,
2. articulating questions that library data may answer,
3. imagining future actions,
4. considering facilitators of library engagement in learning analytics,
5. anticipating librarian roles in learning analytics efforts,
6. envisioning beneficial scenarios,
7. reflecting on existing data, and
8. creating user stories.

The following eight sections of this report convey the results of LIILA participants' engagement in each of the strategies listed to ideate library participation in learning analytics.

3.1 Visioning Strategy #1 – Identifying Problems to Solve & Stakeholders to Support

One method for envisioning ways in which libraries may integrate into institutional learning analytics is to 1) enumerate institutional problems that need to be solved, 2) consider stakeholders that require support at an institutional level, and 3) identify ways in which library data may help remedy problems and support stakeholders.

3.1.1 Beginning with the End in Mind

Libraries exist in order to help individuals and groups answer questions, solve problems, meet needs, close gaps, and fulfill aspirations. In higher education, academic libraries also seek to help their institutions meet their missions and their primary stakeholders—including students and their families, faculty, staff, and administrators—achieve their goals. Likewise, library data, when (or if) integrated at an institutional level, may be used to achieve the ends sought by all institutional stakeholders.

In order to know what academic library data might be useful in achieving the goals of an institution and its stakeholders, librarians can seek to understand the answers to a number of questions:

- What problems does the institution and its stakeholders need to solve?
- What questions need answered?
- What needs are unfulfilled?
- What gaps need closed?
- What aspirations are unrealized?
- What are the missions of the institution?
- What are the goals of its stakeholders?

Fueled by the issues and areas of concern surfaced in answering these questions, librarians can explore the following:

- How does (or could) the library contribute to the redress or improvement of these issues and concern areas?
- What library services, areas of expertise, resources, or facilities do (or could) make an impact on these issues and concern areas?
- What linkages between libraries and these issues and concern areas might be discovered to point the way to decision-making and action-taking for improvement?

3.1.2 Institutional and Stakeholder Issues and Areas of Concern

Libraries support the goals of myriad stakeholders including prospective students, parents, enrolled students, faculty, contingent faculty, librarians, advisors, co-curricular or student affairs professionals, institutional researchers, administrators, senior leaders, resource allocators, accreditors, employers, community members, and other partners (see Figure 2). These stakeholders have a wide range of issues, interests, areas of concern, and other priorities that libraries may impact. Once librarians uncover, understand, and prioritize the issues and concerns of their stakeholders (see Figure 3), they can hypothesize and investigate connections that might logically or reasonably exist between libraries and positive outcomes for stakeholders. One way to approach this process is to draft research questions that explore possible linkages between library services, areas of expertise, resources, or facilities (see Figure 4) and a desired outcome for a particular population.

Connections between academic library services, areas of expertise, resources, or facilities and desired outcomes may be explored in a number of ways; one path is to write research questions that can shape investigations of the impacts, contributions, influences, and/or relationships between library services, areas of expertise, resources, or facilities and desired outcomes, such as student learning and success.[35] This approach can employ a multitude of methods; one option is to look for correlations between library interaction data that can be collected from library systems and institutional data associated with desired outcomes. Indeed, correlation studies have proliferated in academic libraries over the last decade and offer insight into what the next step along that trajectory might look like: the integration of library data into institutional learning analytics.[36]

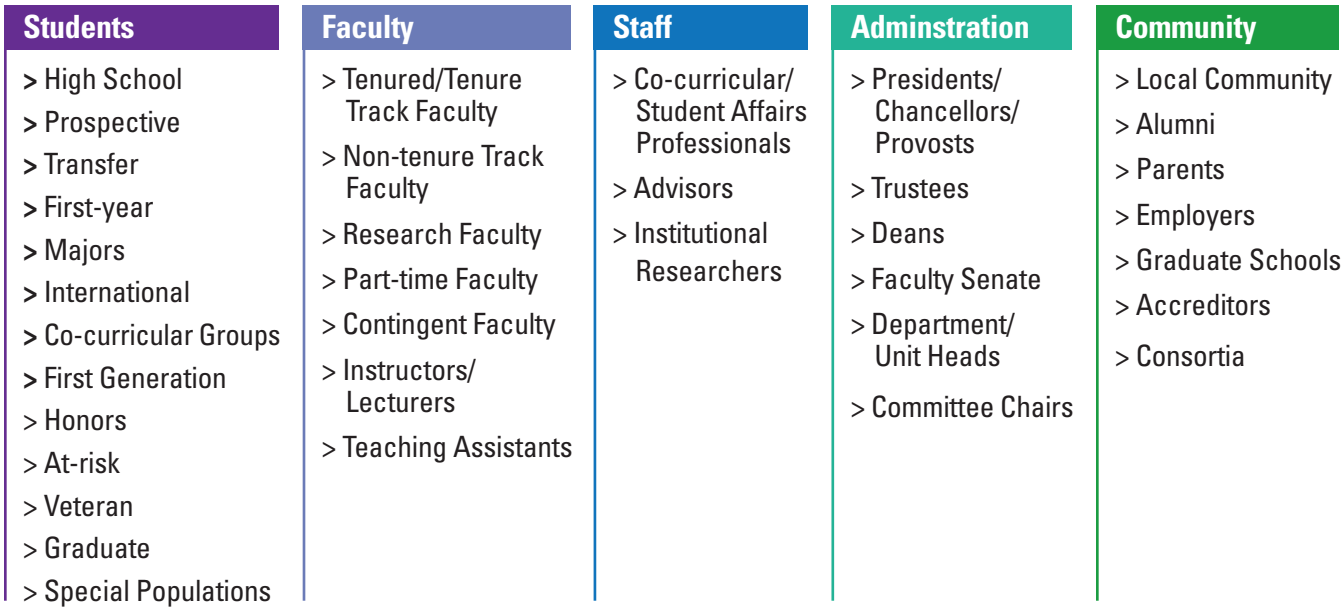


Figure 2. Institutional Stakeholders

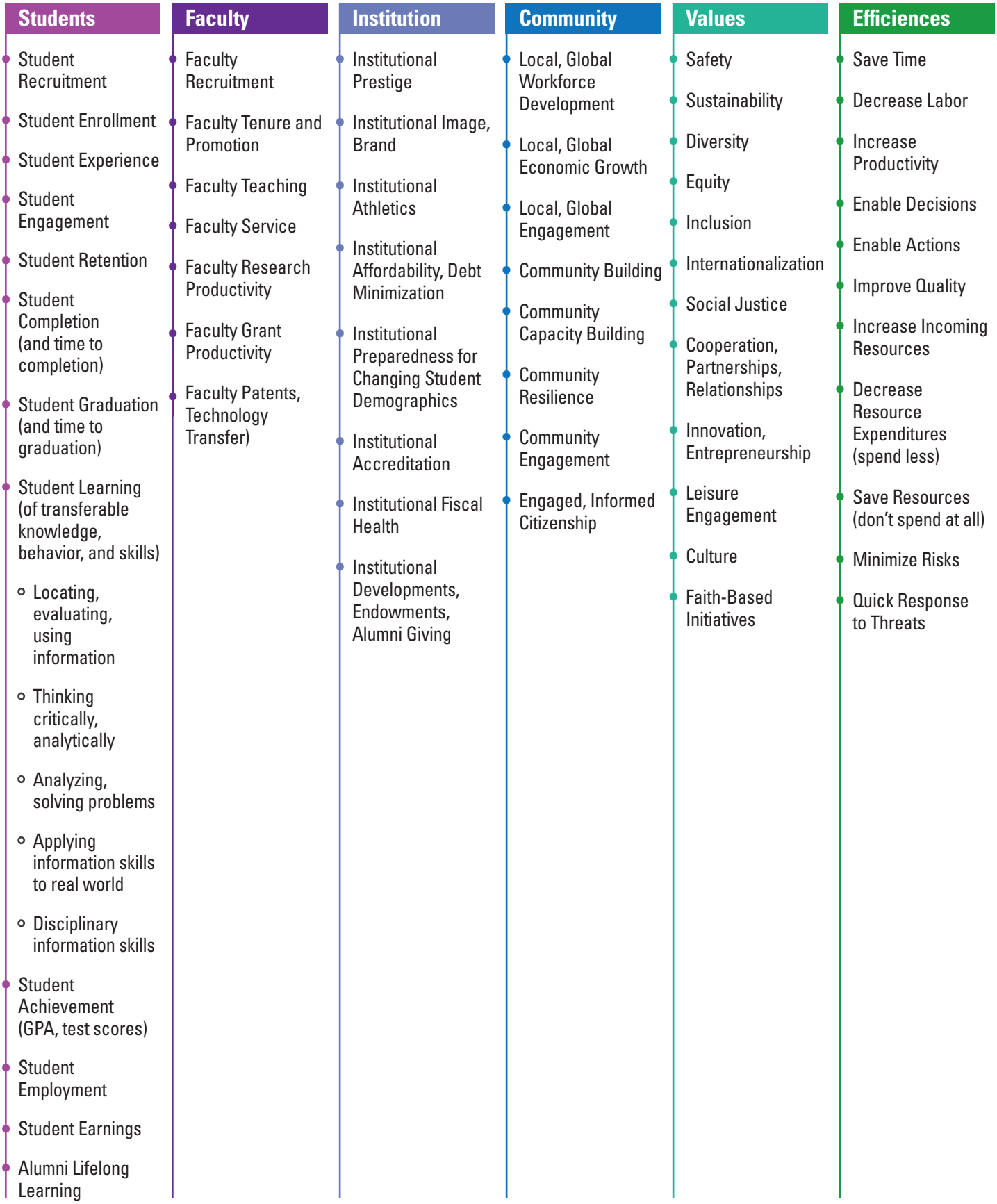


Figure 3. Institutional Issues, Interests, Areas of Concern, and Other Priorities

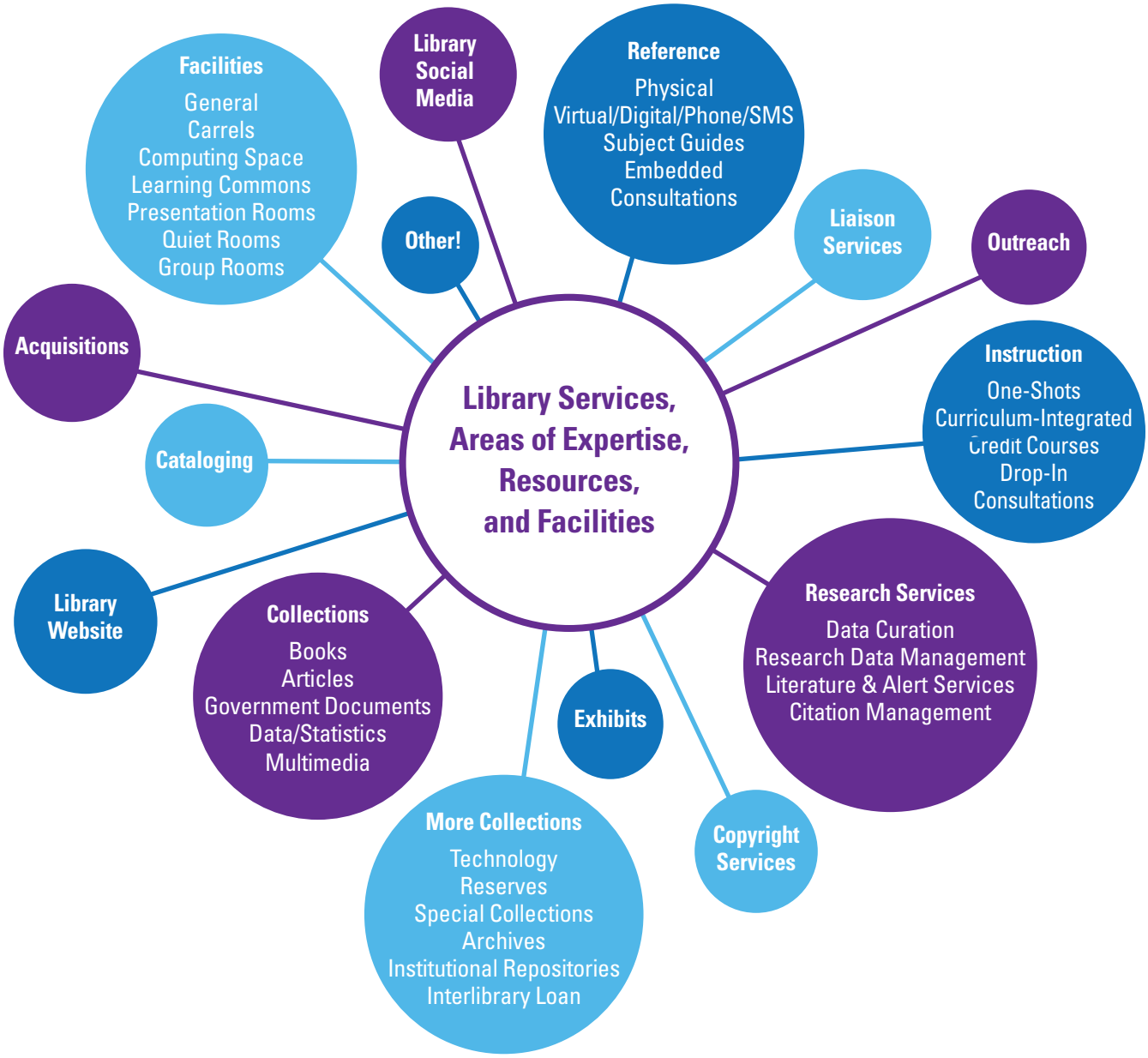


Figure 4. Library Services, Areas of Expertise, Resources, or Facilities

3.2 Visioning Strategy #2 – Articulating Questions that Library Data May Answer

A second way to begin to conceptualize library integration into institutional learning analytics is to consider the kinds of questions that might be answered by such an endeavor. Participants in the LIILA project brainstormed a number of questions that library involvement in learning analytics might help answer. These questions focus on three main areas: 1) library impact on student learning and success support, 2) institutional perceptions of libraries, and 3) managerial perspectives.

3.2.1 Library Impact on Student Learning & Success Support

LIILA participants generated the following questions about library impact on student learning and success support. These questions may be answered, at least in part, by library participation in learning analytics.

- Do academic libraries impact student learning?
- Does library use correlate with student learning and success outcomes?
- What student behaviors or actions related to the library are positively linked with student learning and success indicators, including but not limited to outcomes, grades, persistence, retention, and lifelong learning?
- What patterns of library engagement behavior are linked to student learning and success?
- How much library use is necessary to meet benchmarks of student learning and success?
- When is the best time (at touchpoints, within a term, within a college career, etc.) for library interventions to support student learning and success?
- What are the best methods by which library interventions can support student learning and success?
- What library interactions and/or relationships are (most) positively linked with student learning and success indicators?
- What library services, resources, facilities, or areas of expertise are (most) impactful in terms of supporting student learning and success and those involved in it (students, faculty, advisors, etc.)?
- How can libraries personalize and customize library services, resources, and facilities to maximize student learning and success?
- Does evidence-based collection development support student learning and success? Where does it fall short? How could it be informed by learning analytics data?
- How can libraries respond to changes in student populations, academic curricula, program requirements, and institutional priorities?
- How can libraries identify at-risk students and intervene to empower them, supply choices, and support their learning and success?
- How can libraries identify high-performing students to enrich their learning and success?
- How can libraries augment the quantitative and qualitative data produced by learning analytics efforts to ensure that the resulting information is accurate and actionable?
- How can the answers to the questions above be employed to improve library support of student learning and success? How will they enable librarians to make decisions and take actions to "close the loop"?

3.2.2 Institutional Views of Library Contributions

LIILA participants brainstormed the following questions about institutional perspectives on library contributions to student support which may be informed by library participation in learning analytics.

- How do libraries compare to other student support units, including but not limited to advising, tutoring, and writing supports?
- What is the unique contribution of libraries student learning and success?
- How can libraries share data across student support units to increase an integrated approach to student learning and success?
- How can data collected across the academy be connected to obtain a complete picture of student-library interactions?

3.2.3 Management Perspectives

LIILA participants identified several questions of interest to library administrators that may be addressed or answered by library participation in learning analytics.

- How might linkages between student-library interactions and student learning and success indicators be used to:
    - improve library services, resources, facilities, and staffing?
    - demonstrate the value of and need for continuance of current resources allocated to the library?
    - determine whether library budgets are allocated to areas that most contribute to student learning and success?
    - increase library budgets for areas that demonstrably support student learning and success?
- What is the optimal student-library interaction level that indicates library effectiveness? How can librarians benchmark that level and seek to attain it?
- How can libraries instrument service, resource, facility, or other library use to obtain usage data capture and ensure an accurate picture of student-library interaction?
- How can libraries move to a customer relationship management model to improve library interactions and engagement to support student learning and success?
- How can libraries work with vendor partners to ensure ownership of and access to user data?
- How can libraries engage with learning analytics transparently and in partnership with institutional stakeholders, including students, faculty, advisors, co-curricular professionals, institutional researchers, and senior administrators?
- How can libraries ensure that collected data is maintained, governed, and used ethically and securely either within libraries or at an institutional level?

3.3 Visioning Strategy #3 – Imagining Future Actions

A third way to envision library integration into institutional learning analytics is to imagine ways libraries could help students learn more, better, or faster if they knew more about student-library interactions. LIILA project participants hypothesize that libraries could use learning analytics data to 1) analyze current student learning and success support, 2) communicate with students, 3) improve library services, resources, and facilities, 4) make instructional decisions, 5) and inform managerial decisions.

3.3.1 Analysis

LIILA participants generated a number of actions librarians, informed by learning analytics data, could take to analyze current student learning and success support.

- Identify courses or co-curricular programs that require library support for student learning.
- Identify areas, times, or patterns in the curriculum or co-curriculum that are troublesome for students and direct resources to improve library support for students engaging with those areas.
- Identify areas, times, or patterns in the curriculum or co-curriculum that are effective and engaging for students and direct resources to maximize library support for students student engaging with those areas.
- Provide a fuller picture of student learning data throughout the institution that can be used to more effectively support student learning. Without library data, institutional data cannot be complete, and data completeness is a requirement for data quality.
- Encourage librarians with data, visualization, and learning expertise to engage with institutional learning analytics groups to ensure data quality, effective interpretation and presentation, and ethical use.

3.3.2 Communication

LIILA participants identified the several ways in which librarians could use learning analytics data to communicate with students.

- Provide feedback to students about what student-library interactions tend to result in improve student learning and success outcomes to inform and empower their choices.
- Provide information about a student's library interactions (individually or in the context of aggregated peers' interactions) to enable students to gauge their own learning and empower self-directedness.
- Fuel metacognitive decisions for students and enable better student decision-making.
- Develop real-time alerts, notifications, or interventions to support student learning at time of need.
- Increase and/or personalize communications with students; this may alleviate anxieties, concerns, or fear associated with asking for assistance.
- Establish relationships with students who need or want additional library support for their learning.

3.3.3 Service Improvement

LIILA participants brainstormed a number of strategies librarians, armed with learning analytics data, could employ to improve library services, resources, and facilities.

- Increase access to library services, resources, and facilities based on increased understanding of effective student learning behaviors; make library supports more timely and convenient.
- Improve library discovery and fulfillment systems based on data and evidence that determine practices and/or policies that (most) support student learning.
- Improve library services based on data and evidence that determine practices and/or policies that (most) support student learning.
- Supply greater resources (staff, budget, time) to library services, resources, and facilities that (most) enable student learning.
- Augment existing student support response teams with librarians as part of the intervention support network.

3.3.4 Instructional Decisions

LIILA participants listed several ways librarians could use learning analytics data to make instructional decisions.

- Use real and real-time data to identify, support, and maximize library services, resources, and facilities that (most) support student learning.
- Articulate linkages between student library interactions and student learning to communicate and reinforce "best practices" in student learning behaviors.
- Analyze reference or other support query trends in order to inform and support faculty instructional decision-making.
- Analyze reference or other support query trends in order to inform librarian instructional decision-making.
- Identify courses or co-curricular programs that could benefit from library support for student learning and communicate that information to students and faculty in order to maximize timely instructional access to students in the form of instructional tools and events, embedded librarian supports (in courses, in learning management systems, etc.), assignment or curricular design, and so on.

3.3.5 Managerial Decisions

LIILA participants identified a number of ways librarians, supplied with learning analytics data, could inform managerial decisions.

- Advance beyond episodic and sporadic assessment efforts and engage in continuous improvement.
- Decrease number of assumptions made about student learning and library behavior; replace best guesses with informed evidence.
- Identify and classify critical, useful, and insignificant library data among other data collected to understand and power student learning and success.
- Articulate the value of library data to ease integration of library data into institutional learning analytics efforts, thereby contributing to data completeness, a necessary requirement for overall data quality and a complete picture of student learning behaviors.
- Advocate for increased student-library interactions in areas where demonstrated impact on student learning is identified; make the case to faculty or advisors that library interventions are available, appropriate, and effective.
- Enact evidence-based decision-making with regard to student learning supports throughout the library; prioritize library services, resources, and facilities with demonstrable impact; create and experiment with new library offerings that maximize known behaviors associated with student learning.
- Align librarians with institutional priorities, efforts, and metrics associated with student learning in order to open doors for librarians seeking to connect and engage in institutional level learning support initiatives and strengthen institutional partnerships in support of student learning.

3.4 Visioning Strategy #4 – Considering Facilitators

As a fourth strategy for anticipating a future in which libraries are integrated into institutional learning analytics, LIILA project participants considered a number of facilitators that can encourage, ease, or support libraries in this effort. These facilitators include contemporary issues and pressures felt by both institutions and libraries as well as the unique knowledge, skills, abilities, and values librarians can contribute to learning analytics efforts.

3.4.1 Timing

The pursuit and adoption of a new initiative often comes down to timing. In recent years, a confluence of events have occurred to facilitate the entrance of libraries into learning analytics efforts (see Figure 5). Over the last few decades, higher education has increasingly become the object of public scrutiny and concern. More students are engaging in post-secondary education now than at any time in the past, but more students are also failing to complete their programs and degrees—though they do not fail to accumulate debt. The result is a rising number of people who participate in higher education at great personal cost, but fail to see a return on their investment in the form of increased learning, sense of belonging, self-actualization, or improved socioeconomic status.

Consequently, public concerns about higher education value have resulted in demands for greater analysis of higher education effectiveness. This can be seen in the ways all sectors of higher education are expected to demonstrate accountability to stakeholders; the ways students, parents, and other stakeholders expect institutions to deliver on learning and completion promises and continuously address any shortfalls; and the ways accreditors demand that institutions demonstrate the degree to which they are achieving institutional missions, helping students attain general learning outcomes, and delivering on stated or tacit agreements made to students. Additionally, higher education institutions exist in a state of continual competition with each other—on a local, national, and international scale—and seek to distinguish themselves as institutions that achieve student learning and success outcomes at greater rates than their competitors. Given the substantial pressure to deliver on promises and the persistent competition among peers, an assessment approach that determines whether institutions are operating in adherence with their stated goals, demonstrates areas of success, and surfaces deficits in need of attention is very timely.

As key entities of their overarching institutions, academic libraries are not exempt from these problems and concerns. They too have a responsibility not only to support student learning and success effectively, but also to be knowledgeable about gaps in their ability to do so, to act quickly to close those gaps, and to be transparent in communicating both their successes and challenges. They too have "competition" in supporting students within their institutions and throughout the vendor community. They too have an obligation to ensure that students are educated and empowered so that they can make the most of the unique contributions that the library makes to the pursuit of their goals. They too must justify budgets and costs associated with library staffing and resource procurement. Indeed, learning analytics has been recognized as a 2018 "top trend" in academic libraries.[37]

As a result of the mounting pressures felt throughout higher education, institutions are using all available resources to address and remedy student learning and success gaps. Institutions are marshaling data to explore common difficulties in students' progress toward achievement of their goals, identify the most problematic sticking points, and devise strategies to intervene and assist students. Institutions are also developing centralized learner record stores or other data collection points and instituting policies and practices to establish governance, ensure security, negotiate with vendor partners with regard to data ownership and use, design or adopt analysis and reporting layers, and create and advance best practices. In many cases, the data that populates these stores is student data that has long been maintained in student information systems (SIS); SIS data is now being augmented by information from a wide variety of sources across campus. Because of the increasing need to connect disparate data sources to gain a complete picture of student experiences across an institution, standards have been developed to facilitate this exchange of data across disparate systems. The recent development and adoption these interoperability standards, such as the IMS Global Caliper standard,[38] eases prior technological obstacles to data sharing across systems. Today, interoperability standards are increasingly used by educational technologies, including: learning management systems, e-textbook applications, assessment applications, adaptive learning programs, video playback systems, and student information systems.

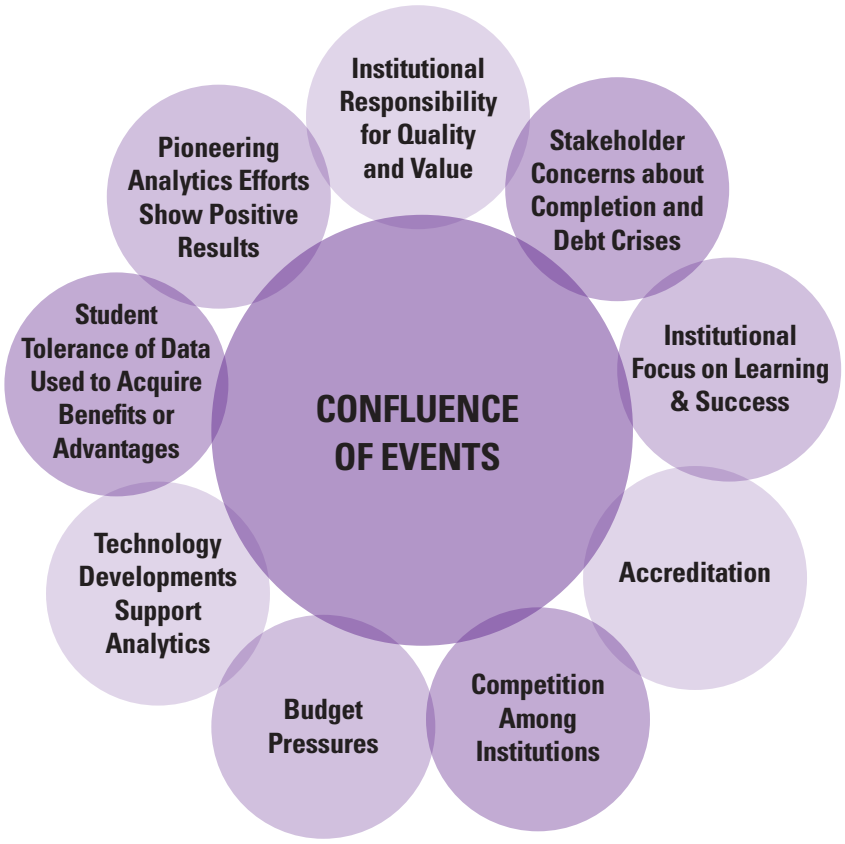


Figure 5. Coalescing Facilitators for Library Engagement in Learning Analytics

As higher education institutions establish and develop data stores to investigate and address student learning and success issues, the question of what data to include and what data to exclude is remains a matter of ongoing discussion. It is important that all stakeholders have a voice in determining data usage within an institution. In particular, students should play a key role in institutional conversations about the systems designed to support them. According to a recent EDUCAUSE study, students appear tolerant of data gathering by trusted entities for purposes that support their goals; for example, in 58% of students said it is "generally a good idea" for their institution to "use their data to create individualized messages about academic progress, training, and guidance opportunities" and between 82% and 92% of students reported interest in "technologies that can help them complete courses, improve learning, achieve their degrees, and generally improve their experiences as students."[39] Student perceptions of data use merit further study;[40] in any case, transparency in public policy and practice statements as well as education on student data use are essential.

Thus, as the need for learning analytics to address student learning and success concerns, the investment in learner record stores, the sharing capability enabled by interoperability standards, and the conversations among institutional stakeholders align, the time is nigh for the advent of learning analytics. Although it is early days yet, higher education is increasingly engaged in learning analytics and beginning to demonstrate positive change effected by the use of learning analytics approaches.[41]

3.4.2 Librarian Abilities

As has been previously described,[42] librarians have a wide range of knowledge, skills, and abilities to contribute to learning analytics efforts at their institutions. LIILA participants generated a list of some key abilities that librarians possess that can facilitate librarian engagement in learning analytics:

- Librarians traditionally collaborate across institutional and organizational silos and can leverage existing relationships or establish new partnerships.
- Librarians can supply knowledge, skills, and abilities in areas including data, visualization, learning expertise, and privacy to institutional learning analytics efforts.
- Librarians already gather large amounts of data for reporting, accountability, and managerial decision-making.
- Librarians seek to make an impact on student learning and success; this perspective is integral to their professional philosophy.
- Librarians have established a history of conducting assessments for continuous improvement and embracing change.
- Librarians have constructed a corpus of research demonstrating the contributions of libraries to student success and learning that can be used to advocate for a greater role in student learning and success initiatives.
- Librarians have long engaged in student learning and success initiatives and possess decades of experience assessing student learning outcomes.
- Librarians are guided by professional principles and viewed as a "trustworthy" profession.

Because much of higher education—including academic departments, institutional research offices, student affairs divisions, and information technology units—is already participating in learning analytics; librarians can benefit from observing and learning from the experiences of those units that are already immersed in this approach to student learning and success support. Likewise, library professional associations can leverage existing relationships with higher education associations already engaged in learning analytics to promote the involvement of libraries and librarians in learning analytics.

3.5 Visioning Strategy #5 – Anticipating Librarian Roles

A fifth method of creating a vision for library integration into learning analytics is to anticipate the roles librarians might play as they engage in learning analytics at an institutional level. LIILA participants suggested that librarians should serve as essential partners in learning analytics initiatives, taking the lead by communicating, becoming active in policy and procedure development, actively participating in learning analytics, creating meaning from the data, and acting on results.

Communicate

- Engage in discussions about learning analytics across the institution at all levels
- Convene institutional or cross-institutional discussions about learning analytics

Engage in Policy and Procedure Development

- Shape policies governing the deployment and use of learning analytics
- Establish procedures for learning analytics
- Advocate for data security and privacy

Participate Actively in Learning Analytics

- Participate in institutional learning analytics by contributing library data
- Determine the necessary library data to contribute (or withhold) from learning analytics systems
- Experiment and innovate in learning analytics

Create Meaning from Data

- Consult on meaningful data ingested into learning analytics systems
- Provide expertise in data science, curation, stewardship, metadata, taxonomies, classification, and visualization
- Demonstrate and articulate the value of information revealed by learning analytics

Act on Results

- Collaborate to act upon findings revealed by learning analytics
- Intervene with students seeking assistance through or identified by learning analytics efforts

Among the strengths librarians can bring to these roles are their perspectives on learning both inside and outside the classroom; ability to bridge learning analytics practice, research, and administration; intra- and inter-disciplinary perspectives and expertise; subject specializations; project management ability; customer focus and user experience skills; and instruction and training skills.[43]

3.6 Visioning Strategy #6 – Envisioning Beneficial Scenarios

As a sixth way to imagine ways in which libraries could become involved in institutional learning analytics efforts, librarians can consider the potential benefits of such involvement. To brainstorm the benefits of library engagement in learning analytics, librarians can envision ways in which library data might be gathered, maintained, and used to:

- investigate student-library interactions that are common among successful students,
- communicate with students about which library engagement behaviors may enhance their learning and success,
- connect with institutional partners who likewise seek to support students, and
- determine ways in which this information can be used to improve and expand library interactions, connections, and relationships with students.

The development of scenarios is a helpful starting point for conceptualizing what library involvement in learning analytics might look like as well as the advantages that such an approach may yield. Potential scenarios for library integration into learning analytics are numerous, and the positive outcomes of any one scenario might be multiplied by the many stakeholder groups who could benefit. If, for instance, patterns of student-library interactions can be linked to improved learning and success, then librarians, faculty, administrators, student support and co-curricular professionals, institutional researchers, and—most importantly—students can use that new knowledge of best practices with regard to library engagement to make decisions and take actions. Students, for example, might use that information to pattern their own library use to more closely match their personal and educational goals. Equipping students with awareness of the ways in which libraries can and do support student learning and success, backed with analytics-based research, could uncover previously opaque keys to higher education success, enable them to make more informed choices, and empower them to take actions that result in greater individual agency and increased likelihood of success.

Envisioning specific scenarios in such a high-stakes environment can be overwhelming. As a starting point, it seems reasonable to posit that libraries and librarians have the most impact on the students that they interact with via services such as reference and instruction or resources like collections and spaces. It also may be reasonable to expect that students who have more numerous, meaningful, or timely interactions with library services and resources might experience greater benefits than students who have fewer, superficial, or poorly timed library experiences. And so, one might imagine that integrating library data within larger institutional learning analytics contexts might begin with learning more about the impact of student interactions with reference, instruction, collections, and facilities. What positive benefits might learning analytics yield in these four areas? One way to begin to imagine ways in which libraries might engage in learning analytics is to consider three questions:

1. **What might librarians want to know?**
2. **What would that knowledge help librarians do?**
3. **What benefits might this approach offer to students?**

3.6.1 Scenario 1: Reference

What might librarians want to know? Librarians may want to know whether students who interact with library reference services meet (or exceed) intended learning outcomes more deeply, more easily, or more speedily; earn better assignment or course grades; are more engaged in learning experiences, persist in their educational pursuits; complete, transfer, or graduate successfully and/or on time; secure employment in accordance with their intent; earn appropriate compensation; and/or achieve other goals or markers of success as defined by students themselves or their institutions.

What would that knowledge help librarians do? Librarians could use this information to improve, customize, or personalize reference services; advocate for more (or more appropriate) reference resources including personnel, staffing, professional development, collections support, etc.; encourage students to interact with reference librarians using evidence-based rationales; and/or engage faculty in curricular or assignment designs that incorporate reference interactions.

What benefits might this approach offer to students? Students could use this information to become aware of successful learning practices; gauge their own learning behaviors against uncovered "best practices" or an aggregated representation of peers' learning behaviors; discover library services to support their learning; reduce anxiety associated with initiating reference queries; sequence their academic workflows to include interactions with librarians when appropriate; save time and avoid frustration in completing their academic workload; establish relationships with librarians as part of their support team within their institutions; and so on.

Imagine: Learning analytics could enable librarians to capture the type, content, course connections, information literacy outcomes, or other content of reference transactions; view the course outcomes, curricular trouble spots, assignment sticking points, and other aspects of specific courses student take; receive or recommend student referrals for learning support; provide feedback or ideas for follow up to students, advisors, or faculty; view student progress of information literacy outcomes over time individually, in the aggregate, or by cohort; or make other linkages that benefit students. Students could likewise be informed about their own practices either individually or in the context of peers' practices; be encouraged to take advantage of a range of support services available to them; or be prompted with messages or alerts that enable them to have greater agency in the learning journey. In this way, learning analytics could enable librarians and students to co-create learning experiences via reference interactions that help students learn information literacy and disciplinary content, connect them with librarians who play a unique role in their individual learning team, and enable them to achieve their personal and professional goals in a supported, customized, and facilitated environment.

3.6.2 Scenario 2: Instruction

What might librarians want to know? As in the case of reference, librarians might want to know whether students who participate in library instruction in its various forms (one-shots, tutorials, subject guides, drop-in workshops, course- or curriculum-integrated instruction, for-credit courses, etc.) meet (or exceed) intended learning outcomes more deeply, more easily, or more speedily; earn better assignment or course grades; are more engaged in learning experiences, persist in their educational pursuits; complete, transfer, or graduate successfully and/or on time; secure employment in accordance with their intent; earn appropriate compensation; and/or achieve other goals or markers of success as defined by students themselves or their institutions. In short, librarians may want to know what difference their instructional efforts make in the lives of students.

What would that knowledge help librarians do? Armed with this information, librarians could improve, customize, or personalize their instruction; learn about the efficacy of their teaching and learning approaches; design professional development to close teaching skill gaps; advocate for more (or more appropriate) instruction resources; encourage faculty to incorporate library instruction using evidence-based rationales; and/or engage faculty in improved curricular or assignment design. Librarians may be able to identify outcomes that are over- or under-taught; scaffold instruction through or across curricular and co-curricular programs; contribute to assessment of information literacy outcomes in assignments, courses, and programs; identify learning content with which students struggle and advise or enact instructional improvements in those areas; encourage students to follow up or through with learning supports; provide real-time encouragement, support, or reinforcement as students engage with information literacy content, and the like. Essentially, this information could enable librarians to improve their teaching and enhance student learning and development.

What benefits might this approach offer to students? Students could benefit from more relevant and timely instructional offerings, improved instructional delivery, more intentionally designed instructional experiences, and customized—or even personalized—library instruction powered by more evidence-based learner needs assessments. They may discover library resources and services, previously unknown to them, that support their learning. They may experience less instructional repetition and engage with different or deeper learning outcomes and concepts. Students may receive faster, more useful feedback on their learning activities as well as encouragement or extra support for personal trouble spots in their individual learning or difficult curriculum. They may benefit from a stronger rapport and connection with librarians and faculty instructors who are better able to target and time instruction; students may therefore build stronger instructional relationships.

Imagine: Learning analytics could enable librarians to become full partners in the academic team by linking them to course and curricular information, gathering assessments of information literacy learning, and facilitating real time librarian assistance and feedback to students engaged in curricular and co-curricular learning activities. Librarians could view learning outcomes for courses, identify trouble spots in student progress or engagement in activities, build detailed assessments of learner needs, design tailored instruction to address students goals and facilitate customized learning experience, then view or participate in the assessment of information literacy outcomes at the project or assignment level, enabling informed instructional decision-making for the future and opportunities for extended support for learners. In these ways, learning analytics could help faculty and librarians ensure that students understand the goals of their learning experiences and assignments, experience tailored instruction based on detailed learner needs assessments, receive detailed formative feedback from librarians and faculty on their assignment progress, and benefit from iterative improvements to instruction over time. Learning analytics could enable librarians to gain access to course and program learning outcomes; customize, scaffold, and differentiate instruction based on detailed learner needs assessments; observe longitudinal student progress toward information literacy learning; contribute to unit- or institution-level information literacy learning outcomes; and generally transform the level of integration of librarians in the teaching and learning process. As a result of such informed, intentionally designed, and responsive instruction, students may feel more engaged, overcome learning hurdles, and ultimately learn more.

3.6.3 Scenario 3: Collections

What might librarians want to know? Librarians might want to know whether students who engage with library resource collections (including print and electronic materials, reserves items, interlibrary loan materials, textbook collections, primary sources, special collections, archives materials, digitized collections, government documents, or specific disciplinary collections) attain more learning outcomes, earn better assignment or course grades, are more engaged, are retained, transfer successfully, graduate/complete on time, get jobs, earn more money, or attain other success markers. They might investigate whether the amount, degree, or relative rank of student library resource use impacts those markers; they may also explore whether the placement of resources (for example, in an LMS or not?) or timing of use (beginning of a term or a number of weeks prior to an assignment or assessment deadline?) is a significant factor. They might also examine the affordability implications of student use of various library resources.

What would that knowledge help librarians do? Gaining this information from learning analytics initiatives could help librarians develop or deepen relationships with instructors, encourage instructors to engage students with more (or different) resources in their courses, develop library instruction to support students using resources that are troublesome, or fine-tune resource recommendations, access, or discovery processes for students. This knowledge might also help librarians empower students or instructors to choose resources that reduce course costs and improve overall affordability, as well as reveal student experiences of resource scarcity caused by high use costs. Librarians might also use learning analytics information to make better collection decisions, review collections policies or approval plans, and make other internal workflow improvements.

What benefits might this approach offer to students? Students could benefit from more targeted, affordable, or accessible resource collections. They may experience improved instruction in the use of resources. They also could be informed about their individual resource use (including comparisons to aggregated peer usage or linkages between resources used and successful outcomes like grade attainment) and use that knowledge to discover new library resources, adjust their resource usage to match their individual goals, uncover previously unknown good learning practices, or make more informed choices about their engagement with the library. Students could investigate which courses utilize or require particular resources and/or the costs of resource use; this knowledge may empower them to reduce their expenses or accumulate less debt.

Imagine: Learning analytics could enable librarians to make data-driven decisions about their collections by revealing which resources are being accessed and used. Librarians could view breakdowns by resource content or type and explore how those resource groupings are used in a variety of curriculum areas, courses, or programs. Depending on the granularity of data capture, librarians may be able to identify trouble spots in accessing or using resources, identify gaps between expectations and actual resource engagement, make informed decisions about the costs vs use of resources, and so on. Learning analytics could also help students gauge their individual resource participation against norms; learn about resource use best practices; receive real-time encouragement or instruction on the discovery, access, or use of resources; request individualized assistance in using resources; or avoid unnecessary resource expenses.

3.6.4 Scenario 4: Facilities

What might librarians want to know? Librarians might want to know whether students who spend (more) time in the library attain more learning outcomes, earn better assignment or course grades, are more engaged, are retained, transfer successfully, graduate/complete on time, get jobs, earn more money, and/or feel more engaged and included in student-to-student relationships, student-to-faculty relations, or other engagement measures. They may also want to know which library facilities (learning commons, group study rooms, presentation practice rooms, etc.) make an impact on these learning and success markers.

What would that knowledge help librarians do? This information could help librarians make data-driven facility/space decisions, design new or redesign existing spaces, and/or advocate for additional library space. Librarians could also encourage students to spend (more) time using the library facility and point students toward library spaces aligned with their needs.

What benefits might this approach offer to students? Students may discover new (to them) library facilities to aid them in achieving their goals. Students could benefit from increased outreach and instruction about good practices related to use of library facilities and potential gains they might acquire by spending (more) time in library spaces in general or using specific library facilities. Students could also benefit from the improvements, designs, and redesigns librarians might enact based on learning analytics data.

Imagine: Learning analytics could empower librarians to make data-driven decisions about their facilities by uncovering which spaces are being accessed and used. Librarians could view breakdowns by space and explore how those spaces are attended by students from different curriculum areas, courses, or programs. Depending on the granularity of data capture, librarians may be able to identify over- or under-utilized spaces, identify gaps between expectations and actual space usage, and consider the balance of facilities costs vs usage. Learning analytics could also help students understand what library facilities can support their learning or engagement goals; receive real-time encouragement to use spaces; request individualized assistance in using or reserving spaces; or avoid expenses associated with lack of awareness of what library facilities offer.

3.7 Visioning Strategy #7 – Reflecting on Existing Data

A seventh way to begin to imagine library integration into institutional learning analytics is to reflect upon library and institutional data that is (currently or potentially) available and could be put to use to understand and enable support for student learning and success. During the LIILA project a range of data was identified as potentially useful for this endeavor.

3.7.1 Library Data Points and Sources

A learning analytics approach to investigating the impact of libraries on student learning and success requires the pairing of library (see Figure 6) and institutional data. It also necessitates the identification of available data points, investigation of the potential utility of each, determination of how to access the data points that are deemed relevant for understanding library contributions, and discussion of any data points that may raise security or ethical concerns in order to decide whether each should be included or excluded from analysis.

INTERACTION	SUBDIVISION	SOURCE
Reference	Physical desk transaction	DeskTracker, card swipes, …
	Student/faculty librarian consultations (spreadsheets)	DeskTracker
	Peer research consultations	Desk Tracker
	Reference chat/IM/text/SMS participation (transcripts)	OCLC QuestionPoint, Library H3lp, …
	Reference email participation	QuestionPoint
	Referrals to librarians from other systems (Advising/IPAS/Early Warning)	Starfish, APLUS, EAB, APAS, DARWin, Student Explorer, eCoach, …
	Archives & special collections consultations	DeskTracker
Instruction	Library instruction participation	class rosters, Springshare LibCal
	Workshop registration/participation	sign in sheet, Drupal, Springshare LibCal, …
Event/exhibit participation		class rosters, guest books
Collections usage (use/do not use, timing of use)	Physical circulation (books, technology, …)	ILS (SirsiDynix, Alma, Innovative, ExLibris, …) open source ILS (Koha, Evergreen, …)
	Renewals	ILS (SirsiDynix, Alma, Innovative, ExLibris, …) open source ILS (Koha, Evergreen, …)
	Database usage, full text downloads, etc.	Authentication (OCLC EZproxy to Ebsco, Credo, Gale, …) Link data from LMS to library content
	e-book usage, full text downloads, etc.	Authentication (OCLC EZproxy to Gale, Salem, …) Link data from LMS to library content
	Multimedia usage/downloads/etc.	Authentication (OCLC EZproxy to database vendor) Link data from LMS to library content
	Digital video	Authentication (OCLC EZproxy to Alexander Street Press, …) Link data from LMS to library content
	Institutional repository usage	BePress, Dspace, …
	Discovery/search system usage	Primo, Summon, VuFind, …
	Reserves usage	Reserves Direct, Ex Libris Leganto Link data (LTI) from LMS to library content
	ILL usage	ILLiad
Facilities usage	Space usage (security door card access)	Space usage (wifi, signups,…) Springshare Room Bookings
	Learning commons usage	wifi, workstation logins
	Technology/device usage	
	Computer usage	Workstation logins , Cybrarian, …
	Software usage	
	Printer/copier usage	swipe card, system logins
	Makerspace usage	swipe card, signup sheets
	Room usage (presentation, group study etc.)	reservation system, LibCal, Springshare, …
Library website usage	Library instructional content usage (videos, tutorials, …)	Google Analytics Library website logins (Drupal, CMS, web logs …)
	Subject guide usage	(LibGuides, …)

Figure 6. Library Data Points and Sources

3.7.2 Institutional Data Points

From a learning analytics perspective, investigating library contributions to student learning and success means pairing library data with institutional data (see Figures 7-8). The following chart includes typical information retained about students at many higher education institutions.

INSTITUTIONAL Static
Age
Ethnicity
Gender
High school GPA
SAT score
First generation
Veteran
Transfer
New or returning
Developmental or college-ready
Pell
Survey data (CIRP, SERU, NSSE, …)

Figure 7. Static Institutional Data

INSTITUTIONAL Dynamic
Major
Minor
Other program affiliation
Full- or part-time
GPA
Customer relationship management (Salesforce)
Tutoring participation
Advising participation
Student life, non-academic engagement participation (Campus Labs, …)
WIFI data, building and floor level
Scheduling data
Bookstore data (required textbooks, who purchases, who doesn't when matched with class roster)
LMS data (Blackboard, Canvas, 2U, Moodle, …)
Assessment/assignment grades
Plagiarism detection (Turnitin)
Real time course progress
Course grades
Outcomes data (TK20, Academic Reporting Toolkit…)
At-risk flag
Term-to-term enrollment persistence
Year-to-year enrollment retention
Course/degree completion
Time-to-completion, velocity
4- and 6-year graduation
Job placement/salary
Unizin Data Platform
Unizin Course Monitor
Unizin Engage (e-textbook usage platform)

Figure 8. Dynamic Institutional Data

3.7.3 Data Difficulties

Is there a point on the continuum at which student learning and success support can be maximized while maintaining professional values and ethics? What does the point at which librarians can grasp the benefits and mitigate the risks look like?

It's worth noting a few key difficulties surrounding this approach to envisioning library integration into institutional learning analytics. Both library and institutional data can be problematic in three main ways: data can be too imprecise, completely unavailable, or inaccessible due to institutional silos.[44] Sometimes, available data are too imprecise and finer levels of granularity are needed.[45] One imprecise data point frequently used to assess student learning and success is GPA. Many educators acknowledge that course grades are useful but imperfect surrogates for learning outcomes data; grades are influenced by attendance, participation, writing and speaking ability, etc. Thus, many factors unrelated to mastering course content influence course grades, rendering them potentially false equivalents of learning outcomes data.[46]

Other times, too little data is available. Data may be unavailable because the necessary data has not been recorded or maintained by either libraries or their institutions, or data may be inaccessible because of data "siloing." That is, the data may be owned by the institution (and not shared with the library), buried in vendor-owned data systems, or stored in formats that are not easily translatable, preventing the research from being conducted at all. In fact, siloed data is an obstacle that presents a major challenge to taking the current body of research correlating libraries with student learning and success to the logical next step.[47]

Because of these challenges, it is tempting to start analysis using data that is available and accessible, but there is a danger in focusing only on available data and allowing those data points to drive inquiry into how student learning and success can be supported in new and better ways. It is possible, even probable, that the data currently collected and maintained will not allow full assessment of student learning and success outcomes. In other words, there is almost certainly a gap between what data is needed to conduct detailed learning analytics work and what is currently available. For example, while some student-library interactions have a digital footprint, many do not. If deemed significant and necessary for understanding how libraries can better support student learning and success, interactions without a digital trail might need to be instrumented to capture relevant data.

Finally, determining what data to include in learning analytics efforts requires deep reflection and thorough discussion of any data points that may raise security, privacy, or ethical concerns in order to decide whether each should be included or excluded from analysis. Librarians must take ownership of the decision-making process with regard to what library data is used to support student learning and success. How much data is needed? How detailed must it be? What data elements should never be used? On one end of the continuum is "all of the data;" at the other end is "none of the data." Librarians must decide: Is there a point on the continuum at which student learning and success support can be maximized while maintaining professional values and ethics? What does the point at which librarians can grasp the benefits and mitigate the risks look like? And what might it take to move libraries to that point?

3.8 Visioning Strategy #8 – Creating User Stories

The eighth strategy used in the LIILA project for envisioning the integration of library data in institutional learning analytics is the development of user stories. LIILA participants developed, ranked, explored, and expanded upon numerous user stories in an effort to conceptualize scenarios in which libraries participated in learning analytics efforts. User stories are tools used in designing systems. Intended as a methodology for describing system capabilities or outputs from a user perspective, user stories describe *who* the user is, *what* the user needs to accomplish, and *why* that outcome is desirable. User stories can be formatted in a number of ways:

- As [**who**], I want [**what**], so that [**why**].
- As a [**user**], I want [**goal**] so that [**reason**].
- As [**stakeholder**], I want [**to be able to do an activity, to have an awareness, to take an action**] in order to [**achieve outcome, solve problem, meet need**].

LIILA participants brainstormed, drafted, circulated for feedback, developed, and ranked a variety of user stories. "Users" encompassed in these user stories included students, librarians, faculty, academic advisors, institutional researchers, and senior leaders. In each user story, the "user" was followed by a "want" statement. Want statements focused on the ability to do an activity, build an awareness, or accomplish a task requiring library/institutional data. When library or institutional data was necessary for the "want" to be achieved, that data was separated into two categories ("library" and "institutional") for clarity. To conclude each user story, a rationale for the "want" was added. Rationales included achieving outcomes, solving problems, and meeting needs. Many rationales focused on planning and deploying interventions to support student learning and success; some were further augmented with ways to improve instructional and institutional environments as well. The full list of LIILA user stories is provided below. This list shares a variety of ways of envisioning library engagement with learning analytics; it is not intended to be exhaustive.

4.0 LIBRARY DATA USER STORIES

The following chart presents the 95 user stories brainstormed as a part of the LIILA project. Each user story focuses on a user group, such as students, librarians, faculty, academic advisors, institutional researchers, or senior leaders. In each story, the "user" is followed by a "want" statement. Want statements may include the ability to do an activity, build an awareness, or accomplish a task requiring library/institutional data. When library or institutional data is necessary for the "want" to be achieved, that data is visually separated into two categories ("library" and "institutional") for clarity. To conclude each user story, a reason, intent, use, or goal for the "want" is listed; in general these focus on achieving an outcome, solving a problem, and/or meeting a need.

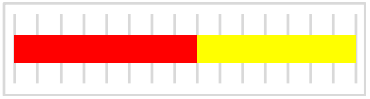
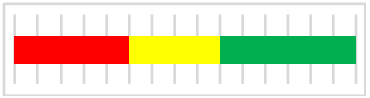
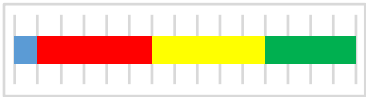
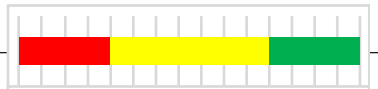
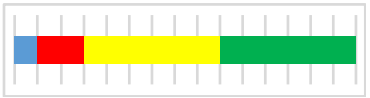
It should be noted that user stories are intended to be concise statements, represent only a first step in visualizing library integration into learning analytics, and are limited by a number of factors, including the perspectives of the LIILA participants. Librarians hoping to build upon these user stories should expand the pool of engagement in this work to ensure diverse voices and multiple stakeholder groups are included; at least one effort to address this limitation is in development at this time.

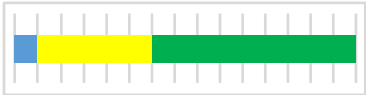
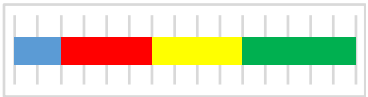
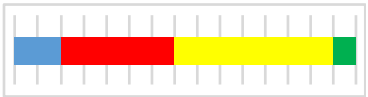
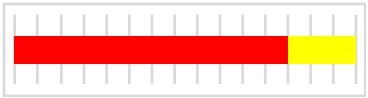
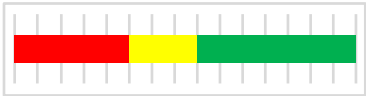
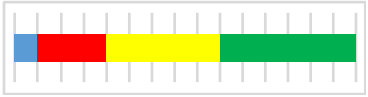
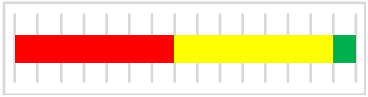
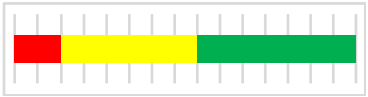
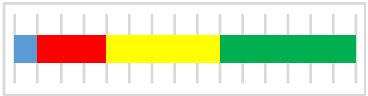
Librarians seeking to develop these basic user stories into detailed use cases could continue the process by:

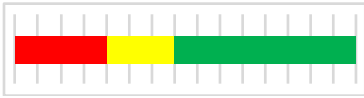
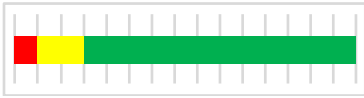
- brainstorming analytics outcomes that can be produced based on a set of accumulated data;
- brainstorming the student-library interactions, activities, or system events that would trigger data capture;
- describing the data emitted and captured;
- mapping the source systems implicated for data capture, and identifying ownership of the source systems;
- considering accessibility and transferability issues to record stores or analysis layers; and/or
- evaluating privacy issues, considering attendant privacy safeguards, and devising mitigation strategies.[48]

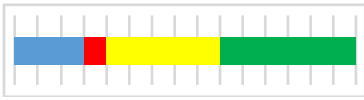
Ninety-one user stories were complete when 15 participants ranked the potential impact of each; four were added later on. LIILA participants judged user stories on a scale of from "low" potential impact to "high" potential impact with one midpoint ("middle" potential impact) and a non-response option. Responses were weighted and averaged, then clustered around ranks (1=high impact, 5=low impact). The highest ranked user stories were marked with the notation 1+.

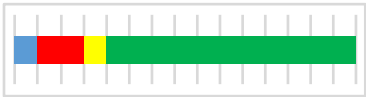
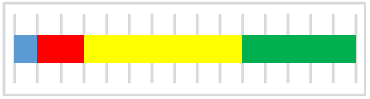
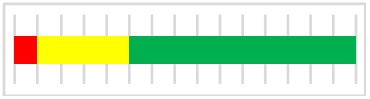
4.1 Full List of User Stories

#	AS [stakeholder],	I WANT [to be able to do an activity, to have an awareness, to take an action].		IN ORDER TO [achieve outcome, solve problem, meet need].	POTENTIAL IMPACT LEVEL high mid low no response n=15	RANK
1	As a student,	I want to know whether my use of the library is more/less/equal to other students		so that I can match my library use with other students who are successful.		5
2	As a student,	I want to know whether studying in the library	will improve my assignment/course grades or test scores or make it more likely that I stay in school	so that I can make good choices about where to study in order to get good grades and stay in school.		3
3	As a student,	I want to know whether using a presentation practice space in the library	will help me earn a better assignment/course grade	so I can sign up and get a slot before they fill up or decide to skip it altogether.		4
4	As a student,	I want to know whether I use more/less/equal amount of library resources to complete my assignments (compared to other students)		so that I can adjust my library use to get better grades.		3
5	As a student,	I want to know which library resources successful (grade attainment, retention, other?) students are using		so that I can match my library resource use with other students who are successful and improve my assignment/course grades.		3
6	As a student,	I want to know whether using library resources	will help me get better grades on my assignments	so that I can match my library resource use with other students who are successful and improve my assignment/course grades.		3
7	As a student,	I want to know whether attending a library instruction session/workshop	will improve my assignment/course grades or test scores	so that I can decide whether to attend one (and which one to attend).		2
8	As a student,	I want to know whether enrolling in a for-credit information literacy course	will improve my grades in other courses	so that I can decide whether to take the course.		2

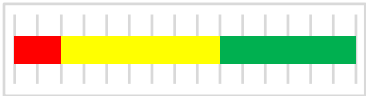
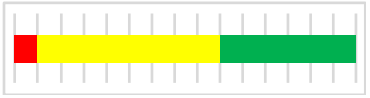
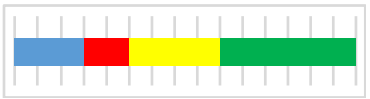
#	AS [stakeholder],	I WANT [to be able to do an activity, to have an awareness, to take an action].		IN ORDER TO [achieve outcome, solve problem, meet need].	POTENTIAL IMPACT LEVEL high mid low no response n=15	RANK
9	As a student,	I want to know whether using resources provided by the library	will save me money on textbooks	so that I can afford to stay in school or accumulate less debt.		1
10	As a student,	I want to know whether using technology provided by the library	will save me money on computers, printers, or other equipment	so that I can afford to stay in school or accumulate less debt.		3
11	As a student, *from Katie Jones	I want to know whether using technology provided by the library	will save me time/ frustration needing/using my own computers, printers, or other equipment	so that I can be more efficient and productive.		4
12	As a student,	I want to know what library exhibits/events other students attend		so that I don't miss out on academic and social benefits.		5
13	As a student,	I want to know whether other students use the reference desk or reference librarian consultations more/ less/equal amount than I do		so that I can avoid making mistakes, feeling anxiety about library service use, or missing out on help I can get with my assignments.		4
14	As a student,	I want to know whether asking a question at the reference desk	will improve my assignment/ course grades or test scores	so that I can decide whether to take my assignment problems to a reference librarian.		3
15	As a student,	I want to know what experiences (courses? other?)	will teach me the information literacy skills employers expect	so that I can get a (better, more highly paid, more selective) job or graduate school admission offer.		3
16	As a student, *from Krista Siano	I want to know what kinds of questions successful students (in my field of study) ask of the reference librarians		so I can understand when/how to use the reference desk to support my assignments and improve my grades.		5
17	As a student, *from Krista Siano	I want to know what databases (or other online reference materials)	are most frequently used by successful students in my course of study	so that I can match my use and i mprove my grades.		2
18	As an online student, *from John Stawarz	I want to know my use of library resources and services	is more/less/equal to the use of campus-based students	so that I can develop strategies to better engage with the library as an online student, so that the library could improve support for online students, or even to decide whether I'd like to enroll as an online student in the first place.		3

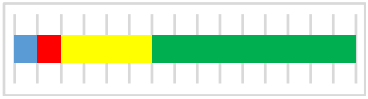
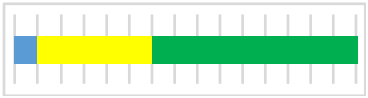
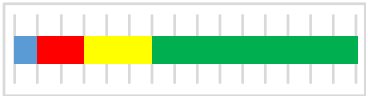
#	AS [stakeholder],	I WANT [to be able to do an activity, to have an awareness, to take an action].		IN ORDER TO [achieve outcome, solve problem, meet need].	POTENTIAL IMPACT LEVEL high mid low no response n=15	RANK
19	As a campus-based student, *from John Stawarz	I want to know whether using only online library resources	will help me achieve more learning outcomes (or do so faster or more easily, earn higher GPA or test scores (CAAP, CLA, GRE, LSAT MCAT, MAPP), engage more with peers and others, stay in school, transfer successfully, graduate/complete, find an appropriate job and earn more money	so that I can know whether I actually need to visit the library in person and make more informed choices about how to interact with the library.		3
20	As a student, *from Jacob Glemaker	I want to know which courses (sections) use more freely available (through the library) resources		so that I can choose courses (sections) that will allow me to spend less on textbooks or other resources in order to afford to stay in school or accumulate less debt.		2
21	As a librarian,	I want to know whether students who interact with library reference services	attain more learning outcomes, earn better assignment or course grades, are more engaged, are retained, transfer successfully, graduate/complete on time, get jobs, and/or earn more money	so that I can advocate for more (or more appropriate) reference resources, encourage more faculty and students to interact with reference librarians, and improve reference services.		1+
22	As a librarian,	I want to know whether students who participate in library instruction	attain more learning outcomes, earn better assignment or course grades, are more engaged, are retained, transfer successfully, graduate/complete on time, get jobs, and/or earn more money	so that I can advocate for more (or more appropriate) instruction resources, encourage more faculty and students to schedule/participate in library instruction, and improve library instructional services and decision-making.		1+

#	AS [stakeholder],	I WANT [to be able to do an activity, to have an awareness, to take an action].		IN ORDER TO [achieve outcome, solve problem, meet need].	POTENTIAL IMPACT LEVEL high mid low no response n=15	RANK
23	As a librarian,	I want to know whether students who participate in particular, identifiable library instruction sessions (from Jen Fabbi: analyze by mode of instruction.)	attain more learning outcomes, earn better assignment or course grades, are more engaged, are retained, transfer successfully, graduate/complete on time, get jobs, and/or earn more money	so that I can advocate for more instruction resources and encourage more faculty and students to schedule/participate in library instruction, and improve library instructional services.		1+
24	As a librarian, *from Mark Emmons	I want to know whether students who take a for-credit information literacy course	attain more learning outcomes, earn better assignment or course grades (in other courses), are more engaged, are retained, transfer successfully, graduate/complete on time, get jobs, and/or earn more money	so that I can advocate for students to take a for-credit information literacy course, develop basic, advanced, or discipline-specific versions of the course, and/or create an information-based minor program.		2
25	As a librarian,	I want to know whether students who take courses that require extensive use of library resources	have improved learning outcomes, GPA or test scores (CAAP, CLA, GRE, LSAT MCAT, MAPP), engagement indicators, semester-to-semester retention, transfer success, employment rates or earnings after graduation/completion	so that I can advocate that faculty use more library resources in their courses, review and improve courses that should but do not use library resources, ensure maximum quality/match of library resources with library resource-intensive courses.		1
26	As a librarian, *augmented by Starr Hoffman	I want to know whether students who take courses taught by faculty who have consulted with librarians on course/assignment design	have improved learning outcomes, GPA or test scores (CAAP, CLA, GRE, LSAT MCAT, MAPP), engagement indicators, semester-to-semester retention, transfer success, employment rates or earnings after graduation/completion	so that I can advocate that faculty consult with librarians in preparing their courses, figure out exactly what impactful contributions librarians are making to the courses, and ensure that all librarians are making impactful contributions in this context.		1+

#	AS [stakeholder],	I WANT [to be able to do an activity, to have an awareness, to take an action].		IN ORDER TO [achieve outcome, solve problem, meet need].	POTENTIAL IMPACT LEVEL high mid low no response n=15	RANK
27	As a librarian,	I want to know whether the amount, degree, or relative rank of student library resource use or other library participation	impacts learning outcomes attainment, assignment or course grades, GPA or test scores, engagement indicators, and/or semester-to-semester retention, transfer success, employment rates or earnings after graduation/ completion	so that I can encourage faculty to require use of more library resources in their teaching content and assignment design, and encourage students to increase their library resource use.		1
28	As a librarian, *inspired by Carol Tenopir	I want to know whether the amount of time (or amount of engagement) students spend reading (or other interactions like highlighting, annotating) library resources	impacts learning outcomes attainment, assignment or course grades, GPA or test scores, engagement indicators, and/or semester-to-semester retention, transfer success, employment rates or earnings after graduation/ completion	so that I can encourage students to spend more time interacting with library resources and educate faculty about the benefits (hopefully) of reading and in-depth interaction with library resources.		3
29	As a librarian, *from Starr Hoffman	I want to know whether the degree of student library resource use or other library participation classified by Bloom's taxonomy of knowledge / comprehension / application / analysis / synthesis / evaluation	impacts learning outcomes attainment, assignment or course grades, GPA or test scores, engagement indicators, and/or semester-to-semester retention, transfer success, employment rates or earnings after graduation/ completion	so that I can encourage faculty to require use of more library resources in their teaching content and assignment design.		3
30	As a librarian, *from Starr Hoffman	I want to know whether students who engage with primary sources (archives, special collections, digitized collections, government documents)	attain more learning outcomes, earn better assignment or course grades, are more engaged, are retained, transfer successfully, graduate/complete on time, get jobs, and/or earn more money	so that I can nudge more faculty to encourage student engagement with these resources in their courses, and grow more library instruction partnering with archives and special collections.		1

42

#	AS [stakeholder],	I WANT [to be able to do an activity, to have an awareness, to take an action].		IN ORDER TO [achieve outcome, solve problem, meet need].	POTENTIAL IMPACT LEVEL high mid low no response n=15	RANK
31	As a librarian,	I want to know whether the amount, degree, or relative rank of student library resource or technology use or other library participation	impacts institutional affordability and or debt minimization for students	so that I can encourage students (and faculty) to engage with the library in ways that enable students to save money and train/retrain librarians to consider this criterion in their collections decisions. (*from Adam Murray: use that information in order to advocate for resources (funding, positions) to improve the scalability of the resources that impact student financial issues.)		3
32	As a librarian,	I want to know which print materials are used by students	who attain more learning outcomes, earn better assignment or course grades, are more engaged, are retained, transfer successfully, graduate/complete on time, get jobs, and/or earn more money	so that I can make better collection decisions, inform faculty of how resources are being used, point students toward better resources, and improve library instruction. (*from Adam Murray: use information about use of the collections in order to leverage the network of deans for advocacy related to collections funding.)		3
33	As a librarian,	I want to know which electronic materials are used by students	who attain more learning outcomes, earn better assignment or course grades, are more engaged, are retained, transfer successfully, graduate/complete on time, get jobs, and/or earn more money	so that I can make better collection decisions, inform faculty of how resources are being used, point students toward better resources, and improve library instruction. (*from Adam Murray: use information about use of the collections in order to leverage the network of deans for advocacy related to collections funding.)		2
34	As a librarian,	I want to know which disciplinary collections are used by students	who attain more learning outcomes, earn better assignment or course grades, are more engaged, are retained, transfer successfully, graduate/complete on time, get jobs, and/or earn more money	so that I can make better collection decisions, inform faculty of how resources are being used, point students toward better resources, and improve library instruction.		2
35	As a librarian, *from Shane Nackerud	I want to know whether students who use of library resources in the first X weeks of a term	pass midterms/assignments/ courses at greater rates	so that I can educate students and faculty about early library resource use.		2

#	AS [stakeholder],	I WANT [to be able to do an activity, to have an awareness, to take an action].		IN ORDER TO [achieve outcome, solve problem, meet need].	POTENTIAL IMPACT LEVEL high mid low no response n=15	RANK
36	As a librarian,	I want to know whether students who spend (more) time in the library	attain more learning outcomes, earn better assignment or course grades, are more engaged, are retained, transfer successfully, graduate/ complete on time, get jobs, and/or earn more money	so that I can advocate for more library spaces, redesign the spaces we have, and encourage students to spend more time using the library facility.		1
37	As a librarian,	I want to know whether students who spend (more) time in the library	feel more engaged and included in student-to-student relationships, student-to-faculty relations, or other engagement measures	so that I can advocate for more library spaces, redesign the spaces we have, and encourage students to spend more time using the library facility. (*from Adam Murray: advocate for furniture and equipment)		1
38	As a librarian,	I want to know which library facilities (learning commons, group study rooms, etc.) are used by students	who attain more learning outcomes, earn better assignment or course grades, are more engaged, are retained, transfer successfully, graduate/ complete on time, get jobs, and/or earn more money	so that I can make better facility/space decisions, inform faculty of how library spaces are being used, and point students toward library spaces aligned with their needs.		1
39	As a librarian, *from Starr Hoffman	I want to know what students are doing in library facilities (learning commons, group study rooms, etc.) and whether those activities help students	attain more learning outcomes, earn better assignment or course grades, are more engaged, are retained, transfer successfully, graduate/ complete on time, get jobs, and/or earn more money	so that I can make better facility/space decisions, inform faculty of how library spaces are being used, and point students toward library spaces aligned with their needs.		1

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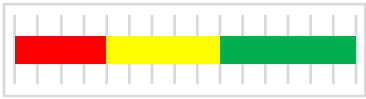
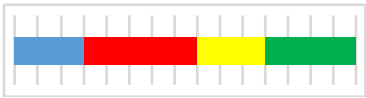
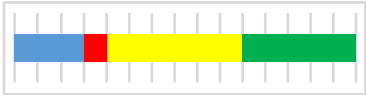
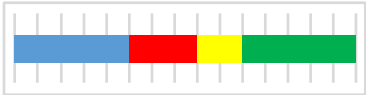
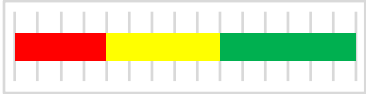
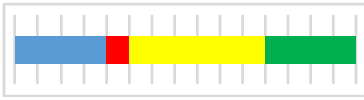
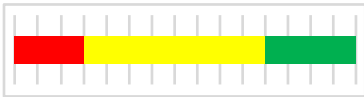
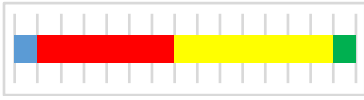
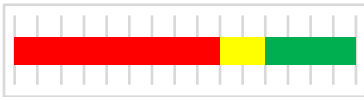
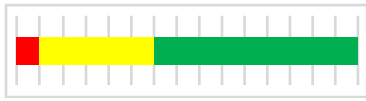
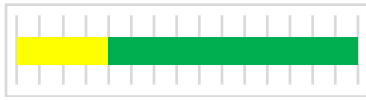
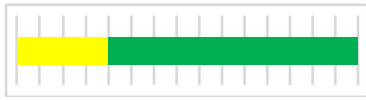
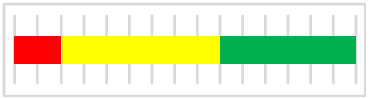
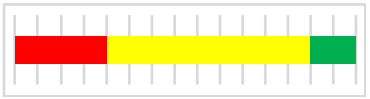
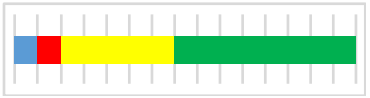
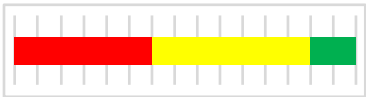
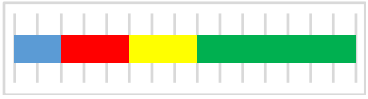
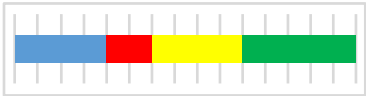
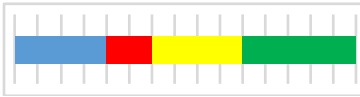
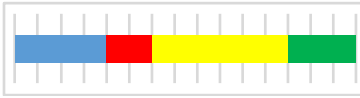
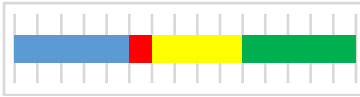
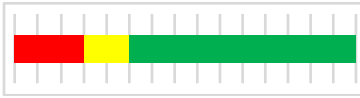
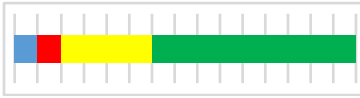
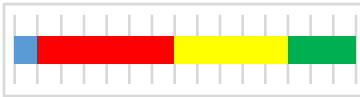
40	As a librarian,	I want to know whether students who use (which) library discovery tools	attain more learning outcomes, earn better assignment or course grades, are more engaged, are retained, transfer successfully, graduate/ complete on time, get jobs, and/or earn more money	so that I can improve library resource discovery.		3
41	As a librarian, *from Emily Daly	I want to know whether students who begin their library research at the library website rather than Google or another freely available search tool	have improved GPA, semester-to-semester retention, transfer success, employment rates or earnings after graduation/ completion	so that I can advocate for more staff and resources for the library website, hosted search tools, and discovery layers.		4
42	As a librarian,	I want to know whether students who use (which) library-coordinated digital reading lists and/or course packs	attain more learning outcomes, earn better assignment or course grades, are more engaged, are retained, transfer successfully, graduate/ complete on time, get jobs, and/or earn more money	so that I can advocate an increased library role in coordination or devel-opment of digital reading lists and/or course packs.		3
43	As a librarian, *from Shane Nackerud	I want to know whether students who use library-managed course reading lists/ course reserves	demonstrate increased course engagement	so that I can advocate with faculty for increase used of library-managed course reading lists/course reserves.		2
44	As a librarian, *from Shane Nackerud	I want to know whether students who use library-managed course reading lists/course reserves use (or use more) library resources, services, or facilities		so I can advocate an increased library role in management of reading lists and/or course reserves.		3
45	As a librarian,	I want to know whether students who use (which) library-provided textbooks	attain more learning outcomes, earn better assignment or course grades, are more engaged, are retained, transfer successfully, graduate/ complete on time, get jobs, and/or earn more money	so that I can review collection policies and decisions and ensure maximum use and impact of library-provided textbooks.		3

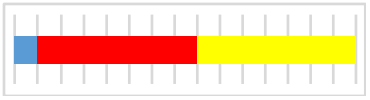
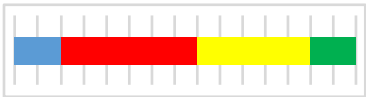
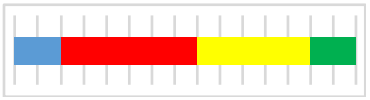
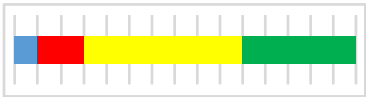
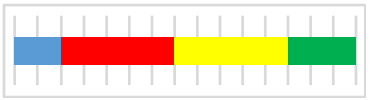
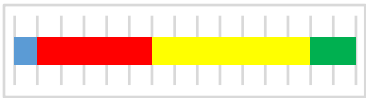
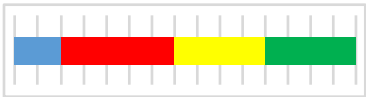
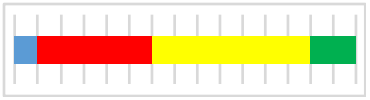
#	AS [stakeholder],	I WANT [to be able to do an activity, to have an awareness, to take an action].		IN ORDER TO [achieve outcome, solve problem, meet need].	POTENTIAL IMPACT LEVEL high mid low no response n=15	RANK
46	As a librarian, *from Shane Nackerud	I want to know whether students who take courses in which include course-specific library materials/ services/ resources into the LMS (e.g. library resources aligned with course content)	attain more learning outcomes, earn better assignment or course grades, are more engaged, are retained, transfer successfully, graduate/ complete on time, get jobs, and/or earn more money	so that I can justify and promote to faculty the inclusion of a library presence in the LMS.		2
47	As a librarian, *from Tasha Cooper	I want to know whether students who cite more (which) library resources in their assignments	attain more learning outcomes, earn better assignment or course grades, are more engaged, are retained, transfer successfully, graduate/ complete on time, get jobs, and/or earn more money	so that I can encourage and instruct students to cite more resources in their assignments and encourage faculty to require more library resource citations in relevant assignments.		3
48	As a librarian, *from Tasha Cooper	I want to know whether students who request items via ILL	attain more learning outcomes, earn better assignment or course grades, are more engaged, are retained, transfer successfully, graduate/ complete on time, get jobs, and/or earn more money	so that I can encourage and instruct students to ILL more resources and encourage faculty to structure assignments to accommodate ILL timelines.		5
49	As a librarian,	I want to know whether students who submit papers, assignments, or other materials to the institutional repository	attain more learning outcomes, earn better assignment or course grades, are more engaged, are retained, transfer successfully, graduate/ complete on time, get jobs, and/or earn more money	so that I can expand the capability of the institutional repository and market it to faculty and students.		4

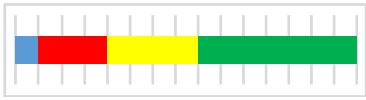
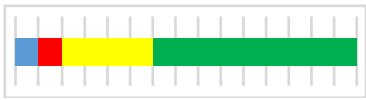
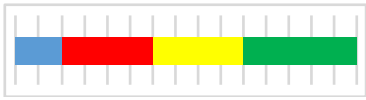
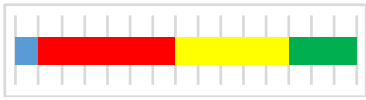
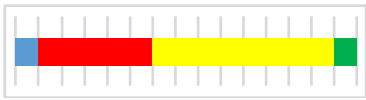
#	AS [stakeholder],	I WANT [to be able to do an activity, to have an awareness, to take an action].		IN ORDER TO [achieve outcome, solve problem, meet need].	POTENTIAL IMPACT LEVEL high mid low no response n=15	RANK
50	As a librarian, *inspired by Teresa Faust	I want to know whether students who use library resource guides or library tutorials	complete assignments faster or earn better grades	so that I can assess and improve the quality of the library resource guides or tutorials to help more students save time and earn better grades.		1
51	As a librarian,	I want to know whether any relationships between the use of library services/resources and institutional outcomes (described in other user stories above)	vary by student population/ status/characteristics (Starr Hoffman recommendation: include commuting students and/or those who work off-campus, especially full time in the characteristics explored.) (Other recommendation: include library student employee status in the analysis.)	so that I can tailor library services/ resources to meet the needs of populations with specialized needs and engage in appropriate instruction, outreach, etc. and help the institution prepare for changing student demographics.		1+
52	As a librarian,	I want to know whether any relationships between the use of library services/resources and institutional outcomes (described in other user stories above)	impact learning outcomes attainment assessed at the assignment level (or some other more granular level that may actually get at learning directly) Learning outcomes might include: • Locating, evaluating, using information • Thinking critically, analytically • Analyzing, solving problems • Applying information skills to the real world • Disciplinary information skills	so that I can tailor library services/ resources to maximize and facilitate student learning.		1+

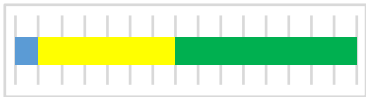
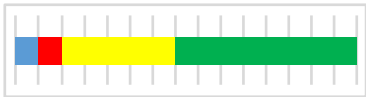
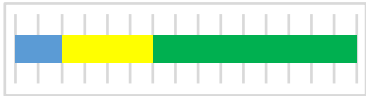
#	AS [stakeholder],	I WANT [to be able to do an activity, to have an awareness, to take an action].		IN ORDER TO [achieve outcome, solve problem, meet need].	POTENTIAL IMPACT LEVEL high mid low no response n=15	RANK
53	As a librarian, *from Adam Murray, based on *Young Adults Adrift*	I want to know whether any relationships between the use of library services/ resources and institutional outcomes (described in other user stories above)	impact students' civic engagement or being a contributing member of society (i.e., voting registration/ participation, lack of criminal activity, pursuit of graduate degrees or further certifications, lack of student loan default, public library use, philanthropic activity, entrepreneurial activity, home ownership/not living with parents post-graduation, having a significant other and/or children).	so that I can tailor library services/ resources to maximize and facilitate student development.		3
54	As a librarian,	I want to know whether any relationships between the use of library services/resources and institutional outcomes (described in other user stories above)	vary across (peer) institutional comparisons	so that I can identify best practices that I can borrow from other institutions, understand how different practices impact outcomes, and advocate to improve library services/resources at my institution to reflect those at institutions with better outcomes.		3
55	As a librarian, *from Selena Killick	I want to identify students contact our helpdesk the most, when, about what	by courses/departments/ units	so that I can work with the course/ department/unit teams to improve their learning design and empower the students to be more independent learners.		2
56	As a librarian, *from Selena Killick	I want to identify which aspects of library service (resources, skills and/or support)	has the highest impact on student satisfaction as measured through institutional survey tools	so that I can support the institutional strategies to improve student satisfaction scores.		4
57	As a librarian, *from Selena Killick	I want to identify students who don't use the library resources, skills or service	by any indicators/ characteristics	so that I can work with faculty/advisors to understand if there is a reason for the lack of student engagement with the library and to share with them the benefit the library could provide their students		1

#	AS [stakeholder],	I WANT [to be able to do an activity, to have an awareness, to take an action].		IN ORDER TO [achieve outcome, solve problem, meet need].	POTENTIAL IMPACT LEVEL high mid low no response n=15	RANK
58	As a librarian, *from Selena Killick and Starr Hoffman	I want to determine which library instruction by design (teaching method, 1 vs multi-shot) and format (written, video, or live delivery)	has the most impact on student success indicators	so that I can appoint library resources to the best effect for students and advocate for increased library tuition embedded in curriculum, nudge more faculty to ask for multi-shot sessions (presumably), and nudge more librarians to expand their teaching practices/methods.		3
59	As a librarian, *from Selena Killick	I want to know how many resources are purchased to specifically support a course/department/unit, how much they cost,	and how much they are used	so that I can nudge faculty into using existing library resources more.		4
60	As a librarian, *from Selena Killick	I want to identify courses/departments/units who do not interact with the library to embed content or skills materials		so that I can investigate reasons for the lack of engagement with the library and to share the benefit the library could provide to students.		3
61	As a librarian, *from Adam Murray	I want to know whether (which) library interactions	impact student success measures, faculty research productivity, faculty grant productivity, institutional brand/image/prestige, institutional affordability, and/or institutional accreditation (in UK, Teaching Excellence Framework - national audit per Selena Killick)	so that I can ensure library alignment with institutional accreditation and disciplinary accreditation standards, advocate for the resources to correct places where that alignment isn't correct, and ensure library instruction is structured to be in alignment with all academic program learning outcomes.		2
62	As a librarian, *from Emily Daly	I want to know whether students who are referred to and meet with librarians and library resources by their instructors	have improved GPA, semester-to-semester retention, transfer success, employment rates or earnings, after graduation/completion	so that I can advocate that faculty and instructors refer students to librarians and encourage them to take advantage of library resources and services.		2

#	AS [stakeholder],	I WANT [to be able to do an activity, to have an awareness, to take an action].		IN ORDER TO [achieve outcome, solve problem, meet need].	POTENTIAL IMPACT LEVEL high mid low no response n=15	RANK
63	As a librarian, *from Emily Daly	I want to know whether students who have librarians as officially identified members of their academic support network (e.g., academic advisors, Residence Hall Librarians, learning-living community advisors)	have improved GPA, semester-to-semester retention, transfer success, employment rates or earnings, after graduation/ completion	so that I can advocate that librarians connect with students on campus in ways outside librarians' traditional roles and responsibilities and determine the most effective ways for librarians to connect with students on campus, outside librarians' traditional roles and responsibilities.		2
64	As a librarian, *from Jen Fabbi	I want to know whether any relationships between the use of library services/resources and institutional outcomes (described in other user stories above)	make an impact	so that I can pilot responsive services and resources and facilitate and expedite decision making.		3
65	As a librarian, *from Mark Emmons	I want to know whether library student employees	display more skills employers expect (i.e., workplace skills, information literacy, etc.) than other students	so that I can continue to make a case to various funders that the budget for student employment is critical to maintain as a contributor to student success.		2
66	As faculty,	I want to know whether my students are using library resources		so that I can counsel them to use more or better resources.		1
67	As faculty,	I want to know whether my students who use (more) library resources are getting better grades on assignments or in my course		so that I can encourage more students to increase their library resource use.		1
68	As faculty,	I want to know which library resources my students are using (call number ranges, databases, journal titles, etc.)		so that I can check to see whether they're using what my discipline requires and re-teach as needed.		4

#	AS [stakeholder],	I WANT [to be able to do an activity, to have an awareness, to take an action].		IN ORDER TO [achieve outcome, solve problem, meet need].	POTENTIAL IMPACT LEVEL high mid low no response n=15	RANK
69	As faculty,	I want to know which courses in my department have students using the most library resources		so I can emulate the practices of those instructors and/or develop the instruction skills of faculty with low resources use if appropriate.		3
70	As faculty,	I want to know which of the courses in my department work with librarians in a consulting or instructional capacity		so I can report to accreditors, create a curriculum map, or otherwise get organized.		3
71	As faculty,	I want to know what library exhibits or events my students (or faculty colleagues) attend		so that I can build on those experiences in my class or practice.		5
72	As faculty,	I want to know the numbers of library resources cited in articles or grant publications in my department or discipline		so I can adjust my publications or proposals to make them more competitive.		4
73	As faculty,	I want to know the numbers of library resources included in syllabi in my department or discipline		so that I can adjust my syllabi to bring them more in line with standard practice.		4
74	As faculty,	I want to know the courses in my department that include library instruction		so that I can adjust my practice to avoid repetition, build on what students learn in other courses, and address student learning needs.		3
75	As faculty,	I want to know what library resources in my discipline	are most cited in funded grant proposals	so that I can prepare more competitive grants.		4
76	As faculty	I want to know what library resources in my discipline	are most cited on course syllabi in my department	so that I can match what my colleagues are using, reduce duplication across courses, etc.		4
77	As faculty,	I want to know how the use/citation of library resources in my publi-cations	correlates with successful tenure and/or promotion cases	so that I can alter my use/citation practices to increase the likelihood of earning tenure and/or promotion.		4
78	As faculty,	I want to know whether my inclusion of library resources in my sylla-bus	correlates with teaching evaluation measures	so that I can change the amount of my inclusion of library resources in my syllabus in order to receive better teaching evaluation scores.		4

#	AS [stakeholder],	I WANT [to be able to do an activity, to have an awareness, to take an action].		IN ORDER TO [achieve outcome, solve problem, meet need].	POTENTIAL IMPACT LEVEL high mid low no response n=15	RANK
79	As faculty,	I want to know whether my inclusion of library resources in student assignment requirements	correlates with student learning outcomes attainment, assignment or course grades, or teaching evaluation measures	so that I can change the amount of my inclusion of library resources in student assignment requirements to increase student learning or receive better teaching evaluation scores.		2
80	As an academic advisor,	I want to know if students who are contacted by or referred to librarians for consultations or instruction	attain more learning outcomes, earn better assignment grades or course grades, are more engaged, are retained, graduate/ complete on time, etc.	so that I can make more referrals and get students the help they need.		1
81	As an academic advisor,	I want to know whether students who are struggling	are using fewer library resources than more successful students	so that I can suggest that they use more library resources as part of an intervention plan.		3
82	As an academic advisor,	I want to know whether students who are struggling	are using fewer reference desk services than more successful students	so that I can suggest that they use the reference desk services as part of an intervention plan.		3
83	As an academic advisor,	I want to know whether students who are struggling	are attending fewer library instruction sessions than more successful students	so that I can suggest that they use library instruction as part of an intervention plan.		4
84	As an academic advisor,	I want to know whether students who are struggling	are attending fewer library exhibits or events than more successful students	so that I can suggest that they attend more library events or exhibits as part of an intervention plan.		5
85	As an academic advisor,	I want to know whether students who are struggling financially	are using library technology options	so that I can suggest that they use free library technology options as part of an intervention plan.		4
86	As an academic advisor,	I want to know whether students who are struggling financially	are gaining access to required resources like textbooks and resources listed on syllabi	so that I can suggest that they investigate free textbook options as part of an intervention plan, or that I could encourage my faculty to use more open educational resources to cut down on textbook costs.		3

#	AS [stakeholder],	I WANT [to be able to do an activity, to have an awareness, to take an action].		IN ORDER TO [achieve outcome, solve problem, meet need].	POTENTIAL IMPACT LEVEL high mid low no response n=15	RANK
87	As an academic advisor,	I want to know whether students who are struggling	are studying in the library facility	so that I can suggest that study in the library as a way to focus on their academic progress.		3
88	As an academic advisor,	I want to know what library experiences (courses?)	will teach students the information literacy skills employers expect	so that my advisees can get a (better, more highly paid, more selective) job or graduate school admission offer.		3
89	As an institutional researcher,	I want to know whether or the degree to which including library data in institutional learning analytics	leads to more informed student success models	so that I can identify existing and/or predict future individual students or student populations in need of intervention and identify existing and/or predict future courses, departments, or other divisions in need of improvement.		1
90	As an institutional researcher,	I want to know whether and to what degree librarian interactions with identified at-risk student populations	influence their short- or long-term student success	so that I can facilitate connections with librarians and improve student outcomes.		1
91	As a senior institutional leader,	I want to know whether (which) library expenditures	impact student success measures, faculty research productivity, faculty grant productivity, institutional brand/image/prestige, institutional affordability, and/or institutional accreditation (*from Selena Killick: in UK, Teaching Excellence Framework - national audit)	so that I can make resource decisions that will maximize institutional outcomes.		1+
92	As faculty, *from Laurie Alexander	I want to know whether the inclusion of library resources in student assignment requirements	impacts student learning outcomes	so that I can make informed instructional choices regarding library resources when designing course assignments.		

#	AS [stakeholder],	I WANT [to be able to do an activity, to have an awareness, to take an action].		IN ORDER TO [achieve outcome, solve problem, meet need].	POTENTIAL IMPACT LEVEL ■ high ■ mid ■ low ■ no response n=15	RANK
93	As an institutional leader, *from Steve Hiller	I want to know how academic support services (advising, library, tutoring, writing support, labs, learning technology, etc.)	contribute to student success measures	so that I can better understand the effectiveness of each and make informed resource decisions.		
94	As an institutional leader, *from Steve Hiller	I want to know how academic support services (advising, library, tutoring, writing support, labs, learning technology, etc.)	contribute to student engagement measures	so that I can better understand the effectiveness of each and make informed resource decisions.		
95	As an institutional leader, *from Steve Hiller	I want to know how research support services	contribute to research and scholarship productivity	so that I can make resource decisions that will maximize institutional outcomes.		

4.2 Top Ranked Library Data User Stories

LIILA participants ranked each of the preceding user stories on a scale of from "low" potential impact to "high" potential impact with one midpoint ("middle" potential impact) and a non-response option. Responses were weighted and averaged, then clustered around ranks (1=high impact, 5=low impact). The most highly ranked user stories were marked with the notation 1+.

The most highly ranked (1+) user stories were clustered for clarity into 14 collapsed concepts, presented below in order of perceived impact.

IMPACT RANK	TOPIC	USER STORY	AS [stakeholder],	I WANT [to be able to do an activity, to have an awareness, to take an action].		IN ORDER TO [achieve outcome, solve problem, meet need].
1	Library Reference	#21	As a librarian,	I want to know whether students who interact with library reference services	attain more learning outcomes, earn better assignment or course grades, are more engaged, are retained, transfer successfully, graduate/ complete on time, get jobs, and/or earn more money	so that I can advocate for more (or more appropriate) reference resources, encourage more faculty and students to interact with reference librarians, and improve reference services.
2	Library Instruction	#22	As a librarian,	I want to know whether students who participate in library instruction	attain more learning outcomes, earn better assignment or course grades, are more engaged, are retained, transfer successfully, graduate/ complete on time, get jobs, and/or earn more money	so that I can advocate for more (or more appropriate) instruction resources, encourage more faculty and students to schedule/participate in library instruction, and improve library instructional services and decision-making.
		#23	As a librarian,	I want to know whether students who participate in particular, identifiable library instruction sessions	attain more learning outcomes, earn better assignment or course grades, are more engaged, are retained, transfer successfully, graduate/ complete on time, get jobs, and/or earn more money	so that I can advocate for more instruction resources and encourage more faculty and students to schedule/participate in library instruction, and improve library instructional services.

IMPACT RANK	TOPIC	USER STORY	AS [stakeholder],	I WANT [to be able to do an activity, to have an awareness, to take an action].		IN ORDER TO [achieve outcome, solve problem, meet need].
3	Library Resource Use, Part 1	#25	As a librarian,	I want to know whether students who take courses that require extensive use of library resources	have improved learning outcomes, GPA or test scores (CAAP, CLA, GRE, LSAT MCAT, MAPP), engagement indicators, semester-to-semester retention, transfer success, employment rates or earnings after graduation/ completion	so that I can advocate that faculty use more library resources in their courses, review and improve courses that should but do not use library resources, ensure maximum quality/match of library resources with library resource-intensive courses.
		#26	As a librarian,	I want to know whether students who take courses taught by faculty who have consulted with librarians on course/assignment design	have improved learning outcomes, GPA or test scores (CAAP, CLA, GRE, LSAT MCAT, MAPP), engagement indicators, semester-to-semester retention, transfer success, employment rates or earnings, after graduation/ completion	so that I can advocate that faculty consult with librarians in preparing their courses, figure out exactly what impactful contributions librarians are making to the courses, and ensure that all librarians are making impactful contributions in this context.
4	Library Resource Use, Part 2	#27	As a librarian,	I want to know whether the amount, degree, or relative rank of student library resource use or other library participation	impacts learning outcomes attainment, assignment or course grades, GPA or test scores, engagement indicators, and/or semester-to-semester retention, transfer success, employment rates or earnings after graduation/ completion	so that I can encourage faculty to require use of more library resources in their teaching content and assignment design, and encourage students to increase their library resource use.
		#67	As faculty,	I want to know whether my students who use (more) library resources are getting better grades on assignments or in my course	so that I can encourage more students to increase their library resource use.	

IMPACT RANK	TOPIC	USER STORY	AS [stakeholder],	I WANT [to be able to do an activity, to have an awareness, to take an action].		IN ORDER TO [achieve outcome, solve problem, meet need].
5	Student Demographics	#51	As a librarian,	I want to know whether any relationships between the use of library services/ resources and institutional outcomes (described in other user stories above)	vary by student population/ status/characteristics	so that I can tailor library services/ resources to meet the needs of populations with specialized needs and engage in appropriate instruction, outreach, etc. and help the institution prepare for changing student demographics.
		#90	As an institutional researcher,	I want to know whether and to what degree librarian interactions with identified at-risk student populations	influence their short- or long-term student success	so that I can facilitate connections with librarians and improve student outcomes.
6	Assignment-Level Learning Outcomes	#52	As a librarian,	I want to know whether any relationships between the use of library services/resources and institutional outcomes (described in other user stories above)	impact learning outcomes attainment assessed at the assignment level (or some other more granular level that may actually get at learning directly) Learning outcomes might include: • Locating, evaluating, using information • Thinking critically, analytically • Analyzing, solving problems • Applying information skills to the real world • Disciplinary information skills	so that I can tailor library services/ resources to maximize and facilitate student learning.
7	Library Expenditures	#91	As a senior institutional leader,	I want to know whether (which) library expenditures	impact student success measures, faculty research productivity, faculty grant productivity, institutional brand/image/prestige, institutional affordability, and/or institutional accreditation	so that I can make resource decisions that will maximize institutional outcomes.

IMPACT RANK	TOPIC	USER STORY	AS [stakeholder],	I WANT [to be able to do an activity, to have an awareness, to take an action].		IN ORDER TO [achieve outcome, solve problem, meet need].
8	Affordability	#9	As a student,	I want to know whether using resources provided by the library	will save me money on textbooks	so that I can afford to stay in school or accumulate less debt.
9	Library Space	#36	As a librarian,	I want to know whether students who spend (more) time in the library	attain more learning outcomes, earn better assignment or course grades, are more engaged, are retained, transfer successfully, graduate/ complete on time, get jobs, and/or earn more money	so that I can advocate for more library spaces, redesign the spaces we have, and encourage students to spend more time using the library facility.
		#37	As a librarian,	I want to know whether students who spend (more) time in the library	feel more engaged and included in student-to-student relationships, student-to-faculty relations, or other engagement measures	so that I can advocate for more library spaces, redesign the spaces we have, and encourage students to spend more time using the library facility.
		#38	As a librarian,	I want to know which library facilities (learning commons, group study rooms, etc.) are used by students	who attain more learning outcomes, earn better assignment or course grades, are more engaged, are retained, transfer successfully, graduate/ complete on time, get jobs, and/or earn more money	so that I can make better facility/space decisions, inform faculty of how library spaces are being used, and point students toward library spaces aligned with their needs.
		#39	As a librarian,	I want to know what students are doing in library facilities (learning commons, group study rooms, etc.) and whether those activities help students	attain more learning outcomes, earn better assignment or course grades, are more engaged, are retained, transfer successfully, graduate/ complete on time, get jobs, and/or earn more money	so that I can make better facility/space decisions, inform faculty of how library spaces are being used, and point students toward library spaces aligned with their needs.

IMPACT RANK	TOPIC	USER STORY	AS [stakeholder],	I WANT [to be able to do an activity, to have an awareness, to take an action].		IN ORDER TO [achieve outcome, solve problem, meet need].
10	Special Collections	#30	As a librarian,	I want to know whether students who engage with primary sources (archives, special collections, digitized collections, government documents)	attain more learning outcomes, earn better assignment or course grades, are more engaged, are retained, transfer successfully, graduate/ complete on time, get jobs, and/or earn more money	so that I can nudge more faculty to encourage student engagement with these resources in their courses, and grow more library instruction partnering with archives and special collections.
11	Library Outreach or Referrals	#80	As an academic advisor,	I want to know if students who are contacted by or referred to librarians for consultations or instruction	attain more learning outcomes, earn better assignment grades or course grades, are more engaged, are retained, graduate/ complete on time, etc.	so that I can make more referrals and get students the help they need.
12	Library Data & Success Models	#89	As an institutional researcher,	I want to know whether or the degree to which including library data in institutional learning analytics	leads to more informed student success models	so that I can identify existing and/or predict future individual students or student populations in need of intervention and identify existing and/or predict future courses, departments, or other divisions in need of improvement.
13	Library Guides & Tutorials	#50	As a librarian,	I want to know whether students who use library resource guides or library tutorials	complete assignments faster or earn better grades	so that I can assess and improve the quality of the library resource guides or tutorials to help more students save time and earn better grades.
14	Library Use vs. Non-Use	#57	As a librarian,	I want to identify students who don't use the library resources, skills or service	by any indicators/ characteristics	so that I can work with faculty/advisors to understand if there is a reason for the lack of student engagement with the library and to share with them the benefit the library could provide their students
		#66	As faculty,	I want to know whether my students are using library resources	so that I can counsel them to use more or better resources.	

5.0 OBSTACLES TO LIBRARY INTEGRATION IN LEARNING ANALYTICS

As with any new venture, the obstacles to library integration in learning analytics are multiple and significant. LIILA participants acknowledged a variety of barriers to library involvement in learning analytics such as:

- lack of awareness within the library community of learning analytics and the overall landscape of data-focused student success initiatives across higher education;
- a dearth of library financial, technical, and personnel resources with the capacity to engage in learning analytics work;
- institutional perceptions of librarians as uninvolved in student learning and success efforts;
- institutional perceptions of library data as disconnected from and not contributing to understanding student learning and success priorities; and
- fear that data-driven investigation may show that libraries make little or no impact on student learning and success.

LIILA participants also observed a number of additional obstacles to library integration in learning analytics, including challenges associated with breaking new ground, privacy conundrums, data difficulties, organizational culture issues, and unrealistic expectations.

5.1 New Territory and New Roles

As higher education environments continue to move inexorably toward the use of learning analytics as a critical pathway to enhance and ensure student success, librarians must determine how to engage in institutional efforts to identify student trouble spots, share information with students, and intervene in order to improve student learning experiences and environments. This landscape seemed simpler to navigate in the past when the realm of possible use of data was more limited and professional choices were fewer. Now the terrain requires renewed consideration. Given the advent of expanding data capture potential and the increasing need to support students in enrolling in, persisting through, learning throughout, and completing their higher education careers, librarians can revisit long-held beliefs that are entrenched in the practice of librarianship. Librarians can also consider unprecedented options to support institutional student success work, determine what libraries could or should contribute to the larger picture of student success at their institution, and envision the ways in which libraries could transform their services and resources to better meet student learning needs. Indeed, librarians have a unique opportunity to reimagine and reinvigorate their longstanding role as educators who contribute actively to the learning, engagement, and success of students at their institutions, individually and in aggregate. In short, learning analytics brings to the fore a potential conflict. When library and educational responsibilities appear in conflict, how can librarians chose to honor the values of both roles? And how might librarians who expand upon their educational mission navigate the historical conventions of the library profession?

Librarians have a unique opportunity to reimagine and reinvigorate their longstanding role as educators who contribute actively to the learning, engagement, and success of students at their institutions.

5.2 Privacy

As a profession, librarians have long espoused, upheld, and enacted privacy values and ethics as well as institutional or organizational policy or legal requirements. To avoid entanglement with privacy issues, librarians have entrenched practices of not recording, not maintaining, and/or actively destroying personally identifiable information. Any change in the practices involving gathering, saving, or sharing individual-level data requires thorough consideration and discussion of attendant risks. Personally identifiable information has value to the individuals who generate it, those who maintain it, and others who may use it. Because anything of value may be misused or misappropriated, it is reasonable to be concerned that bad things could happen if individual-level data is improperly secured technically and physically, not protected by policy, bereft of an appropriate governance structure, or otherwise mismanaged or mishandled. Daily news stories underscore the consequences of poor data stewardship. The potential for data insecurity should raise concerns and inspire judicious use of data, but one must also guard against unreasoned responses; rather, it is through clear-headed discussion and debate that risks can be identified and ameliorated.

Indeed, librarians can mitigate many potential data risks associated with learning analytics through education and exchange of information. By learning more about the issues involved in learning analytics data use, librarians can engage in productive discussions about potential risks. Areas for education and dialogue include: 1) anonymity, confidentiality and privacy; 2) personally identifiable information; 3) data privacy and security; 4) opt-in and opt-out choices; 5) institutional data sharing and storage; and 6) risk mitigation practices.

5.2.1 Anonymity, Confidentiality, and Privacy

Librarians often equate anonymity, confidentiality, and privacy, which are not equivalent concepts; knowing more about the differences among these concepts is empowering and essential for meaningful ongoing conversations about library involvement in learning analytics.[49] Questions that can inspire dialogue in this area include:

- What policies, statements, or requirements are relevant to discussions and decision-making with regards to confidentiality and privacy?
    - At the library level?
    - At the professional association level?
    - At an institutional level?
    - At a governmental level?
- Do these policies, statements, requirements, or statutes require re-examination or updating? What elements are timeless?

5.2.2 Personally Identifiable Information

Librarians can learn more about personally identifiable information that is already recorded, maintained, or not actively destroyed by library facilities, practices, and systems, as well as library vendor systems. Knowing more about the status quo enables librarians to have more informed conversations about the future. Questions that can inspire dialogue in this area include:

- What data is being collected?
- How long is collected data retained?
- How secure are the underlying systems in which data is maintained?
- What known vulnerabilities exist in the systems that maintain data?
- How are permissions handled and who has (what level of) access to these systems?
- Are there differences between the stated goals of learning analytics and real-world practice?
- Are the practices and policies with regard to the gathering, use, and retention of personally identifiable information shared with the public in a transparent manner?
- How is data in vendor-controlled systems negotiated? Who owns it? Who has access to it? Are there additional costs associated with access or analysis?

Librarians can also consider what personally identifiable information may be recorded, maintained, or not actively destroyed by library facilities, practices, and systems, as well as vendor systems, in the future. If librarians wish to learn more about user behavior and plan to collect new or different data in order to do so, librarians should also consider:

- What problems need to be solved? What research questions need to be answered? What data would librarians need to solve those problems or answer those questions?
- How granular and identifiable might that data need to be? For example, do librarians need to know *that* a user accessed a library resource, service, or facility? Or do librarians need to know the specifics of that access (resource type? subject? title?), detailed information about a service transaction, or the precise time or place of facility use?

5.2.3 Data Privacy and Security

Librarians can gain more information about how their institutions address data privacy and security issues. Questions that can inspire dialogue in this area include:

- What data is the overarching institution, or individual units within the institution, maintaining?
- What systems are included?
- What policies are involved?
- What practices are employed?
- What safeguards are present?
- What governance structures are in place? Who controls collected data? Who is responsible for decision-making with regard to the gathering, use, and retention of data?
- Who has access to the data? What is the process for others to gain access?

5.2.4 Opt-In and Opt-Out

Librarians can update their awareness of informed consent and the possibility of opt-in or opt-out choices. Frequently, institutional data defaults to a required opt-in in order to engage in institutional systems, and at many institutions all data is used for analysis, regardless of whether students opt-out or not. At other institutions, students can opt-out of human subjects research. Educational technology systems (including library vendor systems) may also be impacted by General Data Protection Regulation (GDPR) in the European Union. An institution-by-institution and/or system-by-system analysis is required to understand this quickly changing area of practice.

5.2.5 Institutional Data Sharing and Storage

Librarians can also weigh the advantages and disadvantages of integrating library data in a larger institutional context, record store, or system versus maintaining the data within the library organization. Questions that can inspire dialogue in this area include:

- What library data can help complete an institutional picture of student learning and success?
- What data is relevant at the library level but may not be significant at the institutional level?
- What benefits can the inclusion of library data at the institutional level provide to student learning and success? Are there other advantages to consider?
- What disadvantages might occur as a result of including library data at the institutional level?
- What access controls does the library possess in terms of controlling the visibility and use of library data at the institutional level?
- Which entity has more robust data security and/or policy protections, the library or the institution?

5.2.6 Risk Mitigation Practices

Librarians who are well-versed privacy issues generally and within the context of their institutions can engage in a range of privacy-focused practices to mitigate risks. LIILA participants developed an initial list of potential practices to reflect upon, which are organized below into three categories: 1) investigating current practices, embracing transparency, and educating others; 2) increasing connections and engagement at the institutional level; and 3) being parsimonious with any library data under consideration for inclusion in learning analytics.

Investigate Current Practices, Be Transparent, and Educate Others

- Investigate current data collection, use, security, and retention policies and real world practices within the library and among systems used by the library (i.e. campus-based, vendor-controlled).
- Uncover default settings in systems used by the library. What data is automatically logged? Are systems opt-in or opt-out by default? What happens to data if a user opts-out?
- Craft transparent statements about library data collection, use, and retention for students and other library users. Provide rationales for data use. Ensure that the statements are accurate, understandable, and findable.
- Educate students and other stakeholders (e.g., parents, faculty) about institutional data collection, use, security, and retention.

Become Connected and Engaged at the Institutional Level

- Become involved in data governance at an institutional level.
- Examine and/or improve institutional policies around the ethical collection, use, and retention of data.
- Discover practices used by other institutional units engaged in collection, use, and retention of data with special attention to those with similar privacy concerns, such as student counseling services and student health services.
- Investigate access to institutional data warehouses and library data storage. Who has access? At what levels? Are best practices and policies followed? Are improvements or changes needed?
- Develop shared requirements for vendor licenses and advocate for their use across institutions.

Be Parsimonious with Library Data

- Consider the level of granularity required for any library data shared at the institutional level.
- Be parsimonious.
    - What is the minimum necessary specificity, amount, or type of data needed to solve problems, answer questions, empower students, support institutional student learning and success initiatives, etc.?
    - Are specific details related to student-library interactions important and necessary to support student learning and success? If so, which ones?
    - If student-interaction details are unimportant or unnecessary, how can they be removed from data collection?

5.3 Data Quality

In addition to the risks associated with collecting, storing, and using individual-level data are issues of ensuring data quality. First, there are a number of dimensions of data quality, all of which should be considered and evaluated when considering data for inclusion in a learning analytics context. In order to draw relevant, timely, accurate conclusions about student learning and success, one should start with data that is complete, credible, appropriate in volume, accurate, unbiased, relevant, reliable, timely, and comprehensible.[50] One of the most important criteria for data quality on this list, completeness, is particularly important in the context of learning analytics. Data completeness refers to "the extent to which information is not missing and is of sufficient breadth and depth for the task at hand."[51] Institutional learning analytics efforts that omit library data from their analyses are inherently lacking in this criterion. If one accepts that academic libraries contribute to student learning and success, then an analysis of student learning and success, along with its facilitators and inhibitors, should include library data or else fall short on this important hallmark of data quality.

Data quality hurdles can also emerge from the systems used to analyze data. For example, the models and algorithms used in learning analytics systems may be closed, rendering them opaque to the institutions using them, potentially leading to inaccurate or misleading patters or misclassifications, and possibly misrepresenting small cohorts of students.[52] In order to enact the effective use of library data in learning analytics, issues of data quality must be scrutinized and addressed.

5.4 Data Granularity

Another obstacle to successful integration in institutional learning analytics is data granularity. Like other forms of higher education assessment, learning analytics tends to rely on large-grained metrics to gauge success like attendance, engagement, persistence/retention, completion/graduation, course or cumulative grades, and other surrogates for student learning that can be easily captured but may be several steps removed from assessment of learning. Learning analytics systems use these metrics to determine when students may be struggling and prompt educators to initiate an interaction or intervention. Thus, these metrics serve as a first step towards understanding student success and appear to be sufficient, even at this rudimentary level, to spur interventions, initiate interactions, make connections, and develop relationships that support student learning. Even so, the lack of granularity and refinement of these guiding metrics lays learning analytics open to criticisms that the approach rejects deep understanding of student learning, development, or other values. It is true that these success measures are easy to capture and track; it is likewise true that they do not assess student learning in a detailed way. Even so, students do not benefit from higher education learning experiences unless they are enrolled and in attendance. Students do not gain the advantages of a certification or degree unless they complete their programs. And students who do not earn their credentials can be thwarted from achieving their goals, including their advancement through meaningful and rewarding career progression and ability to repay the debts incurred to participate in higher education in the first place. Undeniably, students do not go to college to be unsupported, fail, drop out, and incur debt for no return on their investment.[53] For these reasons, large-grained success measures are the focus of national dialogue in higher education circles and often come under institutional and governmental scrutiny. There is indeed a danger inherent in focusing exclusively on these metrics; assessment of learning can be eclipsed by this pursuit of metrics if these measures are allowed to remain the only focus and hallmark of success, rather than part of a multi-pronged effort to solve real student learning and success problems. Therefore, the fact that learning analytics currently emphasizes large-grained success metrics is a worthwhile area of discussion and deliberation by librarians seeking to determine library engagement with learning analytics. At the same time, librarians should also consider that: 1) the focus on large-grained success metrics may be a by-product of this early stage of learning analytics development rather than a permanent condition of the approach; and 2) detailed assessment of learning is possible if learning analytics systems have access to more and different data, much of which is currently available in learning management systems but not yet tapped by learning analytics systems.

5.5 Data Access

An additional significant challenge to successful integration in institutional learning analytics is data access. Throughout higher education, data is housed in a variety of silos. Relevant data for learning analytics initiatives may be included in student information systems; learning management systems; other educational technology systems including video-streaming and web-conference tools; surveys tools; co-curricular and extracurricular involvement systems; and other systems. Some systems are home grown, some are externally-supplied but locally maintained, and some exist separately from the institutions whose users participate in them, including publisher and other vendor systems. One obstacle to library integration in institutional learning analytics is the existence of silos within library-operated systems, such as an integrated library system. An even more challenging obstacle to library involvement with learning analytics is the challenge of gaining access to data housed in vendor-controlled systems.

Library vendors maintain vast amounts of data about users and their access to resources, but many (or most) libraries do not have easy access to that data. For example, if librarians want to understand the ways in which student interactions with library resources connect to student learning and success, they may require a deeper understanding of student use of resources housed in vendor-supplied databases. However, many librarians do not have access to detailed data related to student use of resources and perceive that information to be difficult to obtain. LIILA participants generated a number of actions library vendor partners could take in order to support and participate in the inclusion of library data in learning analytics:

- Cede or share ownership of data with libraries and/or institutions.
- Provide access to data to libraries and/or institutions.
- Develop tools for data capture.
- Experiment with data formats to meet library and institution needs.
- Develop tools for data query.
- Provide dashboards and visualizations to facilitate understanding and use of data.
- Develop tools for data export, transformation, and loading (ETL).
- Instrument data integration with other applications; develop and adopt standards, including interoperability standards.
- Investigate, in cooperation with libraries, data points of significance.
- Define a consistent set of data relevant to student learning and success efforts.
- Develop a common set of best practices for collaborating with library on data and learning analytics.
- Commit to compliance with institutional, local, state,[54] national, and international guidelines and statutes.

LIILA participants also identified a variety of challenges that may hinder library vendor partners from enacting these actions. Several of these actions are complex. Vendors would have to understand what their libraries want and need (and why), overcome library mistrust of profit-related motives, (re)negotiate ownership and access to data, reposition some aspects of organizational culture, acquire tolerance for experimentation, build capacity in analytics, adopt interoperability or other standards, and determine how to monetize and/or productize their work. And ultimately, vendors would need to assess their return-on-investment for these actions and weigh the degree to which libraries may be willing to pay for information for student learning and success support.

At the same time, vendor partners are cognizant of the increasing need for higher education to demonstrate a return-on-investment for rising student costs, the student completion and debt crises, and the emphasis on higher education evidence-based and data-driven practices, assessment, and analytics. They are aware of the movement toward growing expectations for data access; face increasing requirements from coalitions, consortia, and partnerships; and wish to avoid comparisons with big data "bad actors" frequently in the news. These trends, taken together with emergent interoperability standards, recognition that libraries need to demonstrate their value, and desire to create success stories, all underscore reasons why vendors may want to partner with libraries seeking to use data to support student learning and success.

5.6 Organizational Culture

Organizational culture within a library or its overarching institution can be a major obstacle to learning analytics efforts. Librarians interested in learning analytics can learn more about its acceptance and maturity within the context of their institutional culture; they can begin by investigating how learning analytics is defined and deployed at their institution, how it is managed, and most importantly, how it is used to make decisions and take actions in support of student learning and success.

The use of learning analytics in higher education is a rapidly changing field. Like any new field, learning analytics is finding both its footing and its flaws. And, like any kind of educational research or assessment, learning analytics cannot wipe away larger organizational culture issues. Indeed, institutions that do not have a culture of data-driven decision-making may not have the policies, practices, or resources to enact data gained from learning analytics efforts. Institutions that have experienced poorly conceived or executed assessment programs in the past may have developed a culture that is pessimistic, disbelieving, or "burnt out" on any data focused on student learning and success; such institutions are unlikely to embrace learning analytics. And institutions that have cultures that claim interest in student learning and success data but fail to act on that data (due to lack of administrative support, stakeholder buy-in, or insufficient resources to enact policies, processes, systems, and interventions, etc.) are likely to encounter challenges in realizing the benefits of learning analytics efforts. Like any assessment effort, learning analytics initiatives that do not quickly and demonstrably result in visible improvements for students are unlikely to gain traction and realize their full potential to make significant change in the lives of students.

In addition to investing time in understanding the organizational context for learning analytics within their institutions, librarians should also gauge the organizational maturity within libraries for learning analytics (see Figure 9) as well as engage in discussions about the intent and impetus for library assessment of learning generally and library involvement in learning analytics specifically. Engagement in critical reflection and assessment is the hallmark of a professional, caring, responsible educator. Librarians have embraced the importance of assessment as a way to continuously improve their instruction and expand the benefit students derive from engaging in information literacy and other library instruction initiatives. Over time, librarians have also recognized that no single assessment strategy is a panacea; all assessment approaches have strengths and weaknesses.

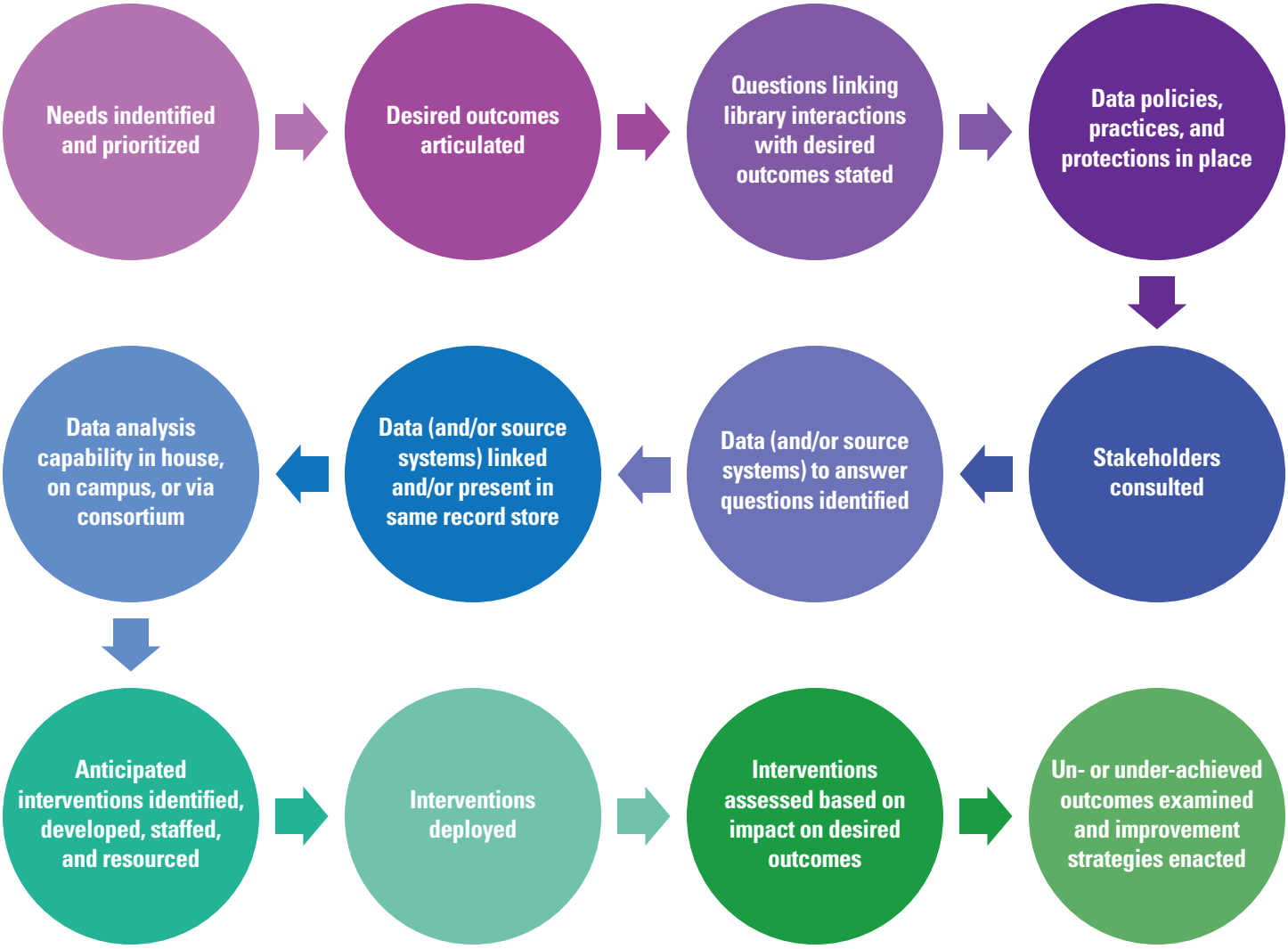


Figure 9. Library Integration in Learning Analytics Maturity Model

5.7 Expecting a Panacea for Library Value Advocacy

Librarians who seek to demonstrate library value and advocate for their libraries may view learning analytics as a panacea. There are a number of risks associated with that perspective. First, there is no one way to explore or express the contributions academic libraries make to student learning. Academic library value in the context of student learning can—and should—be discovered, documented, and communicated by using a variety of methods including existing assessment tools including surveys, tests, performance-based, and ethnographic approaches; use metrics; return-on-investment analyses; satisfaction and service quality measures; and so on.[55] To understand and explore any research question, the use of multiple, mixed methods is a best practice. Academic library value questions[56] are no different, and a learning analytics approach should not be viewed as a unilateral solution to open questions of library impact and value.

The search for library value should not eclipse the effort to *increase* library value for students.

Second, librarians may find it helpful to remind themselves that the search for library value should not eclipse the effort to *increase* library value for students. In other words, a focus on documenting the contribution of the library to student success is not the end goal; rather the intent and result of such work should be on improving student experiences and engagement, increasing and expanding meaningful student learning and development, and informing library decision-making in order to enact more meaningful, impactful, and rewarding student-library interactions.[57] Furthermore, librarians seeking to establish definitive, causative relationships between librarian interactions and student learning and success are unlikely to find quick and easy answers through engagement in learning analytics. Current learning analytics systems are built on correlations, not causations.[58] The key goal of correlational research is to explore student behaviors that correlate with success outcomes in order to uncover the elements of success for students who are struggling. If educators can determine which behaviors make a difference in the lives of students who are engaged in learning and able to achieve success, then they can inform, empower, and encourage other students to embrace those same behaviors and, as a result, those students can learn and attain goals as well. Through its potential to unlock the keys to success, learning analytics may help all students, including or especially those who do not have other pathways to access success formulas, such as first-generation students, community college students, students of diverse backgrounds, students with disabilities, and veterans. If indeed learning analytics can reveal behaviors that lead to student success and make significant impacts in the lives of students —helping them learn, develop, persist, complete/graduate, secure employment, or avoid debt—educators may have an ethical responsibility to pursue and act on those findings, and neglecting the opportunity to support students in this way may be difficult to defend. If librarians can contribute to the effort to help students, is it their ethical obligation to do so? Librarians discussing this question will likely find themselves facing a second question: When the mission, ethics, and historical practices of librarians seem to clash with the goals, values, and responsibilities of librarians as educators, how can librarians find ways to meet the obligations of both in order to best support the students they serve?

If librarians can contribute to the effort to help students, is it their ethical obligation to do so?

5.8 A Balancing Act

All of these obstacles are real and non-trivial. So too are the problems of students lacking the support the need to learn and succeed. As in all things, a balancing of risk and reward is necessary. Inaction is easy to understand. Change is hard; uncertainty is uncomfortable; and the development and deployment of new technologies and capabilities require revisiting long-held beliefs and re-envisioning what student learning and success support could look like. At the same time, exploring new ideas and engaging in free and frank discussion about what options are possible and desirable is necessary to move forward in ways that align with professional values and support student learning and success.

6.0 NEXT STEPS

Learning analytics efforts seeking to investigate and support student learning and success are proliferating across the higher education landscape. In response, librarians can choose among a wide variety of actions, ranging from inaction to accelerated engagement. In the case of learning analytics, "doing nothing" is an understandably alluring path forward. It seems easier, in what is clearly controversial territory, to avoid or resist the issue and continue with the status quo. In contrast, taking any "next steps" in library involvement in institutional learning analytics is obviously difficult, both culturally and technically.

Learning analytics raises questions about the role of academic librarians, their involvement in teaching and learning efforts, and their responsibility for contributing to student learning and success.

In terms of library culture, learning analytics raises questions about the role of academic librarians, their involvement in teaching and learning efforts, and their responsibility for contributing to student learning and success. Are librarians insiders, privy to the learning struggles and successes of students in their institutions? Do they share same the sacred trust upon which a teacher-student relationship is based? Do they need to know what students are learning, where students encounter troublespots along the learning journey, and how students can be best supported along that journey in order to do their jobs as librarians—or perhaps in order to do the jobs they *could* be doing if they had more information about teaching and learning at their institutions? Alternatively, should librarians stay at arm's length, gaining limited glimpses of the teaching and learning process, remaining isolated from the specifics of student challenges, and using a "best guess with limited information" approach in determining the most effective ways to support student learning? Can librarians be full educational partners without a thorough understanding of what students experience in their learning journey, the obstacles they encounter, and the strategies they employ to achieve success in the face of hurdles? Do librarians require detailed information in order to conceive and develop learning and success supports for students? Can they reach, engage, and empower students—particularly those who need it the most—without the awareness, knowledge, and evidence that more detailed information can provide?

Certainly, asking and answering these questions shifts the academic library profession onto new ground culturally—not only new territory concerning expectations of a librarian in the realm of teaching and learning—but also new fronts with regard to privacy, the use of individual-level data, relationships with vendors and the ownership and access to vendor-controlled data, and the development and maintenance of institutional partnerships focused on understanding and supporting student learning and success. Many librarians may feel that the tradeoff, i.e., collecting and using more data to improve support of student learning and success, is not worth the attendant risks. And so, the profession should explore these cultural issues. Is collecting individual data about library interactions worth it? Will increased information about student learning experiences, challenges, and successes enable librarians to provide increased support? Will providing students with information about their library interaction behaviors enable them to make informed choices about their future actions and increase their ability to learn and achieve their goals? Will joining institutional efforts to use data to bolster student learning and success benefit all stakeholders? Will stakeholders use the information gleaned to make decisions and take actions to improve the student learning journey? And can librarians learn from others to accurately identify and effectively mitigate the risks associated with this work?

In addition to the challenge of these cultural issues and questions facing the academic library profession, there are also technical barriers to overcome. Wrangling technology is difficult and library integration into learning analytics would require librarians to identify library data that is relevant and useful in understanding student learning and success obstacles and facilitators, identify the sources of that data (or if that data is not currently available, consider how to instrument it), connect data sources (across library, vendor, and institutional silos), maintain the data in record stores, and analyze and communicate the data to enable its use in decision-making and action-taking. While far from insurmountable, these technical challenges exist, and it would be easier to do nothing than to take on this work.

But at what cost? A central open question for the profession, and one that deserves rigorous discussion, is not only what are the difficulties and potential pitfalls of integrating library data into institutional learning analytics, but what are the costs—to students—if the profession does nothing? What will librarians not discover about how libraries can support student learning and success? What will librarians not do to inform and empower students with information about how their actions and behaviors with regard to library interactions can help them help themselves? What library services, resources, or facilities will not be improved, expanded, or adequately resourced if librarians lack the data and evidence to enact those changes? What voices will not be heard at the institutional level if libraries are not present in the larger conversation around learning analytics and student learning and success? If librarians do nothing with regard to learning analytics, it seems likely that there will be a cost to that decision.

If, on the other hand, librarians determine that library integration into institutional learning analytics is worth investigating and exploring, what are some of the possible next steps? Librarians may choose to: 1) increase awareness and deepen professional discussion on this topic; 2) be informed and forthright about current data practices; 3) communicate and negotiate with vendor and institutional partners; 4) situate learning analytics among other assessment approaches; 5) engage the learning analytics conversation at the institutional level; 6) identify and analyze questions or problems meriting a learning analytics approach; 7) envision library data contributions; 8) explore interoperability standards;[59] 9) identify key user stories; and 10) pursue pilot studies (see Figure 10).

Increase Professional Awareness and Discussion

- Seek out readings, conferences, and other opportunities to learn about learning analytics.
- Connect with other librarians to discuss the role of the library in learning analytics.
- Invite stakeholders including students and faculty to engage in conversations about library involvment in learning analytics.

Be Informed and Forthright about Current Data Practices

- Investigate library systems to determine how data is gathered, maintained, secured, stored, and used.
- Investigate partner systems connected to the library (i.e. institutional, vendor) to determine how data is gathered, maintained, secured, stored, and used.
- Determine whether opt-in and opt-out choices are available and how data generated in each category is utilized.
- Be transparent about data gathering, maintenance, security, storage, and use and communicate rationales for data use.

Communicate and Negotiate with Vendor and Institutional Partners

- Determine who owns or has access rights to data maintained in vendor and institutional systems.
- Work with local procurement officer(s) to ensure that data ownership and access rights are part of contract negotiations.

Situate Learning Analytics among Other Assessment Approaches

- Recognize that learning analytics is one tool for assessing student learning and success and identifying ways to support students in achieving their goals.
- Acknowledge the strengths and weaknesses of all assessment approaches and pursue the approach that best fits the problems to solve, questions to answer, and students to support.

Engage the Learning Analytics Conversation at the Institutional Level

- Connect with learning analytics personnel, committees, and systems at the institutional level.
- Contribute librarian knowledge, skills, abilities, and values to institutional learning analytics efforts.

Identify and Analyze Questions or Problems Meriting a Learning Analytics Approach

- Identify the issues, interests, areas of concern, and other priorities appropriate for investigating via learning analytics.
- Identify and prioritize stakeholder groups that can most benefit from learning analytics inquiry.

Envision Library Data Contributions

- Identify library services, areas of expertise, resources, or facilities are most likely to contribute to student learning and success.
- Inventory the data emitted from the library services, areas of expertise, resources, or facilities most likely to contribute to student learning and success.
- Imagine data that may be instrumented and collected from impactful library services, areas of expertise, resources, or facilities.

Explore Interoperability Standards

- Consider ways to link data "silos" using interoperability standards.

Identify Key User Stories

- Prioritize library and learning analytics user stories likely to result in contributions to student learning and success.
- Develop prioritized user stories into detailed use cases.

Pursue Pilot Studies

- Develop pilot studies to investigate the feasibility and usability of highly ranked user stories and use cases.

Figure 10. Possible Next Steps for Library Integration into Institutional Learning Analytics

7.0 "WE NEED TO TALK": DISCUSSION QUESTIONS FOR MOVING FORWARD

As institutions of higher education commence and commit to learning analytics initiatives, it is time for librarians to determine whether (or to what degree) they will engage with institutional learning analytics tools, systems, and strategies as well. In order to determine the role of academic libraries in institutional learning analytics, librarians need to engage in dialogue.

Imagining new possibilities requires tolerance for discomfort; possible recognition of shortcomings in past practice; careful consideration of changing needs, environments, and roles; engagement in potentially emotional, disturbingly open-ended, determinedly civil, sometimes cyclical, ultimately (hopefully!) productive dialogue; and willingness to explore a positive future state that a change—carefully and intentionally designed—might usher in. While it is difficult to engage in such a process, librarians can—and should—participate in discussions of the benefits library involvement in learning analytics might offer students as well as the potential negative and unintended consequences of such work. It is only through discussing the promise and the pitfalls of library involvement in learning analytics that librarians can move forward productively.

The following question sets are provided to stimulate discussion.

7.1 Getting Started

- What are the problems you (as librarians, as members of a library organization, as participants in an institutional community) are trying to solve?
- What are the questions that stakeholders have?
- What improvements, changes, or customizations could you make if you just knew more information about these problems and/or stakeholders?

7.2 Envisioning Library Integration into Institutional Learning Analytics

- What prior experiences, issues, concerns, expectations, and/or hopes do you have with regard to library integration in learning analytics?
- Imagine library data was integrated into learning analytics systems at the institutional level. How might that result in improvements to student learning and success?
- What unmet student success needs can be fulfilled by the inclusion of library data in learning analytics initiatives?
- What value do you imagine the inclusion of library data might offer to students, faculty, and other institutional stakeholders?
- How do you envision librarian roles evolving as more institutions (and perhaps libraries) advance in their learning analytics efforts?
- What interesting cases of libraries participating in learning analytics initiatives are you aware of? What do you know about these early adopters?
- What is your vision of the role of libraries in institutional learning analytics initiatives?
- Other than the inclusion of library data into learning analytics initiatives, in what other ways might libraries become integrated into the learning analytics efforts of their overarching institutions?
- What questions could the integration of library data into learning analytics answer?
- (How) could integrating library data into institutional learning analytics (enable the library to) help students learn more, better, faster?
- (How) could the integration of librarian into learning analytics help librarians intervene or improve to help students?

7.3 Understanding Learning Analytics at Your Institution

- Is your institutional culture supportive of data-driven decision making and continuous improvement?[60]
- How would you describe the activities, readiness, and/or maturity of learning analytics at your institution?
- Is your institution currently considering a learning analytics system? Has one been selected? Is one in use?
- How long is data from each relevant learning analytics system retained? What about the data feeder systems that contribute to the learning analytics system? What happens to historical data?
- How much coverage does each data feeder system provide? Who or what is omitted?
- Which potential data feeder systems can contribute information to the learning analytics system? Which data feeder systems comply with compatibility or interoperability standards? Which educational data feeder systems are "siloed" and therefore cannot make data available to the learning analytics system?
- What additional tools are necessary to support collection, description, analysis and reporting of data?
- Are there relevant institutional policies or local/state/federal laws about data protection that need to be considered? Are those protections in place?
- How can/do librarians participate in learning analytics discussions at the institutional level?
- How can/do librarians aid in the evaluation and selection of learning analytics systems?
- How can/do librarians engage in the creation of learning analytics policies and procedures?
- How can/do librarians help manage or curate learning analytics data?
- What permissions can/do librarians have in learning analytics systems?
- Will/does the library provide feeder data? Is the library ready to do so? What would/did it take to get ready?
- Will/does the library assist with interventions resulting from learning analytics processes? Is the library ready to do so? What would/did it take to get ready?

7.4 Engaging with this White Paper

- How is learning analytics like (and unlike) assessment efforts librarians have previously engaged in? What do those similarities and differences mean for library involvement in learning analytics?
- All assessment methods have strengths and weaknesses. What are the strengths and weaknesses of learning analytics as an assessment approach? How does learning analytics fill gaps left by other assessment methods? What assessment methods are needed to fill gaps left by learning analytics?
- Learning analytics is intended to help identify and predict student learning and success challenges, alert educators to trouble spots in educational contexts, and spur interventions for students to help them overcome obstacles to learning and success. What might learning analytics offer to student in terms of library interaction and engagement? What might learning analytics reveal to librarians?
- What problems might learning analytics solve at your institution (see Section 3.1)?
- What stakeholders might learning analytics support at your institution (see Section 3.1)?
- What questions might library integration into learning analytics answer at your institution (see Section 3.2)?

- How could library integration into learning analytics help students learn more, better, or faster (see Section 3.3)?
- What facilitators might encourage, ease, or support library integration into learning analytics at your institution (see Section 3.4)?
- What roles might librarians play in learning analytics at your institution (see Section 3.5)?
- Imagine scenarios in which library data might be gathered, maintained, and used to investigate student-library interactions that are common among successful students, communicate with students about which library engagement behaviors may enhance their learning and success, connect with institutional partners who likewise seek to support students, and determine ways in which this information can be used to improve and expand library interactions, connections, and relationships with students. What do those scenarios look like? You might consider 1) what librarians might want to know, 2) what that knowledge would help librarians do, and 3) what benefits this approach might offer to students (see Section 3.6).
- What data points are gathered, maintained, and used in your library and at your institution that could be put to use to uncover, understand, and enable support for student learning and success (see Section 3.7)? Do problems exist with this data? What problems are most significant?
- Which user stories do you believe should be prioritized for future work (see Sections 3.8-4.2)? What ideas, suggestions, hopes, or questions do you have about the pursuit of enacting these user stories?
- What are the most significant obstacles to library involvement in learning analytics (see Section 5.0)? How might they be overcome?
- What do you believe are the next logical steps for library involvement in learning analytics (see Section 6.0)?

Librarians engaging in discussions on the topic of library integration into learning analytics are likely to find themselves in uncharted and choppy waters, feeling challenged and uncomfortable. Nonetheless, librarians need to talk and engage around this topic. Data isn't going away. The need and responsibility to support student learning and success isn't going away. So measured, responsible, and productive dialogue is needed to decide on the best approach and future for library involvement in learning analytics. The LIILA project was intended to initiate and facilitate these discussions in order to usher in a new area of discourse for a profession dedicated to student learning and success.

8.0 ONES TO WATCH: DEVELOPMENTS IN THE INTEGRATION OF LIBRARIES IN LEARNING ANALYTICS

A number of projects involving libraries in learning analytics are well underway. The following summaries provide an entry point into understanding the pioneering work being conducted in this arena.

8.1 Jisc

In the UK, Jisc has been developing the Learner Analytics environment in partnership with a number of pilot institutions in both its Higher and Further (16 - 19 year-old) Education sectors. The project has been running since 2014 and has just completed. Learner Analytics is now part of Jisc's portfolio[1], offering a suite of services that deliver benefits both directly to the student as well as the institution.

Jisc has played a role in library data and analytics for a number of years, funding several projects dating back to 2011. Beginning with the Library Impact Data Project (LIDP) at the University of Huddersfield[2], and culminating in the Library Analytics and Metrics Project (LAMP), which explored the potential of a shared analytics service for UK academic libraries. Although the LAMP project did not continue due to its inability to support analytics at a national scale up, it none-the-less fed into Jisc's work around learner analytics, and the desire to provide the fullest picture of student engagement with the institution.

The University of Gloucestershire was one of the pilot institutions for Jisc's Learner Analytics project, seeing the potential to support key university aims around increasing student engagement and enhancing personalised support. Prior to this partnership, Jisc had focused on virtual learning environments and student record systems only for data sources. Gloucestershire, and its partnership with OCLC enabled Jisc to explore the potential of using library data for the first time.

With Gloucestershire's implementation of OCLC WorldShare Management Services (WMS) in 2017, and the willingness of OCLC to collaborate with the Learning Analytics project, Jisc had access to both circulation data and EZproxy logs for the first time. During the pilot, OCLC set up weekly data feeds from WMS for circulation data and daily data feeds from the hosted EZproxy logs for e-resource usage data and assisted Jisc with understanding the data sets and help convert the data into a standard learning analytics format. As well as capturing the raw data, the project also captured contextual information, including details of the user session to build up a picture of a student's engagement with the library, by monitoring the variety of resources accessed in a user session. With information from the university's student record system already in place, the library data was integrated to provide further insight to explore resource use by department or exploring demographic information.[3]

The pilot with Gloucestershire involving data from OCLC systems has helped Jisc to develop a standard process and creation of data structures that can process data for any WMS and EZproxy institution user. Testing and further development of both this process and the data is ongoing, including exploring journal and title level e-resource information (e.g. using EZpaarse).

1 Jisc (2018), "Learning analytics", available at: https://www.jisc.ac.uk/learning-analytics

2 Stone, G. & Collins, E. (2013), "Library usage and demographic characteristics of undergraduate students in a UK university", *Performance Measurement and Metrics*, Vol.14 No.1, pp. 25-35. Available at: http://dx.doi.org/10.1108/14678041311316112

3 OCLC (2018), "The University of Gloucestershire leads with learning analytics and shares insights", available at: https://www.oclc.org/content/dam/oclc/services/brochures/216089-WWBE_Gloucestershire-Case-Study.pdf

With the launch of Learner Analytics, the team want to focus on enhancing the Learning data hub with as much data from libraries as possible. Progress with OCLC has enabled Jisc to initiate conversations with other library system vendors not previously possible. In the fall of 2018, the team is targeting four institutions to cover two or three different systems vendors, including ExLibris. The intention being to enable to team to resolve any data issues that would ensure a smooth roll-out to other institutions in the future. Jisc is also exploring other types of data including gate entries and reading lists and is in conversation with a major reading list vendor in the UK.

To learn more about Jisc's analytics work, follow at https://libraryservices.jiscinvolve.org/wp/category/analytics/.

By Siobhan Burke

8.2 University of Gloucestershire

Jisc are investing over £1m on behalf of the UK Higher Education sector to develop an "off the shelf" learning analytics system. The University of Gloucestershire have been collaborating with them since 2015 and are one of the pathfinder institutions who have been piloting the Jisc learning analytics products. This is the first time learning analytics has been deployed at a national level anywhere in the world.

The project objectives for Gloucestershire are:

- Enabling a self-help approach for students by sharing their learning data via an App
- Data visualisations for Personal Tutors to support timely interventions
- Using the data to inform module improvement process and developing tools/approaches that promote student engagement

More timely interventions by tutors, academic support teams, librarians and the student themselves can lead to better retention and have a positive impact on wellbeing.

There is also the opportunity to enhance learning gain by focussing on increasing student's engagement with their modules. This could be better attendance, more use of the Virtual Learning Environment or accessing more journal articles.

Jisc had been working with data feeds from virtual learning environments and student record systems but library data was always on the agenda to create a complete learning analytics solution. Lee Baylis, Senior Analytics Innovator at Jisc explains: "We knew that adding library data to learning analytics would move us forward, but we needed to work out how best to access library system outputs and work with the data."

Gloucestershire's relationship with OCLC brought daily EZ-proxy feeds into Jisc's data warehouse plus circulation data from the World Share Management platform. Recent library engagement additions have been visits to the physical library via security gate data and attendance at information skills sessions, utilising the check-in functionality within the Jisc Study Goal app.

A library engagement score is now one of the four key student engagement visualisations within the "Tutor Portal" dashboard. Descriptive parameters are currently creating RAG ratings for every student, but the next development will be a fully predictive model.

Learning analytics triggered interventions are now part of Gloucestershire's "business as usual" and embedded in academic policy. Student referrals to librarians for information literacy instruction are increasing every month to the point where we are considering additional staff resource and initiating a major project to create an e-tutorial hub.

Every library-based intervention is being recorded to enable a comprehensive assessment of impact. Of course, as the data set grows so the understanding of what works well and what needs development will grow. Equally within the wider context of student attainment, the library's role will be clearly evidenced.

One correlation currently under investigation is the characteristics of virtual learning environment course pages, engagement with those pages and student grades. Pages with embedded reading lists, librarian designed resource sections and embedded information skills tutorials appear to be contributing to student success, but far more research is required for a definitive conclusion.

Whatever the outcomes of this, the key achievement by the University of Gloucestershire is to have the library at the front and centre of learning analytics!

By James Hodgkin

8.3 DePaul University

DePaul University is a private, four-year university located in Chicago, Illinois. With two campuses in Chicago, as well as cohort programs pursued in collaboration with academic and corporate partners around the city, DePaul offered more than 300 academic programs across 10 schools and colleges to almost 23,000 students in 2017-18. DePaul maintains a historic commitment to providing access to higher education to underserved communities, and its student body is highly diverse, with almost 40% of its students coming from communities of color, one-third of its students being first-generation, and a substantial number of transfer students arriving each year from community colleges and other institutions. During its most recent accreditation review by the Higher Learning Commission of the North Central Association, DePaul pursued a successful "Major Quality Initiative" defined by its commitment to "[focus] the entire university community on student learning and success."

In 2013, the DePaul University Library collaborated with partners in the Division of Academic Affairs and the Division of Student Affairs to create the "Richardson Library Learning Commons," a center for peer-to-peer tutoring and access to campus-wide learner support services, including the Writing Center, Career Center, STEM Tutoring Center, Office of Multicultural Student Services, Supplemental Instruction, and others. Working with representatives of these campus partners through a library-led advisory committee, librarians established common approaches to identifying key data points to be collected on student use of these services and integrating these data with data collected elsewhere on campus by individual programs. The Learning Commons was established as the first goal associated with the "Foundations for Success" initiatives developed in support of the "Major Quality Initiative" and more information is available at https://library.depaul.edu/get-help/Pages/learning-commons.aspx.

In 2016, library research services were added to learner support services available to DePaul faculty and academic advisors as a referral option through "BlueStar," a locally-branded version of the IPASS (integrated planning and advising for students) system provided by Starfish Retention Solutions. BlueStar and a complementary "student success" portal (https://resources.depaul.edu/student-success/) were designed to meet "Foundations for Success" initiatives promising to improve communication among student support offices and to provide integrated information about academic resources both to students and to their advisors.

In 2017, the library was established as a site within the campus installation of OrgSync, an "engagement analytics" platform for collecting data relevant to student engagement with co-curricular programs and learning outside of the classroom. A key component of DePaul's existing student affairs assessment program, OrgSync allows for a high-level view of the ways in which library spaces provide both a site for student engagement with the university and as a resource that may be employed by campus groups to promote learning in the co-curriculum and extra-curriculum. More information on student affairs assessment at DePaul is available at https://offices.depaul.edu/student-affairs/about/assessment/.

A pioneer in strategic enrollment management and the use of data to maximize opportunities for academic advising and engagement among students, faculty, librarians, and student affairs professionals in support of student learning and academic success, DePaul University was an early adopter of learning and engagement analytics programs that can also enhance the visibility of library services as a key contributor to student success and promote collaboration among campus colleagues whose programs also contribute to student success and learning outside the classroom. For more on library assessment at DePaul, see https://library.depaul.edu/about/about-the-library/assessment/.

By Scott Walter

8.4 Lewis & Clark Community College

Lewis & Clark Community College is a two-year higher education institution located in Godfrey, Illinois. Lewis & Clark has multiple campuses, a river research center, a humanities center, a training center, and Community Education Centers located throughout the more than 220,000-person college district that reaches into 7 counties in Southwestern Illinois. Unduplicated enrollment for academic year 2016-2017 was 7,673 students.

In 2014, Reid Library began systematically tracking students that visit the reference desk or attend a library instruction class in the library. After scanning a student ID and selecting the associated course using SARS TRAK - a check-in/check-out software platform - these data are sent to a Blackboard Analytics data warehouse. Student data regarding grades, enrollment, demographics, and other student-level information from the college's Student Information System (SIS) are merged with the tracking data imported from SARS TRAK within the data warehouse. A Pyramid Analytics reporting tool is then used to query the data warehouse for calculated student success measures based upon whether a student has visited the reference desk or attended a library instruction class.

It is important to note that the librarian asks for permission from the student to track his or her class attendance or reference visit. This is commonly known as a verbal informed consent. The librarian explains to the student that no content-level information will be recorded, only that they have either attended a library instruction class or visited the reference desk. The student is informed that the data will only be used for research purposes to better understand student success metrics, and that no personally identifiable information will ever be shared. Since the inception of this pilot in 2014, no student has ever declined to be tracked.

There are two dependent variables used in this research: 1) fall-to-fall retention and 2) student grades. When comparing fall-to-fall retention for all degree-seeking students, students that visit the reference desk or attend a library instruction class have a statistically higher rate of retention than students that do not visit the reference desk or attend a library instruction class. With respect to improved course grades, attendance in a library instruction class has not shown to be a statistically significant treatment. However, students that visit the reference desk do show statistically higher grades than those students in the same course that do not visit the reference desk.

In terms of new variables to track, a third variable – library circulation – was added in August of 2017. Each time a student checks-out an item, the student's record is retrieved in SARS TRAK and a flag is sent to the SIS showing that the student has circulated an item from the library. No content or item-level data are recorded, only that the event of an item being checked-out by the student has occurred. Retention and grade data for this third variable will be available in October of 2018.

by Dennis Krieb

8.5 University of Minnesota

Since 2011, the University of Minnesota Libraries have been gathering usage data in an attempt to tie library resource and service use to student success measures such as higher GPA, retention, and four year graduation rates. Every semester we collect usage data for approximately 15 different library engagement points, including digital/electronic material usage, online reference transactions, instruction sessions, circulation data, and library workstation usage. This data is gathered in a unique way in that personally identifiable information is only associated with broad categories of library use information. For example, we retain that student X viewed an "ejournal," but not the title of the ejournal or any specific article information. The data includes that student Y "loaned" an item, but not any item information. In this way we attempt to maintain an acceptable level of user privacy, while still gathering useful data for analysis.

In partnership with the University of Minnesota's Office of Institutional Research, and with Institutional Review Board approval, multiple studies have been conducted and published using this data. These studies highlight the correlation between library use and student success, and also demographic analysis of student library usage. Data has shown overall high usage of library resources and services by both undergraduate and graduate students. Approximately 80% of undergraduates and 85% of graduate students make use of the library in any given semester. Further statistical analysis of the data suggests first-time, first-year undergraduate students who use the library have a higher GPA for their first semester and higher retention from fall to spring than non-library users. Another study using data from a 4-year cohort of undergraduates demonstrates that using the library at least one time in the first year of enrollment significantly increased the odds that students would graduate in four years or remain enrolled after four years as opposed to withdrawing from the university. Finally, studies also suggest that populations such as Pell grant recipients, first generation college students, and students of color all have higher retention rates with library use. For more information on the University of Minnesota Libraries' student success research, please see http://z.umn.edu/ldsspubs.

Due in part to our work researching the connection between library use and student success measures, the University of Minnesota Libraries have been given a seat at the table in campus conversations around learning analytics. The University of Minnesota Libraries are helping shape decisions on campus around privacy, data security, and data use transparency. We are interested in exploring making library data available to learning analytics systems, but are currently investigating privacy, security, and ethical use implications, including the possibility of student opt-in/opt-out capabilities.

By Shane Nackerud and Jan Fransen

8.6 University of Michigan - Library Learning Analytics Project

The University of Michigan (U-M) received a three year IMLS grant ($495,280) to study how academic libraries impact learning (IMLS LG-96-18-0040-18). The project is lead by Dr. Felichism Kabo from the Institute for Social Research in collaboration with faculty and researchers from the U-M Library and the School of Information. The project is advised by an advisory group consisting of sixteen partner institutions comprised of a wide variety of types of libraries, including public, community, large, small, public and private.

Primary goals include understanding library impact on learning, especially in the area of course instruction, research and publication; and developing sharable tools, scripts and protocols based on principled engagement and professional agency. The project will use U-M campus and library data in order to prototype and pilot data collection, storage and analysis with the expectation that the tools developed will be made available to other libraries and institutions. The grant provides a framework for how libraries can create secure infrastructures (data repository, virtual enclave and dashboards) for this type of research.

The project will be modeling and analyzing both deidentified and identifiable library use data including: website server logs, library catalog server logs, proxy logs, circulation history and related data, and campus status and affiliation data. These datasets are linkable through various methods, including identifiers that are unique to each individual user, IP addresses, and timestamps. First, using de-identified data, the project will apply clustering algorithms to identify typologies of library users on the basis of library interactions e.g. user type A (high degree of use), user type B (low degree of use), etc. Second, the project aims to replicate the clustering analysis within the identified data, using the de-identified clustering findings as checks for robustness and accuracy. Third, the project will use clusters from identified data from the sequence mining to formulate predictive and prescriptive modeling of the links between learning outcomes and library user types. For privacy reasons, results will be shared using only aggregated and anonymized data.

This project will provide tools and examples for other libraries to adopt and make their own as they engage with learning analytics. It will develop strategies for balancing professional values such as security and privacy with the emerging domain of learning analytics. It will highlight opportunities for librarians to contribute to institutional learning analytics efforts in order to support campus- or community-wide learning activities.

To learn more about the project, follow https://libraryanalytics.org/ and on twitter.com/um_llap.

By Laurie Alexander, Maurice York, and Felichism Kabo

8.7 Data Doubles

Indiana University-Indianapolis (IUPUI) and research collaborators at the University of Wisconsin-Madison, the University of Wisconsin-Milwaukee, the University of Illinois at Chicago, Northwestern University, Oregon State University, Indiana University-Bloomington, and a site facilitator at Linn-Benton Community College received a three year IMLS grant ($514,484) to study student perspectives of privacy issues associated with academic library participation in learning analytics initiatives (IMLS LG-96-18-0044-18).

Very little research has addressed learning analytics and student privacy issues from a student perspective, and extant research suggests that the student voice is missing from learning analytics conversations. To the team's knowledge, no scholarship currently exists that specifically considers student perceptions of their privacy when libraries are actively leading or contributing to learning analytics initiatives. In fact, in Connaway et al.'s OCLC-sponsored study, the authors argue that "this topic is particularly fraught in the areas of assessment and academic libraries since there is a lack of established effective practices and standards addressing the methods and contexts that may threaten the privacy of students." Because of these indicators, the team plans to study library learning analytics and the privacy issues from a student perspective.

The team seeks to answer this overarching research question: How do learning analytics initiatives align with and run counter to student expectations of privacy; and with these insights, how might libraries maximize the benefits of learning analytics while respecting student expectations?

Three iterative research phases structure this project. During phase one, the research team will conduct preliminary interviews with students to identify themes about library participation in learning analytics and learning analytics generally with regard to privacy. During phase two, the research team will deploy a survey to undergraduate and graduate students at each researcher's respective institution. In the third and final phase, each team member will run a series of scenario-based focus groups with students to explore possible applications of learning analytics that respect and break expectations of privacy. All three phases will lead to peer-reviewed scholarship, practitioner-focused conference presentations, workshop materials, and a toolkit for informing library practitioners about student privacy and learning analytics.

For more information, follow the research team's progress at http://datadoubles.org.

By Kyle M. L. Jones

9.0 APPENDIX

9.1 Selected LIILA Meeting Handouts

LIILA Meeting 1 Agenda

For Everyone – Learning Analytics and Libraries

For Librarians – Learning Analytics on Your Campus

Beginning with the End in Mind

Problems, Needs, Aspirations

User Story to Use Case

Visioning of Library Integration into Institutional Learning Analytics

LIILA Meeting 2 Agenda

Data on Your Campus

Library Data Use Cases

Next Steps for Library Integration into Institutional Learning Analytics

LIILA Meeting 3 Agenda

Next Steps for Library Integration into Institutional Learning Analytics

Library Integration in Institutional Learning Analytics (LIILA)

EDUCAUSE

Friday, November 3, 2017

Rooms 407-408, Philadelphia Marriott Downtown

Agenda

8:00 a.m.	**Continental Breakfast (Optional)**
8:30 a.m.	**Welcome & Introductions**
9:00 a.m.	**Agenda, Orientation, & Goals for the Day**
9:15 a.m.	**Libraries, Student Success, & Learning Analytics**
9:45 a.m.	**Debrief of Learning Analytics at EDUCAUSE, Capture of Exemplar Projects**
10:30 a.m.	**User Stories Integrating Library & Institutional Data**
11:30 a.m.	**Lunch**
12:00 p.m.	**User Story Group Presentations**
1:00 p.m.	**Librarian Involvement in Institutional Learning Analytics**
1:30 p.m.	**Snack Break**
1:45 p.m.	**Visioning of Library Integration in Institutional Learning Analytics**
2: 45 p.m.	**Next Steps**
3:00 p.m.	**Adjourn**

INSTITUTE of Museum and Library SERVICES

This project was made possible in part by the Institute of Museum and Library Services LG-98-17-0019-17.

Name: _____

Institution: _____

For Everyone – Learning Analytics & Libraries

At EDUCAUSE, we'll kick LIILA off by engaging the question of what should or could be done in terms of integrating libraries into institutional learning analytics initiatives. To prepare for this discussion, please consider/respond to the following questions.

Before the conference:

1. How would you describe the activities, readiness, and/or maturity of learning analytics at your institution?

2. What prior experiences, issues, concerns, expectations, and/or hopes do you have with regard to library integration in learning analytics?

3. Imagine library data was integrated into learning analytics systems at the institutional level. How might that result in improvements to student learning and success?

4. What unmet student success needs can be fulfilled by the inclusion of library data in learning analytics initiatives?

5. What value do you imagine the inclusion of library data might offer to students, faculty, and other institutional stakeholders?

6. How do you envision librarian roles evolving as more institutions (and perhaps libraries) advance in their learning analytics efforts?

7. What interesting cases of libraries participating in learning analytics initiatives are you aware of? What do we know about these early adopters?*
   *Please add to this list, if possible, as you encounter examples during the EDUCAUSE conference.

8. What is your vision of the role of libraries in institutional learning analytics initiatives?

9. Other than the inclusion of library data into learning analytics initiatives, in what other ways might libraries become integrated into the learning analytics efforts of their overarching institutions?

Name: _____

Institution: _____

For Librarians – Learning Analytics on Your Campus

Start with an environmental scan of campus learning analytics readiness:

- Is your campus culture supportive of data-driven decision making and continuous improvement (Norris & Baer, 2013)?
- Is your campus currently considering a learning analytics system? Has one been selected? Is one in use?

If your institution is beginning to engage with learning analytics:

- How long is data from each relevant learning analytics system retained? What about the data feeder systems that contribute to the learning analytics system? What happens to historical data?
- How much coverage does each data feeder system provide? Who or what is omitted?
- Which potential data feeder systems can contribute information to the learning analytics system? Which data feeder systems comply with compatibility standards? Which educational data feeder systems are "siloed" and therefore cannot make data available to the learning analytics system?
- What additional tools are necessary to support collection, description, analysis and reporting of data?
- Are there relevant institutional policies or local/state/federal laws about data protection that need to be considered? Are those protections in place?

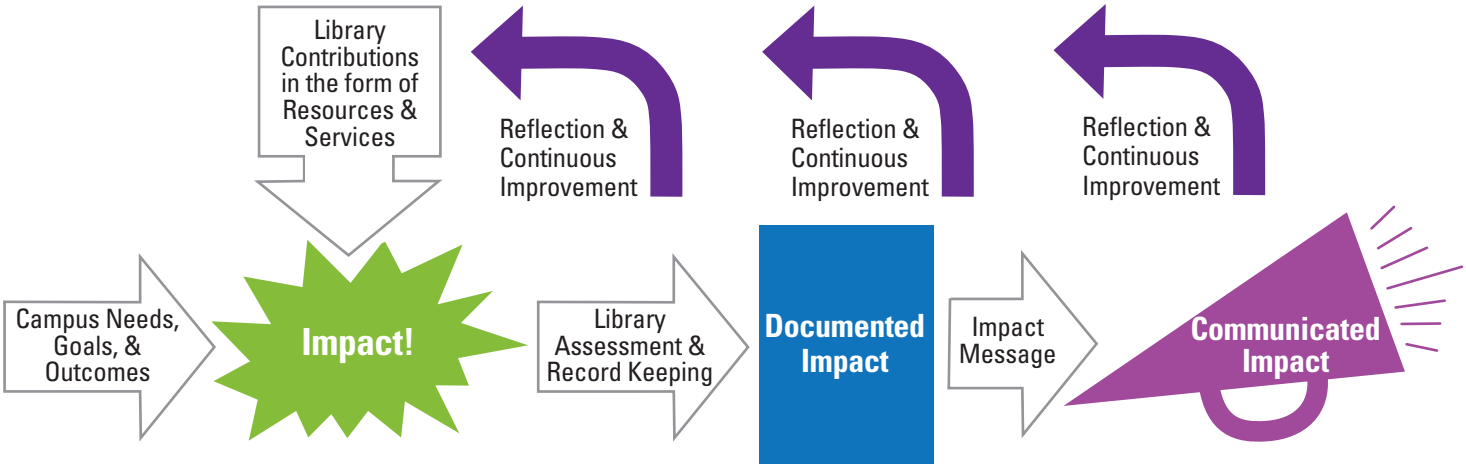
If your institution has committed to a learning analytics future:

- How can/do librarians participate in learning analytics discussions on campus?
- How can/do librarians aid in the evaluation and selection of learning analytics systems?
- How can/do librarians engage in the creation of learning analytics policies and procedures?
- How can/do librarians help manage or curate learning analytics data?
- What permissions can/do librarians have in learning analytics systems?
- Will/does the library provide feeder data? Is the library ready to do so? What would/did it take to get ready?
- Will/does the library assist with interventions resulting from learning analytics processes? Is the library ready to do so? What would/did it take to get ready?

Norris, D.M., & Baer, L., (2013, February). Building organizational capacity for analytics [White paper]. Retrieved from EDUCAUSE: https://net.educause.edu/ir/library/pdf/PUB9012.pdf

Beginning with the End in Mind

Start with problems, questions, needs, gaps…and aspirations.

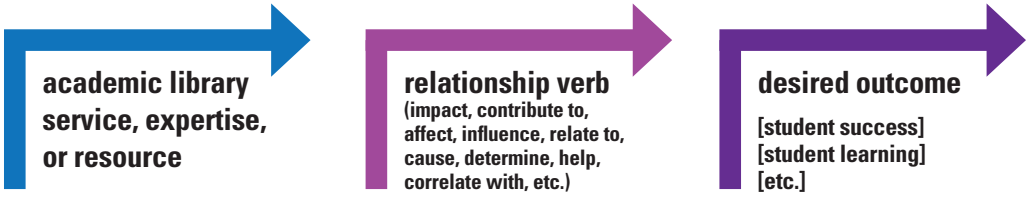


- What problems need to be solved?
- What questions need to be answered?
- What needs are going unfulfilled?
- What gaps need closed? What aspirations are unrealized?
- What are our institutions trying to do?
- What are our stakeholders trying to do?

→

- ✓ How does/could the library contribute?
- ✓ What library services, areas of expertise, or resources are related?
- ✓ Where might connections and correlations point the way to decision-making and action-taking for improvement?

Questions can be formatted in the same way…



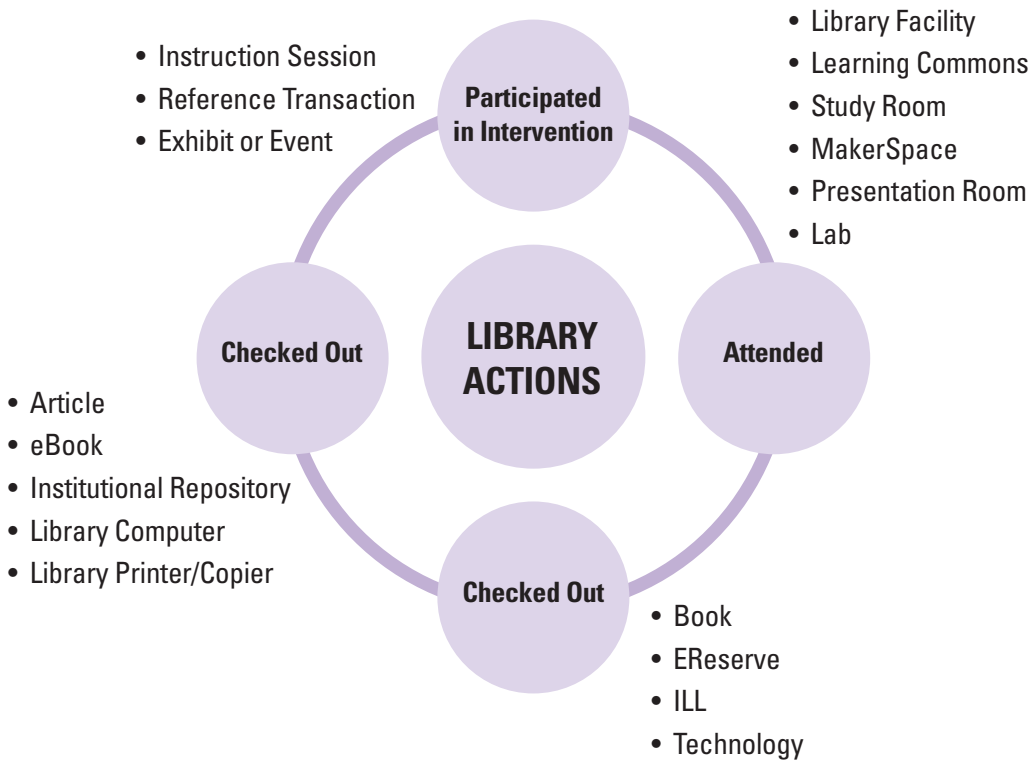
Possible Problems, Questions, Needs, Gaps, Aspirations, Institutional Missions, Stakeholder Goals
Figure out what is most relevant at your institution. (See separate table.)

Figure out what is most relevant to your stakeholders: Prospective Students, Parents, Students, Faculty, Instructors, Librarians, Advisors, Co-Curricular or Student Affairs Professionals, Institutional Researchers, Administrators, Senior Leaders, Resource Allocators, Accreditors, Employers, Community Members, Partners

Where might connections logically or reasonably exist? What would need to be linked in order to investigate possible connections?

Problems, Questions, Needs, Gaps, Aspirations, Goals (See separate table.)	→	Potentially Related Library Services, Areas of Expertise, Resources
	Connections?	Reference Physical Virtual/Digital Subject Guides Embedded Consultations Outreach Liaison Services Instruction (Information Literacy or Other) One-Shots Curriculum-Integrated Credit Courses Drop-In Consultations Exhibits Research Services Data Curation Research Data Management Literature & Alert Services Citation Management Collections Books, print/electronic Articles, print/electronic Government Documents Data/Statistics Multimedia Technology Reserves Special Collections Archives Institutional Repositories Interlibrary Loan Facilities General Carrels Computing Space Learning Commons Presentation Practice Rooms Quiet Rooms Group Rooms Cataloging Acquisitions Copyright Services Library Website Library Social Media

Where might there be data that could be collected, harvested, or otherwise made available to explore potential connections?



Who would need/want to know about connections and who could make decisions or take action to improve outcomes?

Stakeholders	Want to Know	Need to Know	Can Make Decision	Can Take Action
Prospective Students				
Parents				
Students				
Faculty, Instructors				
Librarians				
Advisors				
Co-Curricular or Student Affairs Professionals				
Institutional Researchers				
Administrators, Senior Leaders, Resource Allocators				
Accreditors				
Employers				
Community Members				
Other Partners				

Possible Problems, Questions, Needs, Gaps, Aspirations, Institutional Missions, Stakeholder Goals, Etc.

Students	Faculty	Institution	Community	Values		Efficiencies
Student Recruitment Student Enrollment Student Experience Student Engagement Student Retention Student Completion (and time to completion) Student Graduation (and time to graduation) Student Learning (of transferable knowledge, behavior, & skills) ○ Locating, evaluating, using information ○ Thinking critically, analytically ○ Analyzing, solving problems ○ Applying information skills to real world ○ Disciplinary information skills Student Achievement (GPA, test scores) Student Employment Student Earnings Alumni Lifelong Learning	Faculty Recruitment Faculty Tenure & Promotion Faculty Teaching Faculty Service Faculty Research Productivity Faculty Grant Productivity Faculty Patents, Technology Transfer	Institutional Prestige Institutional Image, Brand Institutional Athletics Institutional Affordability, Debt Minimization Institutional Preparedness for Changing Student Demographics Institutional Accreditation Institutional Fiscal Health Institutional Development, Endowments, Alumni Giving	Local, Global Workforce Development Local, Global Economic Growth Local, Global Engagement Community Building Community Capacity Building Community Resilience Community Engagement Citizenship	Safety Sustainability Diversity Internationalization Inclusion Social Justice Cooperation, Partnerships, Relationships Innovation, Entrepreneurship Leisure Engagement Culture Faith-Based Initiatives		Save time Decrease labor Increase productivity Enable decisions Enable actions Improve quality Increase incoming resources Decrease resource expenditures (spend less) Save resources (don't spend at all) Minimize risks (associated with irrelevant or inappropriate information) Quicker response to risks

User Story to Use Case

User Story # _____ Give your user story a name/title! _____

WHAT

What library data* would need to be collected?

How could that library data be collected?

What institutional data would need to be collected?

**Reminder: Think about what is possible, and leave privacy concerns aside, just for now.*

WHY

What's the rationale/goal for pursing this user story scenario?

How could the results from this user story be used to improve teaching and learning and overall student success?

THE DETAILS

Are there "preconditions" for this user story? Are there things that would have to be in place or have already happened to pursue it?

What would usually happen to make this user story happen? Please describe the process as a series of steps. Are there variations on this process?

What is the "post condition" for this user story? What will have been done by the end of the story or series of steps?

Sources: http://www.stellman-greene.com/2009/05/03/requirements-101-user-stories-vs-use-cases/, https://www.boost.co.nz/blog/2012/01/use-cases-or-user-stories

What questions could the integration of library data into learning analytics answer?
(How) could integrating library data into institutional learning analytics (enable the library to) help students learn more, better, faster?
(How) could the integration of librarian into learning analytics help librarians intervene or improve to help students?

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Library Integration in Institutional Learning Analytics (LIILA)

CNI Fall

Tuesday and Wednesday, December 12 and 13, 2017

Governor's Room, Omni Shoreham Hotel

Tuesday Agenda

4:00 p.m.	**Snack Break (Optional)**
4:10 p.m.	**Welcome & Introductions**
4:30 p.m.	**Agenda, Orientation, & Goals for Meeting**
4:45 p.m.	**Libraries, Student Success, & Learning Analytics**
5:15 p.m.	**User Stories & Use Cases Integrating Library & Institutional Data**
6:00 p.m.	**Adjourn**

Wednesday Agenda

12:00 p.m.	**User Story Group Presentations**
1:00 p.m.	**Librarian Involvement in Institutional Learning Analytics**
1:30 p.m.	**Snack Break**
1:45 p.m.	**Visioning of Library Integration in Institutional Learning Analytics**
2: 45 p.m.	**Next Steps**
3:00 p.m.	**Adjourn**

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Name: _____

Institution: _____

Data on Your Campus

To prepare for our meeting, **please create an inventory of data within your library or institution** that might be relevant to the participation of libraries in institutional learning analytics generally and/or the LIILA-generated Library Data User Stories (see handout) in particular.

- What library data exists that might apply to these library data user stories (e.g., reference or instruction data, usage data, etc.)?

- What institutional data exists that might apply to these library data user stories?

- What vendor partner data exists (or may exist) that might apply to these library data user stories (e.g., LMS data, publisher data (textbooks, full text, OER), etc.)?

—— *If you attended the first LIILA meeting, you can ignore the following questions* ——

If your institution is engaging with learning analytics, please respond to the questions below:

- What learning analytics system is being used on your campus?

- How long is data from each relevant learning analytics system retained? What about the data feeder systems that contribute to the learning analytics system? What happens to historical data?

- How much coverage does each data feeder system provide? Who or what is omitted?

- Which potential data feeder systems can contribute information to the learning analytics system? Which data feeder systems comply with compatibility standards? Which educational data feeder systems are "siloed" and therefore cannot make data available to the learning analytics system?

- What additional tools are necessary to support collection, description, analysis and reporting of data?

- Are there relevant institutional policies or local/state/federal laws about data protection that need to be considered? Are those protections in place?

- Will/does the library provide feeder data? Is the library ready to do so? What would/did it take to get ready?

Library Data Use Case Exploration

User Story # _____ Give it a working name/title! _____

DATA

What library data* would this require?		**What institutional data* would this require?**	
What necessary library data is already collected/accessible?	What would it take to collect/access necessary library data that is not already collected/accessible?	What necessary institutional data is already collected/accessible?	What would it take to collect/access necessary institutional data that is not already collected/accessible?
Who might be involved as a consultant, collaborator, partner, etc. to collect/access this library data?		**Who might be involved as a consultant, collaborator, partner, etc. to collect/access this institutional data?**	

**Reminder: Think about what is possible, and leave privacy concerns aside, just for now. We'll come back to them.*

Megan Oakleaf | LIILA | last update 12/7/17

THE DETAILS

Are there "preconditions" for this use case? Are there things that would have to be in place or have already happened to pursue it?

What would usually happen to make this use case happen? Please describe the process as a series of steps and/or represent it graphically.

Who would be involved?	What user activities or system events that would trigger data capture?	What data would be emitted? How can we describe it?	What systems would be implicated?

Are there variations on this process?

What is the "post condition" for this use case? What will have been done by the end of the case or series of steps?

How **feasible** is the enactment of this use case? How does it fit and/or not fit anticipated use of data and existing or planned systems? What are the gaps between what data is needed and what data is currently generated, captured, or made accessible?

VALUE

What's the rationale/goal for pursing this use case? How could the results from this use case be used to improve teaching and learning and overall student success? Improve library or institutional decision-making or action-taking?

What types of analytic outcomes could be produced based on accumulated data from this use case?

What is lost if this use case is not pursued?

PRIVACY & DATA OWNERSHIP

What **privacy** issues does this use case raise?	How can mitigation strategies be devised?
What **data ownership** issues does this use case raise?	How can mitigation strategies be devised?

How would you describe the fit between the work called for in these use cases and the current state of library and/or institutional systems? How well does the current situation in libraries match what we've been imagining? How well does the current situation at the institutional level match? What connections can we build upon? Where are the gaps?

More specifically, how would you describe the gap between what data is needed to pursue these use cases and what data is currently generated, captured, or made accessible?

What do you believe are the next logical steps in this work?

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Library Integration in Institutional Learning Analytics (LIILA)

CNI Spring 2018

Wednesday, April 11, 2018

Harbor Room, Westin San Diego Gaslamp Quarter

Agenda

8:00 a.m.	**Continental Breakfast (Optional)**
8:30 a.m.	**Welcome & Introductions**
8:40 a.m.	**Agenda, Orientation, & Goals for the Day**
8:45 a.m.	**Libraries, Learning Analytics, & LIILA (So Far)**
9:00 a.m.	**Data, Data, Everywhere… Exercise**
9:45 a.m.	**Partner Round Up, Part 1**
	9:45 a.m. Minnesota – Shane Nackerud & Jan Fransen
	10:15 a.m. Gloucestershire – James Hodgkin
	10:45 a.m. Unizin – Etienne Pelaprat
	11:15 a.m. IMS Global & Caliper – Rob Abel & Anthony Whyte
	11:45 a.m. Debrief Partner Round Up, Part 1
12:00 a.m.	**Lunch**
12:30 p.m.	**Partner Round Up, Part 2**
	12:30-1:00 p.m. OCLC & Analytics – Jill Dukarich
	1:00-1:10 p.m. ExLibris – Tamar Sadeh
1:10 p.m.	**Choose Your Own Adventures – Selecting Use Cases for Focused Work**
1:15 p.m.	**Use Cases – Getting Real! Round 1**
1:45 p.m.	**Use Case Round 1 Group Presentations**
2:00 p.m.	**Use Cases – Getting Real! Round 2**
2:30 p.m.	**Snack Break**
2:45 p.m.	**Use Case Round 2 Group Presentations**
3:00 p.m.	**Use Cases – Getting Real! Round 3**
3:30 p.m.	**Metric Profiles – Reacting & Revising**
4:00 p.m.	**Vendor Partner Involvement in Learning Analytics**
4:30 p.m.	**Visioning of Library Integration in Institutional Learning Analytics**
4: 45 p.m.	**Next Steps**
5:00 p.m.	**Adjourn**

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Which use cases do you believe should be prioritized for future work in this area? What ideas, suggestions, hopes, or questions do you have about the pursuit of enacting these use cases?

What ideas, suggestions, hopes, or questions do you have about interoperability standards and possible data profiles used to pursue library integration into learning analytics?

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What do you believe are the next logical steps in this work?

What would you like to see included in the final LIILA white paper?

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9.2 Recommended Reading List

While the literature on learning analytics is voluminous, the following six readings provide foundational information on learning analytics and suggest initial steps for librarian involvement.

Austin Booth, H., & Hendrix, D. (2015). Libraries and institutional data analytics: Challenges and opportunities. *The Journal of Academic Librarianship*, 41(5), 695-699. doi:10.1016/j.acalib.2015.08.001

ECAR-ANALYTICS Working Group. (2015, October). The predictive learning analytics revolution: *Leveraging learning data for student success* (ECAR working group paper). Louisville, CO: ECAR. Retrieved from https://library.educause.edu/~/media/files/library/2015/10/ewg1510-pdf.pdf

EDUCAUSE Learning Initiative. (2011, April). *7 things you should know about analytics* (brief). Louisville, CO: EDUCAUSE. Retrieved from https://library.educause.edu/~/media/files/library/2010/4/eli7059-pdf.pdf

EDUCAUSE Learning Initiative. (2017, July). *7 things you should know about developments in learning analytics* (brief). Louisville, CO: EDUCAUSE. Retrieved from https://library.educause.edu/~/media/files/library/2017/7/eli7146.pdf

Oakleaf, M. (2016). Getting ready & getting started: Academic librarian involvement in institutional learning analytics initiatives. *The Journal of Academic Librarianship*, 42(4), 472-475. doi:10.1016/j.acalib.2016.05.013

Oakleaf, M., Whyte, A., Lynema, E., & Brown, M. (2017). Academic libraries & institutional learning analytics: One path to integration. *The Journal of Academic Librarianship*, 43(5). 454-461. doi:10.1016/j.acalib.2017.08.008

9.3 Privacy Resources

The following resources provide a basic framing for privacy considerations related to libraries and learning analytics.

7 Things You Should Know About How Learning Data Impacts Privacy
https://library.educause.edu/resources/2017/5/7-things-you-should-know-about-how-learning-data-impacts-privacy

ALA Code of Ethics
http://www.ala.org/united/sites/ala.org.united/files/content/trustees/orgtools/policies/ALA-code-of-ethics.pdf

Association of Institutional Research Code of Ethics and Professional Practice
http://www.airweb.org/Resources/Pages/Code-of-Ethics.aspx

Consenting Adults? Privacy in an Age of Liberated Learning Data
https://er.educause.edu/articles/2017/1/consenting-adults-privacy-in-an-age-of-liberated-learning-data

Ethical Use of Student Data for Learning Analytics Policy
http://www.open.ac.uk/students/charter/essential-documents/ethical-use-student-data-learning-analytics-policy

Ethics and Privacy in Learning Analytics – a DELICATE issue
http://www.laceproject.eu/blog/ethics-privacy-in-learning-analytics-a-delicate-issue/

Ethics and Privacy in Learning Analytics
http://epress.lib.uts.edu.au/journals/index.php/JLA/issue/view/373

IMS Global Learning Data & Analytics Key Principles
http://www.imsglobal.org/learning-data-analytics-key-principles

JISC Effective Learning Analytics - Using Data and Analytics to Support Students
https://analytics.jiscinvolve.org/wp/

> Code of Practice for Learning Analytics: https://analytics.jiscinvolve.org/wp/2015/06/04/code-of-practice-for-learning-analytics-launched/ and https://www.jisc.ac.uk/guides/code-of-practice-for-learning-analytics
>
> Literature Review: http://repository.jisc.ac.uk/5661/1/Learning_Analytics_A-_Literature_Review.pdf
>
> Taxonomy of Issues: https://analytics.jiscinvolve.org/wp/2015/03/03/a-taxonomy-of-ethical-legal-and-logistical-issues-of-learning-analytics-v1-0/

The Learning Analytics Landscape: Tension Between Student Privacy and the Process of Data Mining
https://www.carnegiefoundation.org/blog/the-learning-analytics-landscape-tension-between-student-privacy-and-the-process-of-data-mining/

NISO Consensus Principles on User's Digital Privacy in Library, Publisher, and Software-Provider Systems
https://groups.niso.org/apps/group_public/download.php/16064/NISO%20Privacy%20Principles.pdf

NIST Cybersecurity Framework
https://www.nist.gov/cyberframework

SPEC Kit 360: Learning Analytics
https://publications.arl.org/Learning-Analytics-SPEC-Kit-360/

University of California Learning Data Privacy Principles and Recommended Practices
https://library.educause.edu/~/media/files/library/2016/12/learningdataprivacyslides.pdf

University of Maryland, Baltimore County – Use of Student Data
https://my3.my.umbc.edu/about/studentdata

University of Michigan Learning Analytics Guiding Principles
http://ai.umich.edu/learning-analytics-guiding-principles/

University of Michigan Library Privacy Statement
https://www.lib.umich.edu/library-administration/library-privacy-statement

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[2] Oakleaf, M. (2016, December 8). What's missing from your institutional learning analytics initiatives? *EDUCAUSE Review*. Retrieved from https://er.educause.edu/blogs/2016/12/whats-missing-from-your-institutional-learning-analytics-initiatives

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