

Academic Resources and Precalculus Students: Knowledge and Use of Tutoring Services, Skill Sessions, and Academic Coaching

Katie McKeown
The University of Alabama

Discussion of a study that examines data from a single large, public university to determine how and when precalculus students elect to use learning center resources and their experiences using these resources. Data collected and to be analyzed includes survey and interview data from the precalculus students, interview data from instructors, class and learning center artifacts, and interview data from learning center leaders.

Keywords: learning centers; mathematics; precalculus

Colleges and universities provide many supplementary academic resources to support students outside of the classroom in their learning. Designated spaces that provide many of these supplementary resources in one space are often referred to as learning centers and can be found at the majority of colleges and universities (Bhaird et al., 2009; Byerley et al., 2019; Gilbert et al., 2021; Grove et al., 2020; Lawson et al., 2020; Matthews et al., 2013; Rickard & Mills, 2018). However, a large number of factors may influence a student's decision to use these resources, including the difficulty of finding new sources of help when first entering college, their desire to learn the course material, and their prior knowledge (Giblin et al., 2021). While a variety of research on learning centers has examined the impact of learning centers on students' success (e.g., Wurtz, 2015) or the various roles of learning centers on a campus (e.g., Solomon et al., 2010), one of the gaps in learning center research is how students make the decision to seek out help and their experiences of the provided resources. This study intends to approach that gap using a multiphase mixed methods design study to explore what precalculus students experience concerning the phenomenon of using free supplemental learning resources. Data from the students, instructors, and learning centers at a single university will be analyzed to look at how and when students elect to use learning center resources and their experiences using them once there.

Given the importance of learning centers to postsecondary institutions and of knowing more about how students decide to use these sites, this study will look at how, in past, present, and future, precalculus students learn about, decide to use, and experience using academic resources external to their introductory mathematics course at a large, southern, public research university, following the proposed theory of source selection by Giblin and colleagues (2021). The resources focused on in the study will be the mathematics content tutoring offered by the campus learning center (LC), mathematics content tutoring offered by the campus student success center (SSC), academic coaching offered by the SSC, and skill sessions offered by the SSC. In particular, I ask:

1. What opportunities do precalculus students at a large, southern, public research university have to learn about each of the four resources being studied, and to what extent do students identify as being aware of each resource?
2. What factors relate to patterns or changes in use by students over time?

I will answer these questions using a variety of data sources, including site observations, student surveys and interviews, instructors and center coordinators interviews, and center and

course artifacts. These data and research questions are part of a larger study that also incorporates learning center usage and demographic data from students in the precalculus course.

Literature Review and Theoretical Framework

Postsecondary institutions provide a variety of resources to support students in their learning of course material outside of classroom and lab time. However, in order to take full advantage of these resources, students must learn that the resources are available, decide to use those resources, and then, decide whether to continue or discontinue use for the duration of the academic term. Access to these resources is often found in central locations on campus, called learning centers, but places that provide academic supports also often go by the name of tutoring centers or subject specific centers.

Postsecondary Academic Support

In his glossary of developmental education and learning assistance terms, Arendale (2007) defines support areas as, “Institutional services, other than regularly scheduled classes and labs, designed to assess and improve the academic and emotional well-being of students” (p. 29). These services include a number of common support areas, including tutoring and advising services (Parker, 2020; Truschel & Reedy, 2009). Institutions also frequently offer academic skill sessions, which are usually defined to have the purpose of supporting students in developing skills that will transfer to future courses, such as how to study or manage time (Munley, 2010; Parkinson, 2009; Wurtz, 2015).

Learning Centers

When an institution creates a central location where multiple of the previously discussed supports are located, they are usually referred to in the literature as either learning assistance centers or learning centers (Arendale, 2007). As previously discussed, learning centers often are called by a variety of names, including tutoring centers and mathematics support centers.

Mathematics course support. Students seeking success in their mathematics courses frequently find their way to learning centers. In fact, in a study surveying 61 learning centers, the only service that every center reported offering was mathematics assistance/tutoring (Franklin & Blankenberger, 2016). Learning centers can provide a variety of services, but the courses a student is enrolled in determine which of the previously discussed resources are available to them at their institution. As this study explores student resource use in relation to a mathematics course, special attention is on the relationships that the learning center structure and resources have with mathematics content and coursework.

Learning center structure. The structure of learning centers varies widely across institutions (Byerley et al., 2019; Johnson & Hanson, 2015; Perin, 2004; Truschel & Reedy, 2009). Three of the most common services offered in learning centers are tutoring, academic coaching, and skill workshops (Truschel & Reedy, 2009). Structural differences include drop-in versus appointment only assistance, online versus in-person support, the qualifications of center staff, and the relationship, or lack thereof, between mathematics departments and learning centers.

Student decisions surrounding learning center use. This study explores precalculus students’ experiences concerning the phenomena of using free supplemental learning resources. I look at this phenomena using Giblin and colleagues’ proposed theory of source selection of (a) narrowing of sources, (b) evaluation, (c) solicitation, (d) evaluation of presented help, and (e) use of source as a theoretical framework (2021). In other words,

students must find the resource, decide to try the resource, and then, after using the resource, decide whether or not to continue use.

Methods

Seven main types of data will be used to answer the presented research questions: class artifacts, interviews of course instructors, center artifacts, interviews of learning center supervisors, center observations, student surveys, and student interviews.

Class Artifacts

The course syllabus and information shared on the Blackboard home page were gathered. Information from these sources have been reviewed and will be coded for any evidence of information of any of the four free academic resources being considered in this study.

Interviews of Course Instructors

Once during the semester, I interviewed the course instructors. Questions focused on the nature and frequency of instructor-classroom communication concerning academic resources available to students as well as the instructors' knowledge of these resources. Interviews of course instructors used a semi-structured format, meaning that the interview protocol is used as a guide and questions and probes may or may not be used as well as may be presented in a different order than written (Roulston, 2013).

Center Artifacts

Center artifacts in the form of data presented on resource webpages and distributed advertisements for services sent to students were collected. These data were collected because direct contact from the centers may be a way that students learn about these available academic resources outside of the classroom. Center artifacts will be reviewed for any information that may support student survey and interview responses.

Interviews of Learning Center Supervisors

Once during the semester, I interviewed the learning center supervisors. The questions asked during the interview focused on the center's communications with students concerning available academic resources, including any intrusive messaging, and what they perceived as the typical experiences of students when using each of the resources being studied. Interviews of learning center supervisors used a semi-structured format described previously (Roulston, 2013). The questions and guidelines provided in the initial protocol were framed by the six significant dimensions of undergraduate mathematics tutoring centers described by Byerley and colleagues (2019): "(1) Specialist versus Generalist Math Tutor Models, (2) Strength of Relationship between Center and Math Instructors, (3) Type and Extent of Tutor Training, (4) Types of Tutoring Services, (5) Physical Layout and Location, and (6) Tutoring Capacity." The SSC leader interviews also contained questions about the skill sessions and academic coaching appointments available.

Center Observations

Twice during the semester, I observed both the campus LC and SSC. The observation protocol focused on gathering the nature of student-computer, student-student, and student-staff interactions in the centers. The questions in the observation protocol were framed by the six

significant dimensions of undergraduate mathematics tutoring centers described by Byerley and colleagues (2019), described previously, as both centers provide tutoring services.

Student Surveys

Twice during the semester, I surveyed students about their use or plans to use the four resources being considered across the two centers. The first survey took place immediately following the end of the drop/add period at the university, in the second week of classes. The second survey was given near the end of the semester. Both surveys asked about each of the four resources being studied, with students reporting (1) the extent to which they have heard about or seen advertisements for that resource, (2) how much they have used the resource in the past, and (3) how much they intend to use the resource in the future. Questions concerning knowledge of, past use, and intended future use of resources were asked using scales increasing in frequency (e.g., never; happens on occasion, happens at least once a month, happens at least once a week, happens daily) along with clear layout and other recommendations for survey creation (Walston et al., 2017). The second survey also included questions about help-seeking behaviors and attitudes towards mathematics.

Student recruitment. Students were recruited into the study during a classroom visit that occurred immediately following the drop/add period of classes. During this classroom visit, I described the survey including risks and benefits and then provide a link to the first survey using an electronic QR code that was projected during class. In addition to asking about students' knowledge and use of the academic resources, the linked survey also contained a question asking students if they have interest in participating in the interviews.

Student Interviews

During the semester, I interviewed five different student participants, with three student participants completing two interviews. The first interview took place within the first month of the course, and the second interview took place following the second survey distribution. Interview questions focused on students' decisions to seek help, what informed their decisions to use any combination (including none) of resources offered by the two centers, and their experiences while using the resources.

Student interviews were conducted using semi-structured format as described previously (Roulston, 2013). The first interview focused on collecting information about the student, their course history, and other prior experiences related to seeking help in a mathematics course followed by the tailored questions concerning resource use experiences. The second interview followed a similar format. However, there were data points from two surveys as well as the first interview to guide questions. For example, if a student in the second survey indicated that they were using a resource after indicating they did not intend to use that resource during the first survey, I asked a question that aimed to dive into how that decision was made.

Planned Analysis

As I have just begun my analysis, the following descriptions of planned analysis are in future tense. However, all data have been collected at the time of this proposal submission.

Research Question 1

What opportunities do precalculus students at a large, southern, public research university have to learn about each of the four resources being studied, and to what extent do students identify as being aware of each resource? Using appropriate psychometric analysis on the

student survey data, the frequency that precalculus students hear about resources available to them will be determined. Class artifacts, interviews of course instructors, center artifacts, interviews of center supervisors, center observations, and student interviews will first be reviewed for mention of different ways that resource availability may be advertised or discussed. The analysis of these data sources will flag any mention of these services, which could come from a variety of sources, including verbal or written communications, posted information in course Blackboard, or physical flyers. Finally, this information on the different methods of exposure to the resource availability will then be used to explain the student survey results related to whether students report being aware of those resources. These all point to the first step of Giblin and colleagues' theory of source selection, narrowing of sources (2021).

Research Question 2

What factors relate to patterns or changes in use by students over time? Using appropriate psychometric analysis on the student survey data, separately, the changes over time in survey responses will be analyzed. Analysis of student interviews, center supervisor interviews, and instructor interviews using a phenomenological line-by-line approach will point towards factors related to certain combinations of resources being used. The analysis of these data sources will flag any mention of decision to use or stop use of a resource, which could present in a variety of forms. Possibilities regarding decision of use include mentions of failing a test, struggling with homework, being referred to the resource by their instructor, or being referred to the resource by a friend. Possibilities regarding the decision to stop the use of a resource include expectations of using resources were not met, description of services by source they heard about resource from turned out not to be accurate, by their perception, or mention of not having time. Any mention of deciding to use no resources, a single resource, multiple resources, or all resources will be coded and considered. These data will point toward the other steps of Giblin and colleagues' theory of source selection including evaluation, solicitation, evaluation of presented help, and use of source (2021).

Next Steps and Questions

Next steps include completing the analysis; although all data have been collected, analysis has just begun at the time of submitting this proposal. Thus, there are not yet any results or conclusions to share. The analysis will continue until the conference in February, at which time I expect to provide results and conclusions.

Audience Questions

1. Can you think of any other frameworks that I should look at this data with?
2. Any experiences at your institutions/in your learning centers that might shed light on this study that you would like to share?

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