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Chapter 13

Advising and Mathematics Pathways

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Abstract

Postsecondary mathematics curricula are being redesigned to create mathematics pathways that are appropriate for students' career goals. Academic advising is a fundamental component to the success of students and to the effective implementation of mathematics pathways. The focus of this chapter is to describe the role of academic advising in assuring student success, structures of effective academic advising, and the need for advisors' perspectives and understanding in supporting students' course and career choices. The importance of advising in the design and implementation of mathematics pathways, including suggestions for advising STEM majors, will be discussed. The chapter concludes with best practices in advising for faculty, institutions, and policy leaders when implementing mathematics pathways.

Introduction

The movement to design and implement mathematics pathways that offer postsecondary students the opportunity to develop the necessary mathematical and quantitative reasoning skills for their careers has gained both legitimacy and national support in the last decade. As the implementation of these pathways moves toward normative practice, academic advisors are working to effectively advise students to support their academic preparedness, academic abilities, and career aspirations.

This chapter will discuss the importance of advising students—including underrepresented, low-income, and first-generation students—and advisors' impact on student learning, persistence, retention, and degree completion. This chapter discusses how mathematics pathways are changing the landscape of advising and what that means for training and participation of advisors to support students effectively in choosing the most suitable mathematics pathways. The chapter will conclude with recommendations for advisors, faculty, departments, institutions, and policy leaders in advising students from matriculation to degree completion.

Academic Advisement and Its Role in Student Success

Academic advising is an active and engaged partnership with students, impacting students' retention, persistence, and degree completion (Metzner, 1989). Swecker, Fifolt and Searby (2013) state that “good advising might be the single most underestimated characteristic of a successful college experience” (p. 47). They found in their study “that for every meeting with an academic advisor, the odds that a student will be retained increase by 13%” (p. 46).

When students begin college, it is vital that they begin working with their academic advisor(s)

immediately. It is paramount that advisors monitor and work with students to ensure that students are on the correct academic trajectory to completing course requirements, completing credit hours each semester, and being active in progress to their degree. Advisors can hold the student accountable for enrolling in and completing their courses. Mandatory advising at various points in the semester or for students reaching certain academic milestones, such as moving from freshman to sophomore, entering the college of their major, or graduation check, is used to keep students on track to degree completion.

Generally, students who have consistent, timely, and meaningful contact with their academic advisor tend to be more self-regulated (Drake, 2011; Kuhn, 2008; Pascarella & Terenzini, 2005). They also have a better awareness of how their academic choices and preparedness affect their future career aspirations. In order for students to be held accountable for their educational journey and success, they should be required to participate in academic advising with specific outcomes for their meetings.

Advances in Advising Practices

Over the decades, academic advising has shifted from being prescriptive—simply giving students the information they need without a discourse with the students on their academic goals—to “advising as a form of teaching” (Lowenstein, 2005). Advising as teaching is a process that allows the advisor to have clear learning outcomes and expectations for students. Additionally, advising as teaching provides a process for advisors to scaffold information to help students think critically about their educational choices. This approach enables advisors to give students strategic and timely information, so they can conduct research and

find additional answers to their questions. This form of advising presents students with valuable skills, such as problem solving and critical thinking, particularly useful in mathematics and STEM curricula.

It is critical for advisors to be proactive in advising students, using advising theory or practice such as intrusive or appreciative advising. “Intrusive advising,” as defined by Earl (1987), addresses the difficulties that students encounter and makes the appropriate action-oriented intervention. This action can motivate students to continue in courses and their program. With intrusive advising, advisors ask students probing questions to find out how they are performing in their courses, if they are using support services or taking advantage of research/internship opportunities, and if their selected major still fits their long-term goals and career aspirations. “Appreciative advising” calls on advisors to build a positive rapport with students, which helps advisors learn more about the students’ strengths, skills, and abilities. It provides a space for students to design their academic and career aspirations and allows them to pursue their academic plans and understand what to expect.

Advising for First-Generation and Underrepresented Minority Students

The number of first-generation and underrepresented minority students attending college is increasing (Engle & Tinto, 2008). These students often need more advice than other students. First-generation students are usually defined as students who come from families in which neither parent has attained a degree beyond high school. First-generation students often “come from low-income and minority backgrounds and face a number of challenges that make it more difficult for them, not only to get into, but through college” (Engle, Bermero,

& O'Brien, 2008, p. 13). They tend not to have support systems in place to help them through the academic maze. When compared to other students, first-generation students may face different hardships that affect their persistence, such as parents or friends who cannot assist them with the college admission process.

When advising first-generation and underrepresented minority students, it is imperative to take into consideration the “whole” student. One of the most common approaches for advising first-generation students is using “holistic advising” because it focuses on the whole student (Swecker, Fifolt, & Searby, 2013). Holistic advising is defined as advising the student by taking into account their social perspective, financial status, experiences they bring with them to college, noncognitive factors, and academic preparedness. When advising first-generation and underrepresented minority students, consideration of the students’ family responsibilities, academic preparedness, and social and financial barriers must be factored into any academic decision.

First-generation and underrepresented minority students need to feel and know they belong. Having an advising model that assigns advisors to students is essential to building a rapport with students. The student–advisor relationship should lead to engaging discourse about issues, challenges, and successes that the student has experienced. Providing mentorings in addition to advising helps students interact with people like them who have succeeded and experienced some of the same barriers but were able to overcome those barriers and be successful.

All first-generation students and especially those who are interested in a STEM major should be engaged in the academic process on the first day of college. Their academic development and persistence should be monitored very closely to ensure that they are on track with their academic goals. Students should not be left to self-advise

or be advised by others who do not understand the curriculum, their goals, or their academic preparedness. In particular, when advising first-generation and underrepresented minority students for STEM, it is imperative to make sure that students are linked to mentoring and coaching as soon as possible. Having a structured academic advising process assists with students' retention and persistence in STEM majors (Drake, 2011; Kuhn, 2008; Pascarella & Terenzini, 2005). Self-regulation and intentional and meaningful advisor contact with STEM students are necessary for persistence, for students to stay focused on their major, and for successful degree completion.

Mathematics Pathways and the Impact on Advising

Research has shown that traditional algebra-intensive college mathematics course content does not align with the academic goals or career aspirations of many students (Getz & Ortiz, 2016). Some students believe that they will never use the mathematics content that is taught. The scaled use of mathematics pathways shows that states (specifically, Texas, Oklahoma, Michigan, Washington, and Arkansas) and institutions are beginning to understand the importance of providing relevant concrete mathematics pathways that prepare students for their career aspirations. In 2015, it was reported that 58 percent of public two-year colleges implemented some form of mathematics pathways (Blair et al., 2018, Table TYE.11, p.176). Mathematics pathways are diminishing the stigma of placement in foundational courses that can negatively contribute to students' self-efficacy and contribute to the disenchantment with mathematics courses leading to withdrawal from or failure in the courses (Bahr, 2008).

Mathematics pathways are “developmental and college-level course sequences that align to a

student's academic and career goals, and that accelerate student completion of a gateway college-level mathematics course” (Getz & Ortiz, 2016, p. 1). While well-designed mathematics pathways support the success of all students, they are known to provide underprepared and underrepresented students with increased confidence and motivation, thereby also increasing students' self-efficacy in their abilities to complete their mathematics course(s).

Advisors must be at the table when changes are being discussed and implemented to mathematics curriculum and institutional policies. Advisors provide a lens that faculty may not have, such as seeing how making a minor change in mathematics can adversely affect the student's program. In order for mathematics pathways to be truly successful, institutional policies on course placement and course withdrawal should be reviewed with advisors' input. The review will allow advisors to be more successful at holding students accountable when students consider withdrawing from a course. Institutions should ensure that there is adequate support for students from the first day they matriculate on campus to degree completion. Ultimately, it is advisors who are the first contact for students. Well-informed advisors can help students select the appropriate mathematics pathway based on their interests and career aspiration.

Mathematics pathways may ultimately lessen the need for advisors to have the “hard conversation” with students about lack of success in required mathematics courses. In the past, advisors discussed why students had not completed their mathematics requirement, sometimes despite repeated attempts to complete the required mathematics courses. Such discussions can be devastating for students and can lead to students changing majors. Students may become disengaged academically and lose motivation because their major may be perceived to be out

of their reach because of a mathematics course. With a predetermined mathematics pathways curriculum, students can take mathematics courses that are appropriate to their major and can lead to a higher rate of success in completing their mathematics requirement. The resulting success in mathematics enables the advising conversation to shift to other dimensions of students' academic paths, such as getting involved in activities (i.e., internship or shadowing opportunities) that support and strengthen their ultimate career goals.

Academic advising workshops in states that have implemented mathematics pathways have shown that advising is critical to the successful implementation of mathematics pathways. However, there is still work that is needed to ensure that advising is part of the discussions and the implementation process from beginning to end. Advising is a necessary component to providing guidance to students on which pathway is best for their academic and career aspirations. Advisors need clarity on the purpose of pathways and how faculty members would like for mathematics pathways to be explained to students. Faculty members and advisors need to develop a relationship for sharing information and working together as partners to better support students.

Conclusion and Recommendations

As mathematics pathways programs grow and evolve in shaping the landscape of mathematics requirements, there needs to be a direct connection to academic advisement. Advisors are critical in the process of helping students to understand their curriculum. Advisors provide insight into questions that students are asking about their mathematics requirements. Advisors are on the front line. They see how changes in mathematics requirements can have a positive or negative impact on students' choice of major program and degree completion. Therefore, advising is one

of the critical components to ensure the success of implementation, placement, and assessment of mathematics pathways. Faculty, departments, institutions, and policy leaders should include the following in planning and providing appropriate supports for all students and implementing mathematics pathways:

- Academic advising should begin on the first day of college.
- Advisors should be knowledgeable about different advising models, the needs of all students, and specific needs of first-generation and underrepresented minority students.
- Advisors should be involved in the design and implementation of mathematics pathways, in order to be better equipped to explain the relevance of mathematics courses to students and how particular mathematics pathways fit with particular majors and students' career aspirations.
- Advisors should receive information on the “why” of mathematics pathways so that they are better equipped to explain the benefit of mathematics pathways to students. This knowledge will help advisors to understand the significance of students taking their mathematics course within the first semesters (first year) of their academic journey.
- Academic advising should provide a structured approach for students to be successful in their mathematics courses.
- Advisors and mathematics pathways faculty should work together with a goal of retaining more students in STEM programs and helping students graduate in a timely manner. Faculty members who have the primary advisor role should be trained on advising processes and theories to be able to better assist students holistically.



- Supporting mathematics pathways is a campus-wide endeavor. Institutional policies (such as course placement and course withdrawal) should be aligned with mathematics programs, and appropriate student supports should be implemented.
- When implementing mathematics pathways, there needs to be active involvement and extensive communication amongst internal and external stakeholders. Alignment of policies and programs across sectors—secondary schools, two-year institutions, four-year institutions, and legislatures—is essential to successful implementation.

Academic advising should not be viewed as an afterthought; instead, it should be viewed as a partnership that effectively assists with facilitating mathematics pathways for and communicating them to students. Those partnerships can lead to greater success in college completion as students make better choices about mathematics courses and programs aligned to their academic and career goals.

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About the author



Vanessa Harris is the founder and CEO of Major Changes, LLC, which supports high school students and parents' transition to postsecondary education. Dr. Harris has over 20-plus years of cross-institutional experience in the areas of academic advisement, student success, retention, and recruitment. Vanessa is also a consultant with the Charles A. Dana Center where she created and delivered, in collaboration with the Dana Center, an advisor workshop for six states that implemented mathematical pathways. She is also a consultant and speaker for the National Academic Advising Association (NACADA): The Global Community for Academic Advising where she advocates for the improvement of student success initiatives for the betterment of students to achieve their academic goals and career aspirations.