

A Process for Success: Developing and Supporting Student Learning Outcomes for Multiple Mathematics Pathways

Overview

Traditional postsecondary pathways are not working for far too many students, particularly in the area of mathematics where students are often required to take courses unrelated to their chosen fields of study. Further, courses that students take for a program at one institution may not be applied to the same program at another institution when students transfer. These disconnects lengthen the time to completion, increase student costs, and can lead to students' dropping out of the education pipeline altogether. If states want to address issues related to student mobility, persistence, and success—and use higher education as a driver for improving institutional productivity and bolstering workforce development—then the implementation of multiple mathematics pathways, with corresponding student learning outcomes, is critical.

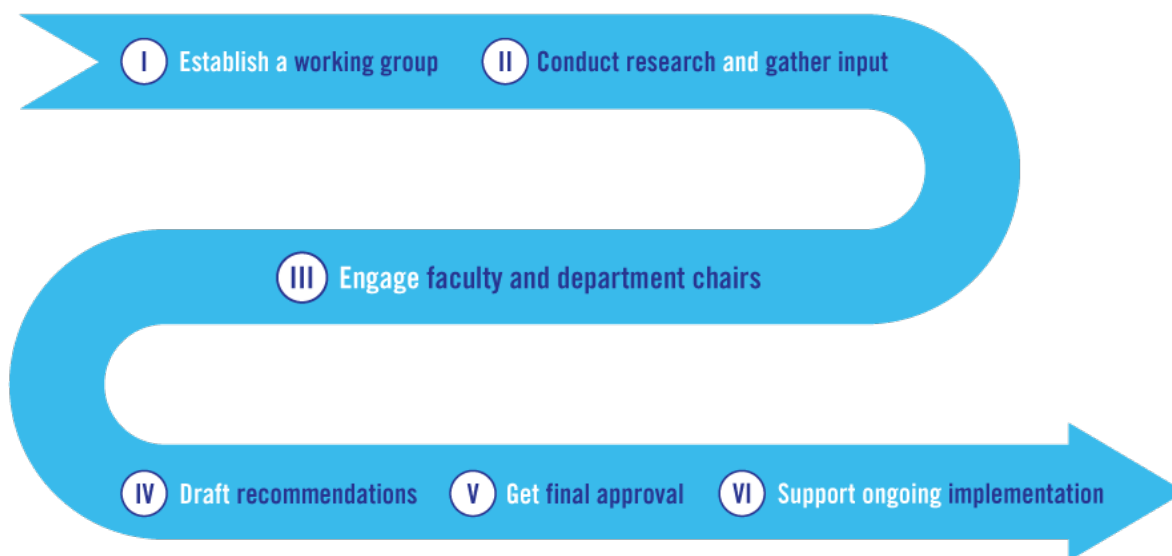
Effective student learning outcomes (SLO) can foster common understanding and agreement about what students need to know to be successful in college and careers. If developed and implemented properly, learning outcomes can also help facilitate student transfer, reduce time to degree, and promote quality instruction. Similarly, the implementation of multiple mathematics pathways can improve student success at the classroom level, empower faculty and administrators at the institutional and regional levels, and inform the decisionmaking of policymakers at the state level.

In this document . . .

I. Establish a working group	2
II. Conduct research and gather input	4
III. Draft recommendations	5
IV. Engage faculty and departments	5
V. Get final approval	6
VI. Support implementation	6
See a summary of the SLO process	7
Find suggested resources	8

While the importance of student learning outcomes and their relation to the implementation of functional math pathways is clear, the process for creating meaningful outcomes that can effectively measure student knowledge and success is all too often unclear, particularly at the state agency or policy level. The purpose of this document is to offer education stakeholders a recommended process for developing constructive, state-level student learning outcomes for multiple mathematics pathways. The goal of this process is to promote retention, transfer, and completion as students move through postsecondary education and beyond.

The model below illustrates the six-phase process. Each phase involves activities that can and should be done simultaneously or accomplished more than once during the entire process. All activities are meant to offer possible strategies for developing a learning outcomes process that includes rigorous expectations and intentional measurement of outcomes designed to increase the likelihood of success for students and institutions alike.



I. Establish a Working Group

The most important factor in developing high-quality learning outcomes is first establishing an effective working group to lead the work. This working group can determine whether the learning outcomes developed are either beneficial or impractical. The following four steps can help ensure that appropriate members are in place to guide the activities and outcomes of the working group and to create a solid foundation for successful work.

Step 1: Set the charge.

Setting a clear charge is a vital step in the formation and support of the working group. The charge is the basis for all future activities, and therefore should be realistic and unambiguous. The following example uses specific language to communicate goals and areas of work:

The Ohio Board of Regents charges the Ohio Mathematics Steering Committee “to develop expectations and processes that result in each campus offering pathways in mathematics that yield (1) increased success for students in the study of mathematics; (2) a higher percentage of students completing degree programs; and (3) effective transferability of credits for students moving from one institution to another.”¹

While developing the exact language and scope of work, one or two stakeholders should draft the charge. Ask questions to guide the focus and scope of the potential work. For example, what are the goals and explicit areas of work? Are there specific policies that need special attention (e.g., transfer and applicability)? What is the ideal timeframe to complete the work? (For more information on setting a charge, see the “Suggested Resources” section below.)

¹ Page 2 in Ohio Mathematics Steering Committee. (2014). *Rethinking postsecondary mathematics: Final report of the Ohio Mathematics Steering Committee*. Columbus, OH: Author.

Vet the draft with others to determine if there is agreement on the purpose and meaning. Once the charge has been set, move through the following steps to define individual roles, develop working group expectations, and recruit members.

Step 2: Define key roles and responsibilities.

Listing the responsibilities and qualifications of each working group member will help clarify roles and expectations. Write a brief description for each role. Consider logistical matters related to the work (e.g., whether members will be paid a stipend, if travel or other expenses will be reimbursed).

Examples of essential roles and members’ skills, experience, and responsibilities are described in the table below.

Roles	Skills	Knowledge / Experience	Responsibilities
Representative of State Higher Education Policy Agency	Organization, communications, facilitation	Understanding of state policy and processes, institutional cultures, and math pathways.	Establish and support process; provide background on state or system policies related to the course; address policy questions as they arise.
Working Group Chair(s)	Organization, communications, facilitation	Experience in leadership roles; respected among mathematics faculty; understanding of math pathways, national trends in mathematics education and of the course in question. Most likely a mathematics faculty member(s).	Work with policy representative to plan the process and recruit participants; lead meetings; help identify appropriate sources for information and research; disseminate meeting information and notes; give input on learning outcomes; promote final product.
Working Group Members	Collaborative work, listening to different perspectives, synthesis of information	Knowledge of the specific content area or the programs likely to be served by the course; experience in writing learning outcomes.	Review research, recommendations, and current practice; provide input; draft learning outcomes; promote final product. Most likely mathematics faculty, although representatives of other disciplines or stakeholder groups might be appropriate.

Step 3: Develop working group activities and deliverables.

Working group members should know what to expect in terms of time commitment and individual workload. Create and share a detailed and realistic timeline of activities and deliverables. At the outset, emphasize the actions rather than the outcomes and be clear about what each member needs to accomplish.

The following suggestions can help ensure clearly defined and actionable working group deliverables:

- Make sure the working group understands the charge.
- Outline a preliminary meeting schedule for specific activities (e.g., launch meeting, review of research and data, vetting, final approval).
- Share resources and pertinent materials with working group members in advance of scheduled meetings and deadlines.

Step 4: Actively recruit members to fill the roles.

Take advantage of existing organizations or programs to help identify potential members. Statewide entities (e.g., math task forces, transfer steering committees) can often recommend the “right people for the job”—or at least help find a suitable person to recruit the appropriate membership. In some cases, having a single point person responsible for recruitment can focus efforts and assist with an efficient search.

Consider what kinds of technical expertise are needed and if certain experts in those respective fields should and are available to participate. Regardless of the recruitment method, working group members should have the following characteristics:

- Represent diverse institutions (two-year and four-year, technical, rural, urban) and have connections to key stakeholder groups (industry, community).
- Have legitimacy with faculty.
- Accommodate the views and feedback of diverse groups.
- Commit to meeting regularly and helping to achieve goals.

In order to work effectively, the size of the working group should remain small—ideally no more than six to eight members. A larger group may make it difficult to coordinate schedules and focus on necessary activities.

Once the working group has been established, the next phase of development and implementation can begin.

II. Conduct Research and Gather Input

Gathering research and informed input from a variety of stakeholders—especially content experts—will provide a solid foundation for all future work. If necessary, conduct a policy scan to reveal any barriers at the state or system level. Consult relevant resources, particularly the curricular recommendations approved by the Mathematical Association of America. (See “Suggested Resources.”)

During this phase, uncover areas for collaboration and coordination between faculty, departments, partner disciplines, and across institutions and systems to develop a new course or refine an existing one. Whenever possible, define what student success looks like based on the course and desired outcomes.

Gather as much information as is needed to draft useful recommendations for the SLO development and implementation. However, be mindful not to let the process stall at this information-gathering phase.

III. Draft Recommendations

The recommendations for student learning outcomes should identify and organize the commonalities that already exist. Consider the so-called low-hanging fruit first—that is, identify areas where alignment already exists and use that to generate further consensus. Have working group members dedicate the majority of their attention to outcomes that cause disagreement. It is imperative that the recommendations are easily understandable and accessible to the target audience. Use terminology that will be understood by faculty members across all disciplines, not just mathematics. Consult with experts in the field if there is a stumbling block or uncertainty on how to proceed. (For more information about drafting recommendations, see the Interstate Passport in “Suggested Resources.”)

As in the previous phase, take care not to unnecessarily extend this activity. While it may take some time to draft appropriate outcomes, adhere to the timeline developed earlier in the overall process. If there are lingering concerns about particular learning outcomes or other issues, the working group should agree to address them at a later date.

In addition, if feedback is encouraged at any point in the process, plan ahead for how to manage and use input. At times, a working group may decide against “popular opinion” based on the research and information gathered. In these cases, it is important to provide an explanation for the decision.

IV. Engage Faculty and Departments

Regular communication and outreach with faculty and department chairs are essential for successfully implementing the outcomes at the institutional level. Appoint an individual, or individuals, from the working group to be the dedicated point of contact. This person (or persons) will communicate with faculty and chairs on a regular basis—weekly, if possible, but once a month at minimum—to keep them fully informed and to offer opportunities to be involved in various stages of the process.

Faculty engagement plays a crucial role in successful implementation of the learning outcomes; therefore, be patient and mindful of what is needed to inform them of proposed changes. It may take several meetings, conference calls, webinars, or other methods to help faculty understand and agree on those changes. Explain why it is important to make these changes and provide supporting evidence of the positive effects that learning outcomes can have on the implementation of multiple math pathways.

A Possible Model for Faculty Engagement

Tuning is a process through which faculty members create shared understandings of the knowledge and transferable skills that students in specific academic disciplines and professional fields must demonstrate upon degree completion. Tuning was developed in Europe in 2000 and later promoted as part of the Lumina Foundation’s “Degree Qualifications Profile” in 2009.

The activities of the working group should be coordinated with the larger communication efforts of math task forces, steering committees, or any other stakeholder group capable of reaching a wider audience.

V. Get Final Approval

Before the recommendations can be finalized, all stakeholders who have been involved in the process should have an opportunity to review, provide feedback, and approve the proposed outcomes. This is especially true for department chairs and math faculty—the people responsible for implementing the outcomes in their institutions and in the classrooms.

Conduct a thorough vetting process and be sure to get approval from all relevant stakeholders. Consider reserving the so-called final blessing for the chairs, as they are the ones who will work most closely with faculty to implement the outcomes. Allow for feedback in the form of meetings or conference calls. Again, know when to limit the amount of feedback and save lingering concerns for a later date.

VI. Support Ongoing Implementation

Once the student learning outcomes have been approved, a kickoff meeting or event that unveils the new outcomes to a wider audience will help launch this effort. The event should include the math faculty and department chairs who will be responsible for implementing the changes on their campuses. Consider planning subsequent workshops for faculty to help them with classroom-level implementation. (See the DCMP website in “Suggested Resources.”)

Faculty and chair engagement is essential to support ongoing implementation. Developing or providing resources, such as handbooks and toolkits, to faculty and chairs will help guide the process at individual institutions. (See the Interstate Passport in “Suggested Resources.”) In addition, constant and careful measurement of student promotion and completion will be necessary to show evidence that the outcomes are working. Remember to stay flexible—the outcomes will continue to evolve and progress over time.

A Possible Model for Student Learning Outcomes (SLO) Development

The [Educate Idaho Network](#) used a successful process to develop the state’s college access and success network by creating a statewide strategy and plan of action. While the model is not directly related to student learning outcomes, its principles align well with those in the SLO process:

- **Common Agenda:** Creating a shared vision for change based on a common understanding of the problem and agreed-upon solutions
- **Shared Measurement:** Collecting data and measuring results consistently across the partnership
- **Mutually Reinforcing Activities:** Coordinating differentiated activities through a mutually reinforcing plan of action
- **Continuous Communication:** Engaging in consistent and open communication to build trust, ensure mutual objectives, and create common motivation
- **Backbone Support:** Working collaboratively with team members to coordinate participating organizations and activities

Summary of the Student Learning Outcomes Process

Phases	Associated Activities
I. Establish a Working Group	<ul style="list-style-type: none">• Set the charge.• Define key roles and responsibilities.• Develop working group activities and deliverables.• Actively recruit members to fill roles.
II. Conduct Research and Gather Input	<ul style="list-style-type: none">• Uncover areas for collaboration and coordination between faculty, departments, partner disciplines, and across institutions and systems to develop a new course or refine an existing one.• Define what student success looks like.• Consult trusted resources (e.g., MAA) that can best inform the courses and outcomes in question.• Recognize when to cut off input in order to keep the process moving forward.
III. Draft Recommendations	<ul style="list-style-type: none">• Adhere to the timeline.• Think beyond content standards and consider problem-solving and practical skills.• Make recommendations understandable and accessible.• Identify the commonalities that can be quickly addressed.• Seek expert advice to move beyond any roadblocks.• Explain why changes are being proposed.
IV. Engage Faculty and Departments	<ul style="list-style-type: none">• Develop communication and outreach plans capable of reaching a diverse audience.• Coordinate efforts with other stakeholders.• Establish strategies to address pushback.• Provide evidence-based information when disseminating information about the learning outcomes.• Host convenings with expert facilitation of discussions related to the outcomes.
V. Get Final Approval	<ul style="list-style-type: none">• Conduct a thorough vetting process.• Get approval from all relevant stakeholders.• Reserve the “final blessing” for the chairs.
VI. Support Ongoing Implementation	<ul style="list-style-type: none">• Host a kickoff meeting.• Offer ongoing training.• Provide resources such as guides, handbooks, and other supports for faculty.

Suggested Resources

Dana Center Mathematics Pathways (DCMP)

The DCMP resource site provides an extensive overview of the Dana Center’s mathematics pathways model and associated state activities. It offers a collection of valuable **resources** for faculty, institutional leadership, researchers, and state-level policymakers.

“Establishing a working group,” Charles A. Dana Center at The University of Texas at Austin

This resource is part of *Developing a state action plan toolkit (2014)*, a suite of materials designed to assist stakeholders in creating a state action plan to enact recommendations.

Interstate Passport, Western Interstate Commission for Higher Education (WICHE)

This WICHE program seeks to improve student transfer across state lines. Learning outcomes for nine essential **learning and skill areas**, faculty **handbooks**, and other **resources** were developed as part of this program.

Liberal Education and America’s Promise (LEAP), American Association of State Colleges and Universities

This national public advocacy and campus action initiative provides a set of **essential learning outcomes** and “Principles of Excellence” to guide student progress through college.

Mathematical Association of America (MAA) Committee on the Undergraduate Program in Mathematics

The MAA’s committee makes cognitive and content recommendations to help math departments design curriculum for undergraduate students and produces curriculum guides with program and course area reports every year.

Transparent pathways, clear outcomes: Using disciplinary tuning to improve teaching, learning, and student success, Midwestern Higher Education Compact (MHEC)

This publication provides an overview of the tuning process, which uses learning outcomes as critical reference points to engage faculty and help them reach consensus on what students need to know to succeed.

About the authors at the Charles A. Dana Center

Author: Carl Krueger, National Policy Specialist

Reviewers: Amy Getz, Strategic Implementation Lead; and Martha Ellis, Interim Director, Higher Education Services

External Reviewers: Rey Garcia, President, Garcia Higher Education Consulting; Terese Rainwater, President, Rainwater Consulting

Editing/Graphic Design: Ophella C. Dano, Senior Writer/Editor; Phil Swann, Senior Designer

About the Dana Center Mathematics Pathways

The Dana Center Mathematics Pathways (DCMP) is a systemic approach to dramatically increasing the number of students who complete math coursework aligned with their chosen program of study and who successfully achieve their postsecondary goals. The DCMP was initially launched as the New Mathways Project (NMP) in 2012 through a joint enterprise with the Texas Association of Community Colleges. For more information about the DCMP, see www.dcmathpathways.org.

© 2017 The Charles A. Dana Center at The University of Texas at Austin