**Guidelines for *Pathways* Instructors**

***Getting your class started***

1. Briefly introduce the course

An optional activity: Invite students to share their majors and describe one attribute they will need to be successful in the profession they want to pursue (engineer, nurse, lawyer, doctor, etc.). Students typically respond with answers like: i) critical thinker, ii) good communicator, iii) good problem solver, iii) good listener, iv) asks questions to uncover problems; v) understand ideas; vi) make connections, etc. Follow this up by asking students if past math classes have helped them develop these attributes. Most will say no. This provides you with an opportunity to build positive momentum into the course by conveying how lucky they are to be in a math class that is focused on helping them develop these abilities/traits!

2. Emphasize that it is essential that they attend class and put forth effort to make sense of ideas/problems. Express how much you care about their learning and let them know that your caring will be expressed in asking them to explain their thinking and helping them learn to make sense of problems on their own. Communicate that they have a responsibility to ask questions when something is unclear. Let them know that they should not get discouraged by failed attempts, but instead think about what went wrong and modify their approach and try again. Share that even mathematicians have many failed attempts as they work toward their solution. In fact, we want to promote the idea that mathematical problem solving is a process not unlike other processes such as writing papers, crafting speeches, etc. that involves first presenting one’s initial thinking, then shaping and refining it, and eventually developing more polished and robust arguments or generalizations.

1. Give students a tour of the various *Pathways* learning resources some time during the first week. This tour should include locating and opening up a video from the *Pathways* precalculus online textbook (indicated by a camera icon). We recommend you pick a relevant video, watch it as a class, and hold a conversation with students about what they noticed or learned from watching the video. We also recommend that you give an assignment for students to read the online textbook and view the videos related to the investigation you’ll be using during your next class.

(New *Pathways* instructors often report that they benefit tremendously by reading the online textbook themselves and watching the online videos. The videos in each section provide a model for leading a conceptually oriented lecture/discussion about specific ideas that are the focus of a particular investigation. Note that the online text section numbers align with a specific investigation (e.g., Section 2.4 of the online textbook is aligned with Module 2, Investigation 4).

1. Post your course pacing guide and homework assignment schedule for students.

* Require students to complete some online homework between every class session.
* We recommend that you require students to complete a review assignment (or quiz) weekly or after each module. This can be an IMathAS quiz (or homework) that includes capstone questions from that module.
  + Student learning is dramatically improved when they are provided repeated opportunities to develop fluency in reasoning and using ideas to solve problems.

***Implementation Tips for Maximizing Student Learning***

1. Display a problem from an investigation or the homework as students arrive in class and develop the expectation that they begin working right away. Choose the problem so that it addresses a challenging idea from the homework they recently completed or assesses whether they read and watched the video in the online text.
2. Select starred questions in the investigations to complete in class. Much of this work can be assigned to students to complete in groups, although for some tasks you might choose to complete them as a whole class. Require that all students produce a written product when completing workbook tasks, even when working in groups. As students are working in groups circulate among the groups to: i) pose questions to help students make sense of/represent the quantities in the problem context, , ii) ask students to explain their thinking and provide a rationale for their approach, iii) encourage student to listen to their peers and compare their thinking with other members in their group, and iii) make suggestions to support students in making connections.

*Some specific questions to support student engagement in “meaning making.”*

* Have you illustrated quantities in the situation in a drawing?
* What two variables are you trying to relate?
* Did you define your variables?
* Can you represent values of that varying quantity with an expression?
* What varying quantity in the problem situation has values represented by that term/expression?
* What does your graph convey about how quantity A (e.g., the bottle’s volume, Jim’s distance from the start) and quantity B (e.g., the height of the water in the bottle, the amount of time elapsed since the start-gun was fired) are changing together?

1. Lecture and/or hold whole class discussions for the purpose of helping students make connections and see how ideas in a lesson are related. Your lecture should model how you approach and make sense of a problem. Talk through what you are thinking and explain why, not just how!

As you lecture:

* Verbalize the thinking you engage in to conceptualize and represent the quantities in an applied problem using a diagram.
  + Model a consistent approach for creating a drawing to represent the quantities in a problem context (e.g., vectors with an arrow represent a varying quantity in the situation).
* Be specific in defining and referencing variables and terms when building expressions and formulas to relate quantities.
  + When defining variables specify where the measurement starts, the direction that is positive and the units used in the measurement (e.g., the distance (number of feet) north of the stop sign).
* Pose questions to specific students to keep all students engaged in constructing their own meaning during your lecture (see question list above).
  + Learn students’ names and/or devise a way to randomly call on students to share their thinking.

1. When students are working in groups encourage students to

* Engage with one another
  + Bill: Can you see how Natasha’s solution is different than yours?
  + Marta: Can you explain what Bob just said?
  + Brandon: Can you explain your approach to Anna?
* Report their thinking/solution approach for the most conceptually challenging question(s) in an investigation.
  + Consider using whiteboards for students to prepare group solutions; tell groups that all people within the group need to be prepared to explain the group’s solution.

1. Give short open-ended quizzes every few weeks. This provides valuable formative data about your students’ learning. When grading quizzes deduct points if they fail to: i) be specific when defining their variables, ii) illustrate a problem context with a drawing, iii) show work needed to obtain their solution, etc. These conventions can be very helpful for improving the performance of struggling students and understandings of all students.
2. Work through the homework questions prior to making an assignment. (This will assure that you are aware of what students will be experiencing.) If you have time toward the end of class, pull up one (or two) homework questions for students to discuss and answer individually. (This is a good way to take attendance and get students comfortable with how to input values in the homework system.)