

SEMI-FLIPPED: SMALL STEPS WITH UNDERPREPARED STUDENTS

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Abstract

The author discusses an instructional approach that has evolved over five years of teaching to assist underprepared students succeed in algebra and improve study skills. The semi-flipped classroom approach incorporated involves students completing pre-work outside of class in MyLab Math, participating in guided questions during class, and practicing homework problems in MyLab Math. The pre-work involves students watching the textbook author's video on a topic and completing a problem or two. The completion of pre-work prepares the students for collaborating on an in-class handout which builds into completing more involved problems with the instructor. The semi-flipped approach has allowed more time for in-depth problems during class.

Introduction

Far too many students graduate from high school underprepared for college-level work and college readiness in math can often be the greatest obstacle to students' success. According to Boylan and Bonham (2007), "Developmental education refers to a broad range of courses and services organized and delivered in an effort to retain students and ensure the successful completion of their post-secondary goals" (p. 2). Unfortunately, the student success rates for developmental mathematics classes are particularly low. Lack of success in developmental mathematics is discouraging for students. They begin to doubt their academic ability. It also becomes expensive for students to repeat courses as they spend money and accumulate debt.

Despite the discouraging statistics, developmental mathematics can have a positive impact on students. Bailey, Jeong, and Cho (2010) articulated that students who successfully completed developmental mathematics requirements are more likely to pass their college-level mathematics requirements. McClenney (1997) and Lesik (2007) reported that participating in a developmental mathematics course has an overall positive impact on student retention as students who complete their developmental mathematics course requirements are more likely to persist in college. Wheland, Konet, and Butler (2003) stated that "instructors must develop effective methodologies to help underprepared students" (p. 26). Depree (1998) also stressed the importance of investigating teaching methods that may improve course completion rates in developmental mathematics.

One instructional strategy to engage students is the flipped classroom. A flipped classroom is a teaching strategy which reverses the traditional educational format (Milman, 2012).

Within this model, instructional content is provided to students prior to the class, often online and in video format, and learning activities, which are traditionally completed as homework, are moved into the classroom (Abeysekera & Dawson, 2015; Herreid & Schiller, 2013). While video content often plays a significant role in the delivery of a flipped classroom, it is not just about using videos in classes, but rather how best to use in-class time with students (Sams & Bergmann, 2013).

Why?

Over my five years of teaching algebra to underprepared students, I noticed a lack of note-taking skills, interaction between students, understanding of basic mathematical terms, and having class time to work in-depth problems. After incorporating a number of instructional strategies with limited success, I researched the flipped classroom. Based on the research and knowing my student population, I decided to start on a smaller scale of flipping the class.

Semi-flipped

The semi-flipped classroom approach (Fig. 1) that I incorporated involves students completing pre-work outside of class in MyLab Math, participating in guided questions and problems during class, and practicing homework problems outside of class in MyLab Math.

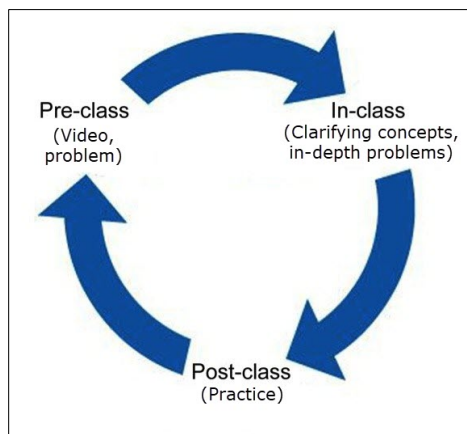


Figure 1. Semi-flipped classroom model

The pre-work involves students watching the author's video on a topic and completing a problem. If another topic is being covered, another video is shown with a problem following. Most pre-works are 1 to 4 topics, depending on content and class schedule. The students cannot access the problems for the pre-work until they watch the videos. I encourage students to take notes while watching the videos to improve their note-taking skills. Students have access to the help features in MyLab Math to attempt the problems. All problems in the pre-work need to be written down in a notebook with work shown and answers circled. When I first implemented the semi-flipped classroom, I had separate homework and pre-work assignments setup in MyLab Math. Students would not always complete both assignments. Based on the students' feedback, I incorporated the pre-work activities into the homework assignments for the second semester. Students now have one

assignment which includes practice problems from the day's lesson and the pre-work for the next class session (Fig. 2).

Do Homework

Name: HW U4L3

Due: 04/22/20 10:00am

Current Score: 0% (0 points out of 7)

Attempts: 3 per question

Late Submission Penalty: **100 % deducted from questions completed after due date**

View the media files and questions listed below in the order listed. Questions that are not clickable will become available when you have viewed the required media.

Media: 1	Scored Media: 0	Questions: 6	Correct: 0	Partial Credit: 0	Incorrect: 0
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Question 1 (0/1)

Question 2 (0/1)

Question 3 (0/1)

Question 4 (0/1)

8.2 Obj 1 Solve Quadratic Equations by Using the Quadratic Formula (0/1)

Question 5 (0/1)

Question 6 (0/1)

Pre-work

Figure 2. Pre-work setup in MyLab Math

I use the term semi-flipped as I do some instruction during class. We begin class by reviewing on the board two or three most missed homework problems that I select from MyLab Math (I am able to view data on the homework assignment to determine the most missed problems and most attempted to select for review). Students work together through the first section of the handout (Fig. 3) that I provide at the beginning of each unit. The students should be able to work through this part of the handout if they attempted the pre-work. This gives me the opportunity to touch base with each student and identify areas of confusion. We then take time as a class to clarify misunderstandings prior to moving into problems.

April 22nd

U4L4

1. To apply the quadratic formula, a quadratic equation must be written in the form _____ where $a \neq 0$.
2. To apply the quadratic formula to solve the equation $8x^2 - 42x - 27 = 0$, the value of a is _____, the value of b is _____, and the value of c is _____.

Solve Using the Quadratic Formula

If a quadratic equation does not factor easily, use the quadratic formula.

$ax^2 + bx + c = 0$ where a, b, c are real numbers and $a \neq 0$ then

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

1. Set the equation in _____
2. Identify _____, _____, and _____
3. _____ the values into the quadratic formula
4. Simplify

Best Method?

The equation $x^2 - 49 = 0$ can be solved by using the _____ property, by _____, or the _____. Which method makes the most sense?

Figure 3. In-class lesson handout

The students work together on a number of problems that build on the concepts discussed from the pre-work (Fig. 4). Some problems are worked through as a class using guided questions.

U4L4 Additional Problems

Solve using the quadratic formula.

1. $2x^2 + 9x = -10$

Is there another method you could use for this one? If so, see if you obtain the same result.

2. $y^2 + 4 = 6y$

3. $\frac{1}{5}x^2 + x + \frac{3}{5} = 0$

Figure 4. In-class lesson problems

Practice problems are assigned from the day's lesson for the next class (Fig. 5). The homework involves a number of problems incorporating basic concepts and building to more difficult problems. Following the practice problems is the pre-work for the next class session.

Do Homework

Name: HW U4L4
 Due: 04/24/20 10:00am
 Current Score: 0% (0 points out of 12)
 Attempts: 3 per question
 Late Submission Penalty: **100 % deducted from questions completed after due date**

Skill Builder is available to help just when you need it.

View the media files and questions listed below in the order listed. Questions that are not clickable will become available when you have viewed the required media.

Media: 1	Scored Media: 0	Questions: 11	Correct: 0	Partial Credit: 0	Incorrect: 0
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Question 1 (0/1)
 Question 2 (0/1)
 Question 3 (0/1)
 Question 4 (0/1)
 Question 5 (0/1)
 Question 6 (0/1)
 Question 7 (0/1)
 Question 8 (0/1)
 Question 9 (0/1)

Practice problems

6.5 Obj 1 Solve Equations Containing Rational Expressions (0/1)

Question 10 (0/1)
 Question 11 (0/1)

Figure 5. In-class practice problems

Benefits

The semi-flipped classroom has provided a number of benefits. I have multiple opportunities during class to check-in with each student to ensure they understand the content. I noticed an increase in collaboration, but I can't say if that's due to the semi-flipped approach or personalities of a different incoming freshmen class. I do think the students are more comfortable working through the lesson handout with their classmates from seeing the content in the pre-work. The handout saves time on students writing rules and procedures when being discussed. The problems are there so they do not need to copy what we are working on. Not needing to cover the basic terminology and rules at the beginning of a lesson has provided more time to work in-depth problems in class. The biggest benefit to using the semi-flipped classroom this past year was the transition to fully online for COVID-19. The students adjusted quickly in continuing to use MyLab Math for assignments and Zoom for live sessions incorporating breakout rooms.

Cons

As with any instructional approach, there are pitfalls. The biggest one that I've encountered is that not all students watch the videos or take notes when doing so. This means they do

not come to class prepared for the new material. This affects collaboration on the in-class handout and in-depth problems during class. Another issue is some students just don't like to collaborate during class or work on the task at hand. They want to wait for others to complete the notes or write everything down when we review as a class.

What has helped?

The author's videos made the transition easier as they were already made and in short segments. Using one assignment that contains both the homework and pre-work has helped students in completing the work required for the next class. As this is a new instructional model for most students, I incorporated a syllabus statement on how students will learn (Fig. 6). The course uses inclusive access which enables students to create their Pearson accounts without worrying about payment (cost is added to tuition). This provides access to MyLab Math containing the assignments the first day of class (Fig. 7). MyLab Math is also integrated into our learning management system for single sign-on.

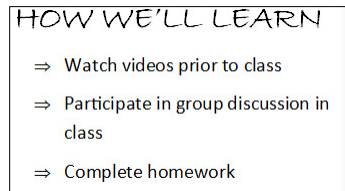


Figure 6. Syllabus statement

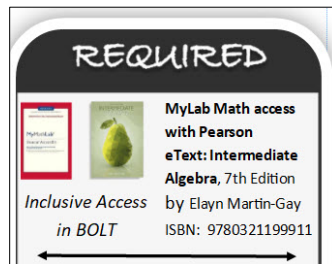


Figure 7. Inclusive access

Conclusions

A semi-flipped approach worked best for my situation as most of my students have been taught in a traditional format. If you decide to flip your class, there are a few things to consider. One is to ask yourself what content makes sense to flip. Once you make that decision, determine how the content will be delivered outside of the classroom and how much. From there, write activities for the classroom portion. Make sure not to 'reteach' what was delivered outside of the classroom. Finally, learning needs to be assessed in some format. I continued to use traditional in-class quizzes and exams.

As the research shows, working with underprepared, mostly freshmen, students gives me the opportunity to not only teach them algebra, but to build their confidence with math and guide them in time management and study skills for college success. Early results indicate the semi-flipped approach increased student learning, collaboration, and a deeper understanding of material.

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