<u>The Modified Flipped Classroom: a case study</u>

This paper will serve as an introduction to my transition of my class from a traditional class to a more "flipped" classroom model in the 2012-2013 school year. Before we begin, I will define a few terms:

<u>Traditional classroom</u>: A classroom where students come to class, receive lecture-based instruction on a daily topic, practice in class on that topic, and then receive a HW assignment on that topic to be completed that evening.

<u>Flipped classroom</u>: A classroom model where students come to class having already been assigned a HW assignment on the day's topic the night before. This assignment serves as a preview of the days lesson, and typically comes in the form of a short video. Hence the "flipped" idea, as the lecture takes place outside of class, and the homework is done in class.

Although there has been a great deal of talk about flipped classrooms over the past several years in the education world, I will detail my specific experiences with this model, and how I modified it to suit my classroom's needs.

For the first several years of my teaching career, I was given a curriculum and a pacing plan, and told to stick to that "no matter what". At the time, I was teaching 9th graders who were mostly several grade levels below 9th grade in their math skills. I started out the year with the plan intact, only for it to fall apart within days as I realized that most of my students still couldn't perform most of the

prerequisite skills for the class. I have heard of many teachers being faced with this same dilemma: should I stick to the curriculum and have large amounts of students failing, or stop and review the skills the students needed, but be far behind the pacing plan?

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The term "Zone of Proximal Development" is often used in education to describe the level of rigor that a student can be challenged at, but still succeed. It is defined as "the distance between the actual developmental level as determined by independent problem solving and the level of potential development as determined through problem solving under adult guidance, or in collaboration with more capable peers."[1] I hadn't heard of this concept until several years into my teaching career, but it really started me thinking on how I could identify and help students when teaching a classroom of mixed-level students. One option, and often the most accessible to me, was to deviate from the curriculum to remediate with struggling students, especially if a large portion of the class was struggling. However, this put me in a position where there was no way that I could reach my curricular goals by the end of the year. If students didn't have certain skills mastered by the end of the year, I would be putting their teacher next year in the same position I was in! Another option was to keep going at the pace of the curriculum, but provide remediation outside of class. This worked for students, but only if students were able to attend after school tutoring on a regular basis. This also was an exhaustive measure to take as a teacher, as I was spending 3-4 hours before or after school tutoring students on a weekly basis. This was fine for the short term, but clearly not a sustainable model.

The compromise I eventually settled on was to maintain the pace of my curriculum, but to set a minimum level of mastery for each unit (or chapter) for students that were really struggling. This allowed me to "set the bar" for success within students' Zone of Proximal Development, but set

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1   L.S. Vygotsky: *Mind in Society: Development of Higher Psychological Processes*, p. 86

students up for success in the ensuing years by pushing them to mastery in certain key topics. I would measure this minimum level of mastery through a series of quizzes, which I eventually called "Gateway quizzes".

Gateway quizzes were a series of quizzes that students would take throughout the year, usually several weeks after being introduced to a given topic. Students could retake Gateways as many times as needed to achieve a predetermined level of mastery (this year, 90%). I used a test-generating software to generate multiple versions of a quiz as needed, and set multiple retake times.

This seemed to solve my curricular conundrum, but only to a point: with only weeks left in the school year, I still had an alarming amount of students that still hadn't mastered all of the requisite skills on their Gateway quizzes. After going into panic mode and holding hours of extra tutoring in a (mostly successful) attempt to get all students to pass before the end of the year, I realized that there was still a missing piece of the puzzle.

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One thing I have been working on diligently since my first year of teaching is my delivery of instruction. I have been told that I am engaging speaker, and I have actively sought out talented educators to make sure that I was not delivering boring, uninspiring lectures in my classes. One goal of mine early on was to have every student engaged during class. I have worked with many talented educators on a variety of project-based and inquiry-based curriculums, either implementing such existing programs like IMP (Integrated Math Project)[2], or creating our own. I have also developed techniques based on perceived student needs, such as The Magic Six, which is a system I devised to help students tackle word problems. In my yearly questionnaire given to students asking them to evaluate my teaching, many students responses reflected my teaching positively. I remember one

2   www.mathimp.org

student telling me that they "didn't like Algebra, but I like the way you teach it."

While this praise and success with student interaction was encouraging and flattering, my numbers were telling a different story. My students were engaged and participating in the learning process, but then why were more than a third of my students still struggling to master their Gateway quizzes on basic topics?

The first question I asked myself was if my quizzes were simply too rigorous, and out of the reach of some of my learners. Perhaps, but the reality was that the topics that I selected for my baseline Gateways were already omitting some key skills that students would need for Algebra II, such as factoring. Further, this was an Algebra I course in a college-prep high school, so lowering the already minimum bar would jeopardize student odds for success in Algebra II and beyond.

The second question I posed was if I was putting in enough hours outside of class. I am a dedicated teacher, and I am always looking for ways to help students learn, so this is a philosophical dilemma I often think about. At the time, I was offering 3 hours of office hours open to all students, in addition to a 3-hour Saturday class devoted to students who were really struggling. Coupled with almost 300 minutes of teaching time per day and numerous hours preparing for class, it appeared as if I was already working at an unsustainable pace.

I realized that my solutions to this point weren't foolish or misguided, but I was looking for solutions in the wrong place. Instead of evaluating what more I could add on, what I should have been examining was ways to make student learning more efficient. It was only until I reached a breaking point, when I was routinely working 12-13 hour days, that I realized how much time students were spending in my class *not* learning. I examined this perspective from the perspective of hypothetical student, and what this student's experience in my class might look like. I assumed that this student was motivated to succeed, and therefore would complete assignments when asked. For the sake of example, I have created this scenario based on what any given student might encounter in my old classroom model. This scenario is culled from years of student and peer feedback, student data, and

anecdotal experiences:

The student, let's call him John, arrives to Mr. Rothgeb's class. He did the HW last night, but didn't understand some of them, so he copied a lot of tough ones from a friend this morning in the cafeteria. He picks up a Do Now sheet as he walks in the room, which consists of five ACT-style multiple choice questions. He knows a two of them, is pretty sure about a third, and guesses on the last two. He then fills in the Old Vocabulary section of his Do Now sheet by flipping back through his binder and copying the definitions from old Do Now sheets.

Next, John knows he is supposed to start on the practice problems from today, so he opens his book to the section listed on the board as he has been told to do many times before. He fails to notice the Big Idea written on the board, and fails to notice that it is identical to the section heading in his book. He skips over all of the text of the section to the problem set, and copies down #1 on his sheet of graph paper. He isn't really sure how to do any of these, so he spends as much time as possible writing a header at the top of his page, then "zones out" for a little while, only pretending to look at the problem set when Mr. Rothgeb circulates around to check on him.

After a few minutes, Mr. Rothgeb asks if there were questions on the HW, and John knows that there were some he didn't understand, but he doesn't really get what to ask, plus no one is asking questions right now, and he doesn't want to be the first one! Mr. Rothgeb goes over a few, "cold-calling" on students. John tries to pay attention as best he can, because he most certainly does not want Mr. Rothgeb to call on him.

After a bit, Mr. Rothgeb asks students to trade and grade the blue Do Now sheet with the person behind them in their row. After getting his paper back, John notices that he got a 3/5. He got the two correct he knew how to do, got the one wrong he sort of knew how to do, and got one of ones right that he no idea how to do but simply guessed

on. Mr. Rothgeb then asks students to raise their hands for each question number if they got it correct, and records the responses in his binder. Mr. Rothgeb goes over a couple of questions that not many students got wrong. John pays attention for the one he sort of knew how to do, and figures out what he did wrong, but he still doesn't understand the really tough one he didn't get. Mr. Rothgeb also goes over the other tough one he guessed on and got right, but he got that one right, so he kind of zones out for that one.

Then, Mr. Rothgeb asks everyone to get out a sheet of graph paper for notes and write a header at the top. He starts a lecture on the topic for today. John does't mind the lectures, as he thinks Mr. Rothgeb is pretty funny, but it is really hard to pay attention for this long. He has been sitting still for more than a half an hour at this point, and he is starting to get antsy. He spends most of the lecture trying to pay attention so that he doesn't look silly if Mr. Rothgeb calls on him.

After a while, Mr. Rothgeb finishes his lecture, and asks students to take a look at the problem set for today. John already has #1 copied down, but he still isn't quite sure what to do. Mr. Rothgeb went over some practice problems with the class, and John copied them down, but he still was unclear on certain parts. Some students were called on and some asked questions, but John was still copying and didn't quite get what they said. He was about to ask a question, but then the lecture stopped.

Mr. Rothgeb then asks everyone to get in their pre-assigned groups. John is working today with Jack and Jill. Jack is absent a lot, so he is pretty behind, but Jill is seems to get what is going on. Jack pretty much checks out and only pretends to be paying attention when Mr. Rothgeb comes around to check in with the group. John spends most of the time asking Jill what to do and watching as she works out example problems for him.

After a period of group work, Mr. Rothgeb stops group work, and asks students

to get back into individual rows. He pauses to wrap up on the problems that students were working on in groups, and John, having had Jill and now Mr. Rothgeb show him how to do a few problems, feels a little better and more confident in his ability to do these types of questions. He can't quantify how what he is doing fits into what they have been doing lately, but he feels pretty confident he can complete problems like the ones he was just practicing.

Mr. Rothgeb writes on the board the individual numbers of questions students should try by themselves, and to raise their hand when they are finished. John finishes the questions, raises his hand, and gets 1 out of 2 right. Mr. Rothgeb gives him a hint on what he did incorrectly, and he fixes his mistake, raises his hand again, and gets the question correct.

After a period of individual work, Mr. Rothgeb asks students to put everything under their desk and hands out a quiz. Most of the questions are review questions, but one question is like the problems from today. The quiz is short, and John thinks most of the questions are pretty easy. Students quickly swap and grade, and John finds out that he got 4 out of 5 correct on the quiz. The only one he got wrong was the one that was on today's topic. He isn't quite sure what he did wrong, but class is ending, so he turns in his quiz and goes to his next class.

That night, John sits down to do his HW. He remembers a couple, as they are just like the ones Mr. Rothgeb explained, but he can't really remember how to do the other ones. He feels like this happens a lot: he understands things when Mr. Rothgeb explains them, but then he can't remember it when tries his HW at night. He does as much as he can, then figures he can hopefully copy the rest from Jill tomorrow morning before school.

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The scenario above is the result of several years of me constantly improving and working on my classroom. I would like to note that my classroom management is excellent, and my transitions were quick and efficient. One consistent piece of positive feedback I've received from my principals, lead teachers, and peers over the years is that my classroom management was exemplary. Many classrooms (including mine for the few few years of my career) have a great deal of distractions that take away from students learning – students getting up and moving around, students entering and leaving the room at varying times during class, students actively engaging in talking or texting, etc. Due to my school's clear expectations and my personal abilities as a classroom manager, these above issues were almost nonexistent. Students in my classroom were in their seats and working silently before the bell rang, every class. In fact, my classroom was often recommended as a model to observe to teachers who were struggling with classroom management. I was creating Do Nows that were specifically aligned to our standardized tests, and I was tracking student results on those Do Nows daily. My lectures had been honed to be engaging and time-efficient over a decade of trial-and-error. I am sure there is still room for improvement in each of these areas, but I mention all of the things above to stress that almost all of the typical distractions to learning (kids misbehaving, teacher is boring and lectures the whole class, etc.) were almost completely removed.

Yet, there I was with more than a third of my students with several Gateways to master still, and only a couple of weeks left in the semester. Wasn't I doing everything right? Students were on task from bell-to-bell, I was recording Do Now and quiz data, and really putting a lot of time into creating dynamic lectures with elaborate slideshows and visuals. Why weren't my students learning at the pace I wanted them to?

For any teacher who has ever gotten the results of a recent unit test and exclaimed, "How could my students do this poorly? We must have gone over this a dozen times!", you can perhaps sympathize

with my plight. The lightbulb clicked when I realized that although I had perhaps "gone over" a given

topic ten times, there was little guarantee that a student was actively learning at that time. I want to be

clear that I am not against lecture-based teaching or lecturing, but it does require the students to sit and

listen, which is a passive learning activity. I can have a place in the classroom, but I realized if you

look at the example above, John was spending well over 65-70% of class time in a passive learning

activity. From grading another student's work from a key, but not reflecting on what he was grading, to

listening to a lecture, to having Jill model questions for him, John wasn't spending enough time with

trial-and-error himself. John wasn't spending enough time asking the questions that he wanted to ask,

and wasn't always getting the help he needed. When I reflected on this, I realized how many students,

teachers, parents, and advisors had told me that their student "tells me they get it when you explain it in

class, but then can't do it when they try it themselves at home". Despite all of my hard work over the

course of nearly a decade in teaching, I realized something still needed to change.

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For some time, I have been a proponent and personal practitioner of metabolic resistance

training (MRT), defined as "completing structural and compound exercises with little rest in between

exercises in an effort to maximize calorie burn and increase metabolic rate during and after the

workout."[3] Popular in various forms in the world, it involves compound, functional movements

performed at high intensity. If you have heard of the Crossfit philosophy, that is based largely on MRT

principles. P90X or Zumba are variations on the same theme. I could elaborate on my passion for

MRT at great length, but the reason I mention it here is that it is surprisingly efficient. I have lost

nearly 45lbs of fat off of my body, and am on pace to lost 15 more within this next few months, all by

quitting my gym and stopping my 4x a week jogging habit. In addition, my HDL cholesterol and

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3   Perry, Marc. "Metabolic Training 101: Definition, Benefits, and Exercises." Web log post. *Built Lean*. Built Lean, 10
     Jan. 2011. Web. 9 July 2013.

energy levels are up, my LDL cholesterol and resting heart rate are down, and I sleep and feel much better than I have in a long time. All by performing workouts at home in a fraction of the time it takes to jog 5 miles. The reason is simple: you are performing full-body, functional movements that work all parts of the body at high intensity. You get much more out of 10 minutes of MRT than 45 minutes of jogging, not to mention jogging isn't really a full-body movement.

It was my quest to improve my physical fitness and lower my body fat that ignited a spark on how to improve my classroom. The model I detailed above, in my mind, was akin to jogging. Nothing wrong with it per se, but was it the most efficient method to get results? I had students that were spending almost 4 hours weekly in class, in addition to 1-2 a week in office hours or outside tutoring, and still weren't mastering basic Algebra I concepts. I started to examine the amount of passive vs. active time students were spending in an average day in my class, and ways to increase their active learning.

My first experiment was to simply split the class into various groups based on ability, than have them work at a pace I set for them. Salman Khan, in one of his Khan Academy videos, extolls the virtues of small-group learning, "Don't try to deliver the same lesson to the entire class,..,rather look at the Dashboard to understand where each student is."[4]. This idea really appealed to me, but I ran into some roadblocks. First, I didn't have the technology in my classroom to allow small groups of students to watch a given video simultaneously. Second, given that I didn't have that technology, I would need to deliver multiple small-group lectures in a given class period. This proved logistically difficult, as I have to create a system where certain students were working quietly while other students were taking notes from my lecture.

Nevertheless, in the month of December, I gave this model a shot. I created a series of worksheets for each section in the book, than a large divider system to hold them all in one side of my room. Kids would practice a certain skills, then raise their hand to take a paper quiz when ready. If

4   Khan, Salman. "Small Group Instruction." Video blog post. *Khan Academy*. Khan Academy, 29 Mar. 2013. Web. 7 July 2013.

they scored high enough on the quiz (usually 8/10), than they could move on to the next section. When finished with the chapter, they could take a Chapter test. Students were allowed to retake any section or Chapter test as many times as needed to earn a passing score.

One success of all of this is that student feedback indicated that they were really on board with the idea. The concept of being able to slow down and take more time on something they understood, and speed quickly through concepts they did pick up quickly seemed to really resonate with them. One student in particular told her adviser, "I really like math class all of a sudden". The drawback was that it swung the pendulum too far in the other direction: students were doing lots of active work and learning, but were spending far too much time working independently, with no feedback. I realized that it was possible for a student to be working quietly for long periods of time without being sure if they were doing their work correctly! In addition, it became exhausting to attempt to deliver 3-4 separate lectures in one class period, while also attempting to answer student questions, grade quizzes, and give students feedback. To their credit, the students handled these transitions and stayed on task remarkably well, but my student data indicated that they were still not progressing at the pace they needed to. I realized that I needed to find a compromise where students were actively participating in their learning, but receiving constant feedback on their work. I also realized that students really appreciated the ability to have a bit more autonomy in their learning. These realizations paved the way for what happened next.

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Michelle Pacansky-Brock, an acclaimed online teaching consultant, notes, "While from afar, it may seem that technology is at the core of the flipped classroom model, I would argue differently. The

foundation of success is a clearly structured instructional design model that organizes content into learning modules, each aligned with a series of measurable learning objectives and a continued focus on modeling the importance of community. Also critical is the need for an instructor to make the intrinsic shift from 'sage on the stage' to 'guide on the side,' or, to reference Barr and Tagg again, from an instructional to a learning paradigm."[5]

I realized that my desire to improve my classroom organically was leading me to a flipped classroom model that Pacansky-Brock had described, and the details of the results are included in this case study. The model you see below began in February and carried through to the end of the year. The attached documents and writings detail exactly what a student would encounter on a daily basis. Perhaps most importantly, it roughly doubled the amount of time a student was actively learning, from 30 minutes to about 60 minutes per class. Also, with the daily quiz and sense of urgency put into their learning, students were now seeking out and using Khan Academy to help them in remediating their individual needs.

Lastly, well over 75% of my class had mastered all 17 Gateways by the end of April, and more than 90% mastered by June. A 50% increase in Gateway mastery, and roughly a 25% increase in student learning on Chapter assessments, all by allowing students to take charge of their own learning!

Jason Rothgeb

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5   Pacansky-Brock, Michelle. *Best Practices for Teaching with Emerging Technologies*. New York: Taylor & Francis, 2013. Print.