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A View into Secondary Education Mathematics

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Abstract

Teaching methods, and the effects they can have on students, are important to consider for a classroom because when teaching you should allow for every student to have an opportunity. Every student should feel encouraged in the classroom, however not every method may allow for that. An important task for a teacher is to find out how to reach their students in their classroom; be it adapting methods or choosing when to implement one item over another. This task differs with every student that enters the classroom as no student is the same. Every students' differences stem from their academic understanding, relationships with and in the school, work ethic, home life, race and ethnicity, and manner of a student. As a possible new teacher entering the field, I'm very inexperienced when it comes to deciphering the chaos of a classroom and finding the solutions to problems. This thesis is an attempt to independently learn more about the inner-workings of a classroom and compare my findings to a respected teacher in the field and see how he tackles certain problems. The teacher I'm collaborating with in this project is my mathematics teacher back when I was in high school; he was a big inspiration to me wanting to become a teacher as I found him to be an excellent role model in the classroom. I plan to use the culmination of my findings to further understand all of the moves I can effectively make in the classroom. What I found in this study were the consequences of not using homework for a grade, behavioral management tips and how to manage the flow of information in the classroom, things to consider with professionalism when it comes to teaching, small bits of relationship building, and other aspects to care for in the classroom.

A View Into Secondary Education Mathematics

Basis

When it comes to the students, managing the flow of content into the classroom can be a mess if not handled properly. According to the National Council of Teachers of Mathematics, there exists an excellent basis for the classroom, known as the "Guiding Principles for School Mathematics." Those principles are: *Teaching and Learning, Access and Equity, Curriculum, Tool and Technology, Assessment, and Professionalism.* To start, let's look at *Teaching and Learning.*

Teaching and Learning

Teaching and Learning refers to an effective mathematics program. Said program requires effective teaching that engages students in meaningful learning through individual and collaborative experiences. The purpose of said experiences are to promote the student's ability to make sense of mathematical ideas and reason mathematically (NCTM 2015). However, teaching mathematics is a rather complex task. To teach mathematics requires you to have a deep understanding of the topic. The National Council of Teachers of Mathematics has developed five interrelated strands that define the learning of mathematics; those strands are:

- Developing a conceptual understanding; the comprehension and connection of concepts, operations, and relations in mathematics.
    - The NCTM also mentions practices that promote a conceptual understanding of mathematics. Those practices are: *establish a goal to focus learning on, implement tasks of which focus on reasoning and problem solving, posing purposeful questions, using and connecting representations to one-another, facilitate meaningful mathematical*

> *discourse, elicit and use evidence of student thinking, and support productive struggle in the learning of math* (NCTM 2014).

- Developing procedural fluency; the meaningful and flexible use of certain mathematical procedures to solve specific problems.
- Strategic competence (the ability to formulate, represent, and solve mathematical problems).
- Using adaptive reasoning to think logically and to justify one's own thinking.
- Productive disposition (the tendency to see sense in mathematics, to perceive it as both useful and worthwhile, to believe that steady effort in learning mathematics pays off).

Conceptual Understanding Building (NCTM 2014)

To continue on developing a conceptual understanding, establishing a mathematical goal to focus learning is important as effective teaching establishes clear goals that the students work today. These goals can be used to situate learning progression and be used to guide instructional decisions. For instance, if the class is falling behind according to your goals, you can make the decision to slow down a bit and retry a subject; maybe focus on that topic for review when a test rolls around.

Next there's the implementation of tasks in the classroom to promote reasoning and problem solving. Developing a conceptual understanding requires a teacher to engage students in solving and discussing tasks that promote reasoning and problem solving. There are different types of tasks to implement for learning; those being low level and high level demands. Low level demands are simple tasks that involve memory and procedures without connections. Memorization typically goes with reproducing previously learned items or committing them to memory; this typically doesn't involve much connection to concepts. Procedures without

connections are typically easy problems that require limited cognitive demand and have no connection to the concepts that focus on the procedure. Higher level demanding tasks include procedures with connections and doing mathematics. Procedures with connections typically uses a procedure for deeper understanding of concepts and broadens itself to connect with other ideas. Doing mathematics is typically a problem that requires cognitive demand to solve and has students explore and understand the mathematics behind the concept. Higher level demanding tasks are the type of tasks that engage students in solving and discussing said task to promote reasoning and problem solving. This doesn't mean to exclude lower demanding tasks from the classroom as there are appropriate times for them; it just means that they're not the type of tasks to promote a conceptual understanding of a topic. When setting up your tasks to support there are aspects to keep in mind to support students' learning. To start, one of the aspects is to *discuss the key contextual features*; this involves a teacher and their students discussing any potentially unfamiliar features of a task. Next is *discussing key mathematical ideas* by talking about any ideas that a student may need about a problem; more importantly is hinting instead of directly telling a student how they'll need something. Next is *developing a common language to describe key features*; this involves a teacher soliciting input from students and building on their contributions and both supporting and pressing students to develop a common language to describe key features of a task. Finally there's *maintaining the cognitive demand* by avoiding suggesting a particular solution method to students (Jackson, Sahan, Gibbons, & Cobb 2012).

Another practice is the use and connection of mathematical representations to one-another. Similar to the high-level demand tasks, this involves engaging students in making connections amongst mathematical representations to further deepen one's understanding of math concepts and procedures. How to go about doing this as a math teacher is to encourage

purposeful selection of representations amongst students; have them use their knowledge in problem solving. Then there's engaging in dialogue about explicit connections using representations, and finally changing the direction of connections made with representations.

Another practice for effective teaching is facilitating meaningful mathematical discourse. Facilitating discourse amongst students builds shared knowledge in the classroom. Doing so allows students to analyze and compare what other students know about math. Doing this effectively as a teacher requires you to do certain practices. Those practices involve anticipating your students' responses prior to a lesson be it predicting their responses or if they'll respond to it. Next is in the present, monitor your students' work and engagement in a task. Doing so will allow you to gauge your student's progress and effectively select particular students to present their work to the class. Taking your students' answers, you can start sequencing their responses in a specific way for discussion; doing so allows for students to make connections to other students' responses and the key mathematical ideas you're working with. Now there are five types of messages to keep in mind when promoting discourse in the classroom. Those five messages are those about tasks, learning, and expectations for students, messages with regard to the relationships with the teacher, messages about relationships among fellow students, and finally messages about the rules and management structures of the classroom (Stein 2007). There are also two types of discourse to be considered in the classroom; those being cognitive discourse and motivational discourse (Stein, 2007). Cognitive discourse is what a teacher says in a lesson to promote the conceptual understanding of the ideas behind mathematics. Motivation discourse on the other hand are the supportive and non-supportive statements that a teacher can make to encourage or discourage participation in mathematics classroom discourse.

Posing purposeful questions is another effective form of teaching mathematics. Using this tool allows you to assess and advance your students. Doing so allows the student to make sense of important mathematical ideas and relationships. Types of questions/statements that a teacher can ask are assessing questions, advancing questions, and judicious telling (Freeburn & Arbaugh 2017). Assessing questions allows a teacher to find out what students are thinking and understanding during a lesson. An example would be a teacher asking a student how they would start a solution. Advancing questions build on and extend a students' current mathematical thinking towards a goal of a lesson. Judicious telling involves a teacher initiating ideas with students in a way that doesn't override the students' thinking process; maybe hinting at an idea the teacher sees them working towards.

More practices are to build procedural fluency for a topic and for a teacher to support productive struggle in learning mathematics. Building fluency with procedures on top of the conceptual understanding means for students to, over time, become skillful in using procedures flexibly as they solve contextual and mathematical problems. Supporting productive struggle involves providing opportunities on the individual and collective level for students to engage in productive struggle as they grapple new ideas and relationships in mathematics.

Finally there's elicit and use evidence of student thinking. Using evidence of student thinking allows a teacher to assess a student's progress toward mathematical understanding and to adjust instruction continually in ways that support and extend learning. To add onto this, there are eight common core state standards practice help develop rich mathematical reasoning for students. Those being making sense of problems and persevere in solving them, reason abstractly and quantitatively, construct viable arguments and critique the reasoning of others, model with mathematics, use appropriate tools strategically, attend to precision, look for and make use of

structure, and look for and express regularity in repeated reasoning. Mathematical practice two, seven, and eight (reason abstractly and quantitatively, look for and make use of structure, and look for and express regularity in repeated reasoning) can be considered blocks for the mathematical practices such that the rest of the practices all relate to those three (Kelemanik, Lucenta, & Creighton 2016). How this works is using the other mathematical practices to build into two, seven, and eight to further build upon practice one (make sense of problems and persevere in solving them).

Identity

Once teachers and students have effectively learned mathematics, then next is to develop a mathematical identity in mathematics. An identity in mathematics refers to how people see themselves and how others perceive them, taking into account personal histories, abilities, character, culture, and so on (Allen and Schnell 2016). It is the belief that students develop their ability to participate and effectively perform mathematics. How a teacher can build an identity in a student is by participating in four practices. First is to *know and believe in your students* by seeing them as people, making an effort to understand their lives, and believe in their abilities in mathematics. Second is *redefining mathematical success* by seeing your students as capable thinkers and problem solvers; your students must experience positive contributions that their fellow peers make. Third is *prioritizing student voice* by limiting broadcast questioning, establishing routines in the classroom that help students develop ideas privately and express them in small groups prior to presenting to the class, and having students help create the goals and write learning targets. Finally there's *monitor identity information*; keep track of your students growth and use it in the classroom (Allen and Schnell 2016). For students to develop an

identity, they need access for every resource available in the classroom; the next principle to talk about is providing access and equity in the classroom.

A teacher is also to design a classroom for student voice and agency (Speranzo & Tillema 2019). A teacher designing for voice is to know that their moves can create a whole-class discussion; that of which is critical for students to leverage their voice in the classroom and own their learning. A teacher is meant to start the discussion and merely comment on anything students say, and they're to look for evidence that students are reaching the learning goal of the lesson. A teacher designing for the agency's goal is to get students to see how mathematics can be used in powerful ways, especially to impact their community. A teacher is supposed to use math to connect it to students' context of life. Designing for voice and agency contributes to empowerment in the classroom and building a students' mathematical identity.

Access and Equity (NCTM 2014)

Effective mathematics programs require that all students have access to high-quality mathematics curriculums along with effective teaching and learning. A teacher needs to have high expectations and bring the necessary support and resources for success to maximize a student's learning potential. Providing access and equity to your class rests on beliefs and practices that empower all students to participate meaningfully in learning math and to achieve outcomes in mathematics that are not predicted by or correlated with student characteristics. However, equity in school mathematics is often mixed with the idea of equality of inputs. Providing all students with the same materials, same methods of teaching, same amount of time, and same support for learning is different from ensuring that every student has the same likelihood of achieving meaningful outcomes regardless of characteristics of the student.

Delivering high quality instruction and opportunities can be difficult for the teacher as not all students are the same.

There are certain practices that support these practices however; those being reflecting, noticing, and engaging in community (Chao, Murray, & Gutiérrezm 2014). The practice of reflecting means to view all students as holding mathematical knowledge, believe in your students' ability to mathematize their everyday world, and support students in developing meaningful and positive identities through mathematics. For a teacher to develop this skill, it requires them to reflect on their own self and evaluate their openness, self-awareness/self-reflectiveness, and commitment to culturally responsive teaching. The practice of noticing refers to paying close attention to your students' process of thinking. You're to attend to building their knowledge and shaping their identity in the classroom. The practice of engaging the community refers to forging a community in the classroom centered around mathematics; this includes modifying expectations for success and failure, assigning roles so students are responsible for each other and contributing equally, and using group assessments to encourage students' responsibility for each other's learning.

Providing proper equity in the classroom also means uncovering biases in a classroom (Wickett 1997). When a teacher is designing for student input in the class, they need to realize that when one student gets called on, they need to consider that another student can feel 'cheated.' You should look for opportunities that provide equity in the classroom. Wickett gives the examples of "are you calling on girls more than boys? Boys more than girls? Whites more than [people of color]? [People of color] more than white?" etc."

Curriculum (NCTM 2014)

The goal of a curriculum is to develop important mathematics content along coherent learning progressions and to develop connections between math and a student's world. Following a curriculum allows for students meeting standards. Building a coherent learning progression includes planning out materials, activities, tasks, units, lessons, and assessments. These are the means to which students do mathematics. There are problems when designing a curriculum however; the typical textbooks used in the classrooms focus only on the big mathematical ideas and only look to make connections among other topics. Students and teachers alike don't get much help when referring to the textbook as they mainly focus on producing correct answers rather than how to find the process to get towards a solution. There is also no focus on real world aspects as not everyone's world is the same. A teacher must go out of their way to figure out what a student's world includes.

There are consequences with the isolation between math and a student's world (Gutstein & Peterson 2013). One consequence is the message that gets portrayed to the students that math is almost completely irrelevant in the real world; it's only used for achieving success in future math classes, or becoming a scientist or mathematician. A second consequence is that students learn that math is not connected to social reality in a substantial way. Another consequence is that if students aren't taught how math can be applied in their everyday lives, then they're cheated of an important tool to help them fully participate in society. To know how to combine math with students' lives, you can follow the four goals of critical-mathematical literacy (Gutstein & Peterson 2013). The first goal is to *understand the mathematics*; this involves breaking down the dichotomy between learning and teaching mathematics, considering the interactions students may have in the real world and their development of mathematical

knowledge, and studying mathematical topics through deep and complicated questions no matter how simple the topic may be. The second goal is *understanding the mathematics of political knowledge*; this happens through understanding types of numerical descriptions and meanings of the sizes of numbers and using calculations to understand and confirm the logic of someone's argument to restate information, and to understand how raw data is collected and transformed into numerical descriptions of the world. The third goal is to *understand the politics of mathematical knowledge* by taking into account what data is collected, which numbers represent the most accurate data, and which definitions should guide how data is counted. The final goal is *understanding the politics of knowledge* by considering what counts as mathematical knowledge and re-representing an accurate picture of contributions of mathematical knowledge.

Tools and Technology (NCTM 2014)

Tools and technology in the classroom are an essential resource to help students learn and make sense of mathematical ideas, reason mathematically, and communicate their thinking much more simply. Technology can provide an easier way to understand how certain aspects work together. For example, graphing tends to be much easier to view on a screen with inputs/outputs rather than recreating it on pencil and paper. Useful technology in the classroom includes items that a student can interact with such as manipulatives. Knowing when to use this tool in the classroom can increase their value for a lesson as students can effectively engage with said tool. Another thing that a teacher must keep in mind is that technology must be an indispensable feature of the classroom allowing for students to use it as they please.

Assessment (NCTM 2014)

Assessment must be an integral part of instruction, providing evidence of proficiency with important mathematics content and practices. According to the NCTM, assessment should

serve four distinct functions in school mathematics. They should be used to monitor students' progress to promote learning, make instructional decisions to modify instruction to facilitate learning, evaluate students' achievement to summarize and report students' demonstrated understanding at a particular moment in time, and to evaluate programs to make decisions about instructional programs. Assessments based on this description should only support learning, however often the obstacle that assessments have in schools is that they are more an obstacle to promoting success.

Professionalism (NCTM 2014)

Finally there's professionalism which is when educators hold themselves, and their colleagues, accountable for the success of every student and for their personal and collective growth toward effective teaching and learning of mathematics. Math teachers are professors who do not do their work in isolation, or at least they shouldn't; there is support for professional collaboration and continual improvement in school. Educators are never satisfied with their accomplishments and are always working to have a larger impact in the classroom. Unfortunately in too many schools, professional isolation exists and severely undermines attempts to increase collaboration with colleagues internally in the school and math educators externally. Educators must hold others accountable for all students instead of just themselves to develop an excellent math program.

Approaches to Teaching

In the classroom, there are approaches to teaching that a teacher can take. These approaches determine the layout of the classroom, the rules and roles of the classroom, the way information is telegraphed to the students, and the expectations of everyone in the classroom including the teacher. For this, I want to look at three approaches that were discussed in the book

Approaches to Teaching (Fenstermacher, Soltis, & Sanger 2009). They are the Executive approach, the Facilitator approach, and the Liberationist approach.

Executive Approach

The executive approach views the teacher as a manager of the classroom overseeing the complex processes inside it. The teacher is charged with bringing about certain outcomes with students through using the best skills and techniques available to them. The curriculum of the class is carefully developed with materials meticulously thought for each task. The task of a teacher using the executive approach is fairly straightforward. They "just get the youngsters together, gain their attention, present a well-constructed lesson, and you could go home knowing that you did a day's work well" (Fenstermacher, Soltis, & Sanger 2009). When managing your classroom, the teacher has to determine what the students are expected to learn. You're to diagnose your students to determine their readiness for the material you wish to present to them. Afterwards, you can revise your plan as many times as you want when teaching that subject again.

The approach offers time management skills for teachers such as monitoring seatwork, reducing chitchat in the room, and maintaining an easy, comfortable means to bring to attention their confusion of material and for clarification to be brought up in class. This approach also gives the opportunity to use wait time. Wait time is the time that elapses between a teacher's question and a student's response to said question. It allows time to think about and do a question before a teacher calls on a student to answer. Another feature to this approach is that the teacher is completely free to concentrate specifically on the students and what they are learning as they essentially control everything in the classroom.

Facilitator Approach

The facilitator approach places high value on what students bring to the classroom; there is a considerable emphasis on making use of students' prior experiences. The facilitative teacher is typically empathetic and believes in helping people grow personally and reach a higher-level of self-actualization and self-understanding. They also believe that their students arrive at school already in possession of a great deal of mathematical knowledge and understanding; they're to honor and respect their students as knowledgeable persons. Doing so will affect the way the teacher and their students talk to each other, what they talk about, and how the teacher plans to engage each student in the topics of instruction. The main task for a teacher using the facilitator approach is to facilitate the coming together of the world that a student brings to school with the world the school seeks to bring to the student. New information and experiences must be offered in ways that facilitate the learner's imparting meaning to it, typically by connecting it to understandings already helped and building new frameworks to accommodate it. They're also to provide ample opportunity to introduce an aspect of teaching that deals with multiculturalism or diversity, and respect for certain human differences; those being race, ethnicity, gender, disability, and sexual orientation. One example of teaching in multiculturalism, of which is discussed Gutstein and Petersons *Rethinking Mathematics*, is teaching about different histories of mathematics is teaching about the Olmec's math system in 1200 B.C.. This is important to bring up as this was 800 years before Aristotle, Plato, and Euclid.

Liberationist Approach

The liberationist approach views the teacher as one who frees and opens the mind of the learner, creating an upbringing to create human ways of knowing and assisting the learner in becoming a well-rounded, knowledgeable, and moral human being. The liberationist is rooted in

the notion of liberal education, where their goal is to essentially liberate the mind to wonder, to know and understand, to imagine and create, to use one's full intellect. The features of this approach are that the liberationist believes that we are not free to dismiss anyone's knowledge as our capacity to understand our freedom and to choose wisely depend on our grasp of all knowledge of humankind; for this they require manner. To teach is to take on the manner of a teacher; there are certain moral and intellectual characteristics that are necessary to good teaching. Among those, there are the ability to be fair in one's interactions with students, to be skeptical about claims that have little-to-no evidence, to show respect for differences between persons in the class, and to provide criticism in ways that assist the students to improve without damaging their desire to keep trying. Why it's essential for a liberationist to take the manner of the teacher is it determines whether the knowledge and skills learned in the classroom will free the mind or simply be trapped with dull and irrelevant facts and skills. This makes the liberationist to be viewed as pursuing the freedom of the individual to pursue their own vision of a good life.

Field Report

Context

Over the first school week of May, 2022, I shadowed my old high-school math teacher, Mr. Gedert, from River Valley Middle/High School in Three Oaks, MI. I watched him teach for the week and compared my findings of how teaching math should go to how he teached his class. For the context of my school, RVMHS has slightly less than 300 students in the entire school; the classes are very small and personal. Mr. Gedert teaches 9th grade algebra, 10th grade geometry, and pre-calculus, however the 9th grade class typically is filled with middle schoolers who were proficient enough in math to test into algebra in 8th grade. Something that I knew going into this

project, oddly enough, is that Gedert doesn't work with his other colleagues on improving his content; he typically works on the individual level when it comes to teaching his class. I will talk about this more when I get to the professionalism section. During the week that I shadowed, I found out that the school switched to where only assessments are to be counted as a grade and homework isn't. Students had little incentive to do any homework as they knew it wasn't getting counted as a grade regardless of the class. The solution to this dilemma is that Mr. Gedert dedicated only fifteen minutes of his class time to teaching a subject and the rest to students working on homework at their own pace, from there he would either do paperwork, help students who needed it, and talk with students who finished their homework quickly (and hopefully correctly).

Findings (Basis and Approach)

What I saw in the classroom for the week was very interesting to say the least. I got to learn a lot from watching him teach various students; much more than when I was his student as my focus was the teaching side instead of the learning side. To start, Mr. Gedert's room was set up in rows. The setup didn't seem like there was much opportunity for group work if any. Watching his very first hour of the week made it seem like he was very lecture heavy and then he would shift gears for his class to just do homework. The decorations in the classroom caught my eye a lot while he was teaching his students; I became entranced with the posters and images for the first few minutes of the first day. It was very hard to keep my attention on Mr. Gedert originally, but I got used to not looking around quickly. I believe that his students on the other hand wouldn't really have a problem with this as Gedert immediately grabs their attention and gets them to work. It appeared that there are designated roles in each of his classes; his first hour heads to their seats and waits for their teacher's instruction.

How Mr. Gedert starts his class by asking his students to get out their notes and tells them where they'll be continuing off from the previous class. Something that I found very interesting was that Mr. Gedert has pre-filled out sheets for the students to use as notes that have a few blanks that they can finish. This gives them a basis for what they'll be learning and forces them to pay attention well enough to finish the notes themselves. Interestingly, I was watching each student very carefully and couldn't find anyone not filling out the notes. When starting to fill out the notes, Mr. Gedert gives a specific goal for the day and talks about what it relates to that they've learned so far. Already Mr. Gedert establishes a goal to focus learning; he typically keeps the goals very brief and to the point too. When it comes to conveying information to the classroom, Mr. Gedert's approach to teaching is very strange. Mr. Gedert teaches somewhat like the executive approach at the same time teaching somewhat like the facilitator approach. He does lecture based teaching where he manages the classroom in a sense, however he also believes that students are likely to already possess the knowledge he's teaching them and actually expects his students to blurt out every answer without raising their hand, and they do. It's not just one student either, it's his whole class. He teaches with examples and practical problems of the real world, but doesn't seem to care about anything but results from the students at the same time. It's perplexing. Mr. Gedert's second hour is pretty much no lecture and students talking amongst each other and to the teacher about their work. It's a rather laid back class for pre-calc students. They have a lot of liberty in there, and when asked about it, Mr. Gedert believes that these are all students that have high expectations and believes they possess the knowledge to do the work sufficiently with any needed guidance on his part. Mr. Gedert's third hour is similar to his first, however, he tries to be more of an executive in that class as it can get a tad rowdier. Mr. Gedert's fourth and fifth hour on the other hand executive as they're the middle schoolers in the algebra

class. They're in his class at the end of the day, already wanting to go home, and they don't respect Mr. Gedert as much as the older kids as they've never had him as a teacher prior. Eventually, according to Mr. Gedert, the students typically mellow out as the years go on no matter who they are. For now however, he's much harder on those students and doesn't allow them to blurt out answers like his other classes.

In general, assessments play a big part in the classroom as Mr. Gedert plans on having a quiz or a test once a week or once every other week. He uses their scores as a gauge for the class and asks for their input whenever necessary. For example, during his second hour one day, he asked his entire class if they wanted to skip a topic entirely as they already seemed to have mastered it quicker than Mr. Gedert was expecting. Only one person said no and that prevented them from skipping that subject. In his first hour however, there was an assessment the class didn't do too well on. Mr. Gedert decided to do a bit of review before moving onto the next subject and asked the whole class a question, which everyone had a hard time answering. Because students were having a hard time answering different questions about math, Mr. Gedert decided to say, "listen before we move onto section two, I need to make sure you know the difference between inscribed angles and central angle problems (that being what they were covering at the time). He decided that he wanted to take another day to work on the problems given for that topic. When talking to him about the curriculum, he planned for this section to be slow as it was the first time he recovered this subject since Covid. Another thing he talked about was the fact that he didn't do group work anymore due to Covid, or at the very least arrange the desks to support group work. Because of Covid, students were encouraged by the school to work on the individual level, which was the contrast of how the class was for me back when I was in his class. Another consequence of Covid was students not wanting to do homework when they

were stuck at home for that period of online school. Because of the lack of motivation, RVMHS changed their grading policy to only count assessments instead of just homework. Now with the students in the class, they're unmotivated to do homework at all as they know it won't be counted as a grade. Mr. Gedert mentioned how new teachers learn about exploration and how they're encouraged to sway away from the method that he does notes. Gedert's justification for his note taking process was rather interesting to hear. Watching him ask his students about inscribed angles and central angles, and how barely any student would answer in a class of students who I know personally should know the answer, showed Gedert's justification. He gave them an exploration activity, but so many students were unmotiviated to explore or just didn't want to show the teacher their exploration. In theory students exploring would be a fantastic idea, however in practice students can become shy and can be hard wired to rely on the teacher. His work around for trying to get students to explore on their own is dedicating a fraction of the class to lecture and then letting the class do their homework for the rest of the hour. When it comes to assessment for his fourth and fifth hour, as they are more chaotic than his first three hours, they tend to fall behind a bit and Mr. Gedert has to keep going. There are horrendous behavioral problems in the classes and that affects his motivation to work with those students. One of the days that I shadowed for his class, he had to move multiple students in the first minutes of the class and would get very assertive when students would blurt out answers. There are a few students with A's in the class, but overall, at the time of me doing this project, 50% of the class was failing. His fourth and fifth hours are learning the same topics and the same time, so he tries to change up what he can with the fifth hour to deal with the problems that they share, but other than that assessments rarely help him in his last classes.

When it comes to professionalism and curriculum, Mr. Gedert makes all of the choices in his class when it comes to what's being taught and when it's being taught. He's been there for almost 20 years now so the school trusts him to make necessary decisions. One thing to note is that the other math teachers in the building have *not* been there nearly that long. Mr. Gedert does not talk to his other teachers unless they come to him. He told me that talking to other teachers is helpful when you're a beginning teacher, but eventually it'll become 'worthless.' The only guidance he looks for from other teachers is for how to deal with students he hasn't dealt with yet. Other than that, he's rocking it out solo. I found that interesting as he told me he has no idea what's going on in the classes of his fellow teachers and vice versa. How would he know if the other teachers are failing in their duties and he would be given students that weren't proficient in their previous math classes? That wasn't answered during my shadow experience. There was one instance of professionalism that I saw during the project, and it was during teacher appreciation day where he made sure that the break room was held accountable for free food for the teachers. Jokes aside, if he's really stumped on what to do, he actually bought an online software that helps create lesson plans and activities to use when teaching a certain topic in class. He showed me it when he had downtime in class; he showed me the worksheet he developed for working with acute and obtuse angles for his first and third hour class. When looking at the tasks, I saw that there were questions that asked for students to defend their answer or explain their reasoning in ways that essentially showed that they were required to know the definitions of acute/obtuse angles, but definitions that relate like for instance that a circle is 360 degrees. It seems that his tasks prioritize procedures with connections with highlight conceptual understandings.

When whether to implement technology into lessons or not, Mr. Gedert actually chooses to implement it after the students have mastered a topic. An example is after the first and third

hour final got down all of the angle types they had been working with (complementary, supplementary, inscribed, etc.), they got to work with manipulatives online that assessed their knowledge. It was some website that was connected to the teacher's account and he was able to see all of their answers. Similar to the fourth and fifth hour, the students worked on computers, but not using manipulatives, instead working with definitions of certain topics. His justification for this is that students seem to get distracted when shown technology for a lesson. He would rather them learn it with pencil and paper first because of this, then move to it online.

Discussion in the classroom, as mentioned before, is typically just Mr. Gedert lecturing and students blurting out the answers in all but his last two classes. The last two classes are only Mr. Gedert lecturing with actually little time to do homework depending on the behavior. Regardless, the discussions in his other classes caught my attention when discussing what to do when solving a problem. The way he does it is he breaks down the problem and asks students to give steps instead of solving for the answer. Not to say that he doesn't do this in his fourth and fifth hour classes, he just does it much more in the first, second, and third hour. When asking for an answer and a student gets a wrong answer, the type of conversation isn't very motivational as he just shuts down a wrong idea immediately. An example of this was in his third hour when asking about opposite angles, he shows a quadrilateral and asks which angles are opposites. When a student gave an incorrect answer, he just said, "nope," and asked another student. Once a student gave a correct answer, he would explain how it's correct. This kind of shattered what I've been learning about being a teacher as I've been taught that you're not supposed to just shut down incorrect answers. Mr. Gedert's reasoning was that he wanted to move through the lecture quickly as he wanted to give students as much time as possible when working on their homework. When Mr. Gedert needs to call on students, he doesn't try to form any biases unless

time is running low. In the fourth and fifth hour, he told me he prefers to call only on the students who he believes would know the answers as he wants to get through work quickly. In his other classes, that isn't the case. He calls on anyone and everyone when looking for an answer from somebody, if nobody blurted an answer out.

One thing to note about my old high school is that it's a predominantly white area. Last time I checked the census, River Valley High School was 89 percent white with a small percentage being either asian, native, hispanic, and black; with the school size being less than 300 students, there's not many members for each group. How that affected the classroom was Mr. Gedert, and most teachers in that school from what I remember, didn't really feel pressured to shift the curriculum for the sake of representation for such a small pool of people. I asked Mr. Gedert about his thoughts on the topic, and he really didn't have much. Essentially, he just wants to make sure every person in the class feels welcomed regardless of race. Watching him in action with his students, even with such a majority being white, there wasn't a bias, from what I could tell, in the classroom. Anyone who had raised their hand/blurted something out usually got called on or responded to. I saw that he made sure that every student who needed help received help until they no longer needed it when it came time to do homework.

There is a lot to consider based on the information I found for this project. Mr. Gedert doesn't really use everything and that's what I expected. What I found from him is that teaching really depends on what's going on in the classroom. Something that Mr. Gedert told me on the last day of the project is that you can prepare for a class for an infinite amount of time, but when put into practice, something will always happen where you aren't happy and you need to work around the students. When designing his class, working in the class, deciding what was going to be homework, etc. it depended on the students entirely. There can be situations where you have

to choose a ‘poison.’ For instance, Mr. Gedert chose to not slow down and recap in his fourth and fifth hour as he had to dedicate class time to get them under control and wanted to dedicate time to homework. I was surprised to see what he doesn’t use, such as technology initially with any lesson for example. Because of this limited time working with him, I didn’t get much time to compare everything as when he wasn’t lecturing, he would be grading, working with a student individually, or have me watch the class if he needed to go somewhere. Keep in mind that he would lecture for about 15 minutes and spend the next 40 minutes letting students do homework. In fear of me being bored, he let me work with students personally when the lecture ended to practice for if and when I would become a teacher. I wish I got to see more, but I’m happy with this project as is.

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