The Third-Year Teacher Rut

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Abstract: *In this paper, I discuss a recent revelation regarding my use of* Teachers Pay Teachers *(TPT) lessons. I analyze falsehoods promoted by a Crime Scene Investigation (CSI) activity I downloaded from TPT and discuss ways in which the lesson unwittingly re-enforced implicit bias and stereotypes of other cultures among my students. Lastly, I explore possible revisions generated with teaching colleagues in a recent graduate-level pedagogy course.*

Keywords: *algebra, collaborative feedback, cultural bias, Teachers Pay Teachers*

1 How I Came to Know *Teachers Pay Teachers*: A Love Story in 3 Acts

1.1 Act 1: Year One—Too Much, Too Fast

As I entered my classroom for the first time, I flipped on the lights. My heart palpitated. Looking at the 25 desks that would soon be filled with students, I turned to the Ohio State Geometry Blueprint that listed the plethora of standards I was supposed to cover over the next nine months. My eyes glazed over while I pieced together what I could remember of polygons, proofs, transformations, congruency, similarity, circles, and probability. My first year of teaching was akin to running on a treadmill set a little too fast—I could never seem to catch up, but at least I was not falling on my face. I felt a deep pressure to create all of my own lessons while simultaneously reviewing the many mathematical concepts my students and I were supposed to know. I saw myself as the driving force—the author and the orchestrator—behind every notes handout, every interactive activity, and every problem-solving puzzle presented to my students. Even though the materials I created included numerous mistakes—some mathematical, some pedagogical, I needed to prove to myself (and my students) that I could create ingenious scavenger hunts and engaging station activities on my own. *I am a teacher!*

It was in this context that I discovered a wonder of a resource, *Teachers Pay Teachers*, a website that reminded me of the beauty of the pre-existing wheel. *You mean, I can buy things that other teachers have already made? Activities that are already solved with absolutely no mistakes? As in I do not have to make every little handout, worksheet, activity, or even classroom decoration? Why did no one tell me about this resource before?*

1.2 Act 2: Year Two—Kicking It Up a Notch

My second year rolled around, and I was at the top of my geometry instruction game. I was teaching the same course as the year before, so I could reuse my best activities and then spend hours making improvements by sorting through the mazes, task cards, scavenger hunts, color by numbers, escape rooms, doodle notes, walkabouts, stations, murder mysteries, games, and riddles within the blackhole that is the *Teachers Pay Teachers* search bar. While the options were overwhelming, I got the hang of the standards I needed to cover and worked my magic. That treadmill had nothing on me—I even stepped up the speed a notch on my own.

1.3 Act 3: Year Three—Catching My Breath

Then my third year happened. With two full years under my belt, planning became a breeze; I kept the pace of my treadmill and felt like I could finally catch my breath. I had my own repertoire of resources: those I had built and modified, those from my co-workers, and the growing bank of pristine interactive fun from *Teachers Pay Teachers*.

STUDENT : Mrs. Miller, what are we doing today?
ME : Oh just you wait...we're going to have some fun today!
STUDENT : I think your definition of fun is slightly different than ours.
ME : Okay, but just trust me. It's going to be good.
STUDENT : (*45 minutes later*) Okay, maybe you were kind of right . . . that wasn't the worst activity ever. Did you buy that off that one website?

Even with a group of energetic and sassy teenagers under my care, everyone seemed to enjoy how this "one website" was spicing up our routine.

After the geometry standardized test towards the end of that crazy year, I decided—with the help of my department—to review big concepts from Algebra I in order to prepare my students for Algebra II after the hiatus that is Geometry. After a quick pre-test, I came to the conclusion that my students needed to review solving equations from a problem-solving standpoint as opposed to the rote plug-and-chug type method to which they had become accustomed.

STUDENT : Mrs. Miller, solving equations is easy. I really don't think we need to practice. Can we just watch a movie?
ME : Oh, really? You do? Then how do you explain how half of you missed the question where you had to solve an equation on your pre-test?
EVERYONE : *Silence*.
ME : It is funny to me how so many of you rated yourselves so well on your confidence with solving, but then didn't actually solve the equation.

Whispers of, "well, that's awkward," flooded the room as we came to an agreement that solving equations needed to be practiced, but at a deeper level and with a splash of hype to balance the end-of-the-year jitters. So, to *Teachers Pay Teachers* I went.

2 Crime Scene Investigation: Solving Equations

I found what I initially believed to be the perfect equation solving activity for an end-of-year review—a history-themed Crime Scene Investigation (CSI) that engaged students in equation solving as they found the culprit by solving a series of puzzles. These were not just any old equations, either; there were fractions, word problems, literal equations, and a symbolic representation of an equation. The feeling that this lesson was going to be good radiated through my core. I partnered up my students and set them off with the challenge that the first pair to finish successfully would earn a prize (donuts, of course). Students raced against one another as they racked their brains for new ways to solve problems and identify the culprit, especially with the challenge from the third crime scene—a task that gave students a symbolic equation to solve using Babylonian numbers (see Figure 1).

STUDENT : What the heck IS this?
ME : Hmm... I don't know. What do you think?
STUDENT : These aren't even numbers!
ME : Interesting . . . you might have to get creative on this one.

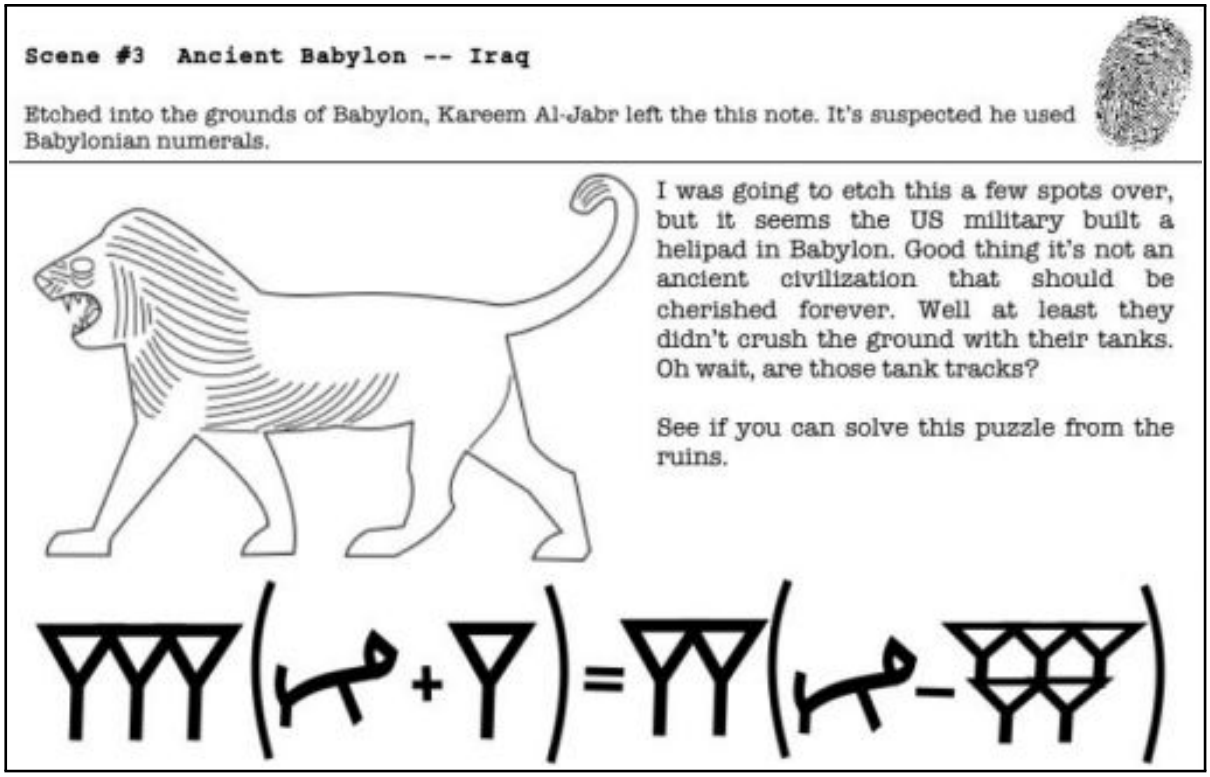

Fig. 1: *Crime Scene #3 (Clark Creative Education, 2019).*

My students' eyes rolled as I walked away, leaving them with time for productive struggle. Returning a few minutes later, I came back to see papers filled with variables and numbers that were not included in the original problem (see Figure 2).

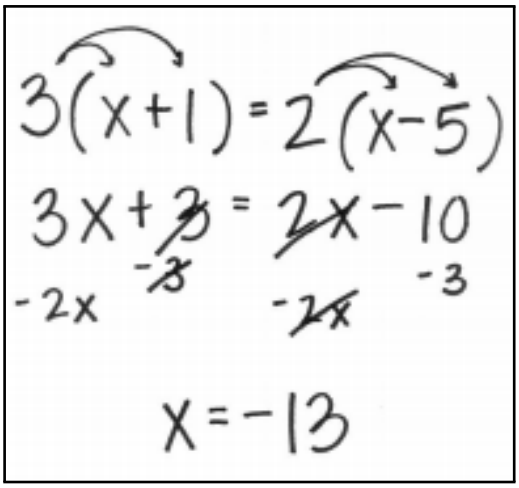

Fig. 2: *After giving students time to contemplate the best solution strategy, many would come up with work similar to this, even though x's were not part of the original question.*

ME : Where did those x's come from?

STUDENT : Well, we knew that symbol was the variable by looking ahead to what piece we needed, so we just used an x instead. Then we knew we had to distribute because of the parentheses and then we just solved like normal.

I expected my students to wrestle with the question from Scene #3 and was proud of how they surprised me. This challenge encouraged students to enhance their structural reasoning by "recognizing equivalent or similar mathematical properties in different forms and across multiple representations" (Druken & Hawthorne, 2019, p. 298). Students are often more concerned about regurgitating knowledge and processes instead of utilizing the *Standards of Mathematical Practice* (CCSSI, 2010) to search for innovative ways to solve problems. This crime scene, however, offered students the opportunity to "step back and [look] for properties that [were] embedded in mathematical representations before selecting a procedure," the first step in structural reasoning (Druken and Hawthorne, 2019, p. 296).

There were, however, two common thought processes I was not entirely sure how to handle. When approaching this task, several students utilized two variables, setting it up like so:

$$3a(b+a) = 2a(b-5a) \tag{1}$$

In short, these students misconstrued Babylonian units as unknowns rather than as constant values, leading to the eventual answer $b = -13a$, instead of $b = -13$. The other common error was that students saw the "5" symbol as "3 over 2" (see Figure 3).

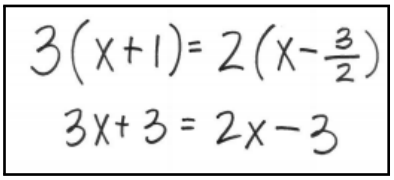

Fig. 3: *A common student error, misrepresenting Babylonian "5" as* $\frac{3}{2}$.

STUDENT : Is this right?
ME : (*Staring at the paper with pursed lips.*) Well, I really like how you thought about this, I didn't see that symbol as $\frac{3}{2}$.
STUDENT : Oh, you saw it as 5.
ME : Yeah, exactly . . . and that might serve you better here.

And in that instant, I was sure her creative spirit was crushed.

3 Collaborative Feedback

In this minute of speechlessness, a flag went up reminding me to bring up these struggles to my colleagues in a month or so when we were scheduled to meet during a summer graduate course, *Mathematics Misconceptions: Diagnosis and Remediation* (EDT 566), as part of my MAT work at Miami University. In the course, I presented the *Teachers Pay Teachers* CSI lesson and showed video clips of students working through each challenge, including the aforementioned one. My peers were to make research-guided revisions, which my burnt-out teacher brain welcomed as I continued to grapple with how I addressed my students' learning needs during the upcoming school year. In a moment of self-perceived vulnerability I expressed my concerns about my students' struggles and misconceptions, looking for advice from trusted colleagues.

COLLEAGUE 1 : What if you told them those symbols in the problem were actually Babylonian numbers?
COLLEAGUE 2 : Yeah! I was thinking the same thing! Then if they knew that, they would know one Y represented a unit, so they wouldn't need a second variable.

COLLEAGUE 3 : Oh! And that would help anyone thinking it was $\frac{3}{2}$ because they could see that symbol actually represents 5!

COLLEAGUE 1 : You could even make a hint card if kids are still struggling with it, because you said some students just couldn't figure it out. Just put a list of all the Babylonian symbols, but cover up the numbers. Make them figure out the pattern.

COLLEAGUE 4 : We were thinking the same thing! You could also teach a mini-lesson talking about the Babylonian number system and what it looks like so maybe they're not caught so off guard.

COLLEAGUE 2 : But that was part of the challenge for them—to see a different representation of an equation and reason through the similarities to a "normal" equation.

Cue my internal monologue buzzing with ideas a million miles an hour. But this was only the precipice as one of my colleagues asked the following: *"Going back to that history lesson, though. The activity already references the Code of Hammurabi and the Rhind Papyrus. Do we feel like any of our kids actually understand what those are and how they contributed to math?"*

In the case of my own students, they most definitely are not familiar with the Code of Hammurabi or the Rhind Papyrus—of the contributions of Babylonians or Egyptians to modern-day mathematics. It's not uncommon for my students to insinuate that I am somehow the creator of all mathematics (and am therefore the most evil person on the planet). My students have little to no knowledge of the long, long line of mathematicians who have made lasting contributions far greater than they could even imagine. And how could they? "History" is not mentioned a single time in any of the *Common Core State Standards for Mathematics* (CCSSI, 2010).

By discovering the historical context of math, however, students will "see and appreciate the nature, role, and fascination of mathematics; so that students know that people are still creating mathematics" (Marshall & Rich, 2000, p. 705). They can begin to piece together the history of humanity and why mathematics plays a vital role in our development as humans. Not only that, but as one of my colleagues stated, "How can we expect students to master solving equations in such a small window of time when it took ancient mathematicians centuries to get to this point?"

Students can get discouraged when it takes time to understand material, but little do they know it took centuries to develop and prove many of the ideas that they encounter in their daily mathematics lessons. As I continued to analyze the *Teachers Pay Teachers* CSI lesson for revisions with a historical lens, I was genuinely surprised by what I found. While the mathematical challenges in the CSI lessons were effective in deepening my students' understanding of equations, they were inadvertently reaffirming and reinforcing stereotypes many of them hold —particularly those regarding cultures of the Middle East.

4 Falsehoods in the Investigation

At Crime Scene #5, the culprit brags about his successful theft of the Rhind Papyrus (see Figure 4) and presents a problem that is allegedly from this historical artifact. The question asks students to solve "Problem 44" which said "The sum of a certain quantity p together with its two-third, and its half becomes 234." Although there are plenty of mathematical problems and proofs presented within the Papyrus, no such task is presented in the document (Howard, 2009).

This was not the only case where a historical artifact was falsely represented, nor was it the most offensive. In Crime Scene #2, students are informed that the culprit had stolen the Code of Hammurabi (see Figure 5) and was reading into "Rule 204" which he had translated to say, *"What you do to one side you better do to the other side. Otherwise, your hand will be cut off."*

Fig. 4: *The Rhind Papyrus on display in London (British Museum, 2019).*

Sadly, this rule does not exist in the Code of Hammurabi—rather, it reflects stereotypes and misconceptions of Middle Eastern culture and ethics held by the lesson plan author. According to L.W. King's translation of the Code, Rule 204 actually says, *"If a freed man strike the body of another freed man, he shall pay ten shekels in money"* (Lillian Goldman Law Library, 2008). The contrast between the violence portrayed in the fictional rule and the actual one was not lost on me.

Fig. 5: *The Code of Hammurabi on display at the Louvre (History.com Editors, 2019).*

To a certain extent, I understand the intent of the misleading Crime Scene #2 task. The author invoked the symbolism of left and right hands as a metaphor for the sides of an equation, as well as the importance of applying rules to "both sides" in the solution process. Regrettably, in his attempt to teach equation solving, the author perpetuates negative stereotypes about the Middle East and its history. By including the false notion that the Code of Hammurabi advocates brutal punishment for mathematical mistakes, the lesson perpetuates hate. By uncritically using the lesson, I unwittingly contributed to my students' ignorance of Middle Eastern culture and history.

Equally disturbing, although perhaps not surprising, none of my students mentioned or questioned any of the contexts for these challenges. I am sure several students skipped the directions and headed straight to the math anyway, but there is still a meaning behind this commentary, especially when it is the only exposure to mathematical history some of my students have ever had. I was implicitly allowing students to continue to believe the negative connotations that exist regarding the Middle East.

5 Implicit Bias in the Classroom

In a small school environment, it is easy for students to be sheltered from new ideas and opinions. Therefore, part of my job must be to introduce students to ideas, cultures, and beliefs they have not seen nor heard of before—a role I had not taken seriously until this point. In a post-9/11 world, allowing poor stereotypes of Middle Eastern cultures to fester is a disservice to my students and to all people. Anti-Middle Eastern and anti-Muslim sentiment is real. For instance, a 2011 survey conducted by the Pew Research Center found that words such as "violent" are commonly used in the United States and Europe to describe Muslims (Lipka, 2017). In the article *15 Years On, Muslims in the Middle East Still Feel the Backlash of 9/11*, Bassem Youssef (2016) notes that, "9/11 was not just a tragedy, it was the beginning of a terrible chaos we are still suffering from in the Middle East."

The view of Muslims as violent has little factual footing because "Muslims mostly say that suicide bombings and other forms of violence . . . in the name of Islam are rarely or never justified . . . including 91% in Iraq" (Lipka, 2017). The ancient land of Babylon, the place from which many of the references from my activity were derived, lies within the current borders of Iraq. Written between 1792-1750 BCE, the Code of Hammurabi was written by the Babylonian King Hammurabi in an effort to improve the lives of his subjects. The Code paved the way for societies to establish a justice system in which suspects are innocent until proven guilty (Mark, 2018).

If we simply glance over this modern application of the Code, it seems as though this ancient law encourages a system in which violence is always the answer. By including the assertion that students' hands would be chopped off for making a common mistake when solving an equation, I was endorsing this extreme mentality. Looking back on this CSI activity, this was one of the rare moments I wish one of my students would have called me out for this crazy claim. I could not have expected that, however, due to their lack of historical understanding of mathematics. According to Katz, "mathematics certainly existed in virtually every ancient civilization for which there are records" (2004, p. 1). Too often, students are only exposed to the picture-perfect textbook math with no understanding of the countless people and cultures throughout time who have advanced our understanding of mathematics.

Therefore, as a mathematics educator, it is imperative to consider that my responsibilities are not limited to procedural and content understanding. By introducing my students to the history of the Pythagorean Theorem, pi, trigonometry, area, and more, they will have a deeper awareness of how we, as a human race, have gotten to this point. In addition, showing them the various attempts at answering these deep questions, students will see that history is not, in fact, one-sided, but multifaceted, as mathematics was accessible to ancient people in all places. This historical appreciation can bridge the gap between lifeless material and learning that is relevant, exciting, and motivating.

6 Revisions

All this history talk brings me back to the question of what I did to revise this CSI activity. I struggled with how to change this lesson because at the end of the day, the math was exactly what my students needed. They practiced their structural reasoning, verbal expression, and written understanding, and they ultimately took their knowledge of equations to a deeper level. My main concerns were these random phrases filled with historical inaccuracies that I did not want to perpetuate nor ignore. So I did what I excel at: *I used my own voice.* Access to my revised plan is provided here: `https://tinyurl.com/csi-revised-plan`; a revised student handout is provided here: `https://tinyurl.com/csi-revised-handout`.

The goal of the lesson remains the same—to solve mathematics problems to figure out which suspect is trying to conquer the world. Our culprit has a bit more of an egotistical edge with slang and references to important topics such as Instagram, hashtags, and Netflix. Not to mention, the villain is now one of their beloved teachers instead of an unknown face. There are still allusions to ancient history as this criminal looks to kingdoms such as Babylon for advice on how not to successfully rule the world for the rest of eternity; but references to specific historical artifacts have been removed. Hint cards have been added for each station, including a key of Babylonian numbers for the third crime scene. Each of these resources are provided in the revised student handout: `https://tinyurl.com/csi-revised-handout`

7 "So What, Mrs. Miller?"

This seems somewhat underwhelming in a sense; all this discussion of history and bias, only to cut out all the references to context from the original activity. But this whole process has been quite the transformative experience for me. By the end of my third year, I was comfortable—one of the most dangerous feelings for a teacher. The enthusiasm and willingness to try new things had lulled since my first two years. With binders and flash drives filled with tried-and-true lessons and the worldwide Internet full of sparkly new ones, the thought of creating my own content became lackluster. The wheel had been invented and the wheel was rolling; if it ain't broke, don't fix it, right?

Wrong. While my students enjoyed the fun activities I was finding online, this experience helped me discover that what truly gets them interested in learning is me, myself, and I. The best days in my class are when I bring my energy and passion to the center of my teaching. Sure, I can take someone else's work and present it with no hiccups; however, it is when I add my own personal touches, quirky sayings, and math puns that students relate not just to me, but also to what I am teaching. Running to *Teachers Pay Teachers*, spending a quick buck, and making copies—that is the easiest way to pull off a good lesson. And sometimes that is the best thing I can do for my students. There are times when another teacher has come up with a better activity than I could that also gives me a new perspective on how to share knowledge with my students. It would be foolish of me to ignore teachers with more experience and the lessons they have already proven as effective.

This does not mean, however, that everything I find on *Teachers Pay Teachers* is perfect by any means. The structure of this CSI activity was wonderful and my end-of-the-year brain appreciated someone else's successful creativity. Yet I realized even when I am on the brink of burn out, my students still deserve my best—not someone else's. My knowledgeable and gracious colleagues helped me put my critical lens back on after a long break in my comfort zone so I could see how to enhance this lesson in my own way.

Part of what gets us math teachers jazzed is understanding the beauty of how far we have come and the intricacies that give way for mathematical proofs and truths. As I bring my own excitement to my classroom each day, it only makes sense to communicate our connectedness to cultures across the world throughout time and how they have contributed to our lives. With that, I do believe now is the time to turn off my treadmill, step outside, and get lost in the freedom to explore what is best for my classroom at my own pace, knowing that a running buddy is always a good idea. By engaging in conversations with other math teachers, incorporating a historical context, and looking to fresh resources for inspiration, not just answers, I can keep myself from falling into the fourth, fifth, tenth, or twentieth year rut. I will never know everything there is to know about teaching math, but I can continue to expand my horizons without falling into what is notably easier or compromising my own fire and heart that make me the awesome teacher that I am.

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