From "Struggle" to "Acceptance": Andy's Narrative of First-Time Teaching and Her Frames

Johan Benedict Cristobal
University of Nebraska-Lincoln

Using narrative analysis on experiences from Andy, a mathematics graduate student instructor, teaching for the first time, I address the question: How do frames of teaching and learning compare before, during, and after teaching for the first time as the main instructor? I focus on Andy's frames while reconstructing her semester-long experience, attending to the events that shaped her perception of these frames. For one, her "business" frame of teaching that she entered the semester with was at odds with her newfound responsibilities as the content instructor. This and other findings discussed have implications for the professional development and mentoring of future mathematics content instructors, including how newer instructors might be better oriented to manage and attend to classroom events.

Keywords: frames, noticing, graduate student instructors, narrative

The landscape of research on frames and teaching has no doubt explored the influence that frames have on the practices instructors enact. For one, the way instructors frame mathematics as a discipline and the learning of mathematics can result in responding to students in drastically different ways (Cristobal, 2024; Louie et al., 2021). These differences in frames may also result in perpetuating a culture of exclusion (Louie, 2017; Thanheiser, 2023). As a response, there have been strides, through professional development, in nudging educators towards asset-based frames of their students' contributions to the learning process (Bastian et al., 2024; Scheiner, 2023).

One corner of this landscape which requires more exploration is to understand how frames change outside of programs designed to nudge them. In other words, what requires more exploration is how do frames change as an instructor teaches day-to-day (or course-to-course). Therefore, the research question guiding this study was: *How do frames of teaching and learning compare before, during, and after their first-time teaching as Instructors of Record?*

This contributed report stems from a larger study that aimed to understand the experiences of mathematics graduate student instructors (GSIs) before, during, and after their first semester of teaching as the instructor of record. The perspective of GSIs is important for mathematics education to know and understand (Miller et al., 2018). In particular, for this study, the transformative experience of teaching for the first time provided a research space to explore how frames change. I report on one GSI's experience teaching for the first time which provides insight into how frames of teaching and of learning change in teaching.

There are multiple contributions drawn from this report. For practice, professional development (PD) leaders can develop resources to preemptively address difficult situations drawn from these experiences. Relatedly, I have hypothesized that graduate school is where future college faculty's teaching philosophy and practice begin to form. Therefore, a theoretical contribution of this study is adding to the array of experiences that future instructional faculty may bring when they enter the profession.

Motivation from the Literature

From a brief search, there appears to be little literature on how mathematics instructors' frames change. Two exceptions are Scheiner (2023) and Thanheiser (2023). Scheiner (2023) analyzed written reflections from prospective teachers before and after their experience in a

semester-long course designed to shift their frames with regards to student thinking. He found that within intentional design towards critical reflection of how instructors framed students' thinking, the prospective teachers were able to shift from deficit-based to strength-based frames. Thanheiser (2023) discussed three frames that mathematicians may have about the subject of mathematics itself. These three frames coincided with her career-long changing perception of what mathematics is.

This study is motivated to further the understanding of how instructors' frames change. Whereas Thanheiser provided a glimpse into how frames of mathematics can evolve, her anecdote happens over a large timescale. Whereas Scheiner demonstrated that an intentional PD program can indeed shift instructors' frames, he did not demonstrate such shifts or changes in the absence of intentional PD. The study did not intend to change instructors' frames, only to understand that if frames changed during an instructor's first semester of teaching, how do the frames compare. However, by asking instructors to reflect on their teaching and learning of mathematics, their frames changed. Fortuitously, this report filled gaps from Scheiner (2023) and Thanheiser (2023) by demonstrating that frames can change during a semester of teaching when instructors are asked to reflect on their teaching and learning of mathematics.

Theoretical Perspective

The theoretical focus of this narrative exploration is on frames. Frames (Goffman, 1986) are the interpretive contexts that participants of a given situation use in order to quickly interpret information, filter the details, and decide how to appropriately proceed. In addition, frames are conceptualized as a facet of teacher noticing, where the way one frames the teaching or learning mathematics influences the ways in which they attend, interpret, or respond to situations in the classroom (Louie et al., 2021; Scheiner, 2021). As exemplified by Jessup (2023), a situated and socially constructed conceptualization of noticing, and also frames, allows for the consideration of the instructors' histories that shape how they notice.

This study focused on instructors' frames of their teaching and their students' learning by building upon the analytic framework in Cristobal (2024). In this framework, frames of teaching could be understood as interpretive contexts that support instructors' perception and enactment of (1) what their role is in the classroom as the instructor, (2) what professional knowledge (Kunter et al., 2013) is relevant or valuable in the act of teaching mathematics, and (3) what type of interactions are favored or useful in fulfilling their role and achieving the intended mathematical learning goals.

Similarly, an instructor's frames of (student) learning can be understood as interpretive contexts that support instructors' perception and enactment of (1) what instructors must do for students to learn intended content, practices, and orientations, (2) what content, practices, and orientations should instructors attend to in the classroom, (3) what type of interactions are favored or useful in fulfilling their role and achieving the intended mathematical learning goals, and (4) where the class fits into students' schedules (or career paths) and what challenges competing responsibilities could pose to their learning.

To address the research question, change is conceptualized as change in or across one or more of these seven aspects of the framework.

Data and Method

This report focuses on the results of narrative analysis of Andy, a GSI, during her first semester of teaching College Algebra. Andy was chosen because her narrative illustrated the possibility of how frames change during a semester of teaching and when asked to reflect on her

frames. The data used in this report comes from a larger study of mathematics GSIs that aimed to understand the experiences of mathematics GSIs before, during, and after their first semester of teaching as the instructor of record. In this paper, "instructors of record" are responsible for the content-delivery and assessments of an undergraduate mathematics course.

To reconstruct narratives surrounding frames, I conducted multiple interviews before, during, and after each participant's first semester of teaching, conducted weekly observations, and collected weekly journal reflections. I followed a grounded theory approach during collection (Charmaz, 2006), meaning that subsequent collections were informed by the previous. For example, each new observation began to focus on aspects of teaching and learning that I had noticed in the prior weeks' data, such as GSI's ways of responding to student questions.

To organize all these forms of data, I utilized the three-dimensional inquiry space (Clandinin & Connelly, 2000). The three-dimensional inquiry space involves *interaction* (encompassing personal and social themes), *continuity* (encompassing past, present, and future), and *place* (encompassing physical context and space). These dimensions are used to organize the narratives towards restorying – the process of reorganizing narratives to some chosen structure (Creswell & Poth, 2018). I expand this structure to organize analysis towards both reconstruction of the narrative and theoretical saturation (Miles et al., 2019) about the nature of how frames change.

Within each dimension of the inquiry-space, I continued the grounded theory approach through multiple rounds of constant comparative analysis (Glaser, 1965). First, I focused on themes that relate to frames of teaching, then I focused on themes that relate to frames of student learning. This allowed for an understanding of each dimension for a robust reconstruction of the narrative. After the initial reconstruction, I met with each participant to discuss the accuracy of the narrative.

Findings

In these findings, I illustrate Andy's change in frames by narratives from before, during, and after Andy's first semester of teaching.

Before the Semester

Andy's story starts two weeks before the summer teaching orientation for mathematics GSIs. Andy and I discussed her experiences as a student and her understanding of what it meant to teach and learn mathematics. Then, I asked her to recall a difficult experience as an undergraduate student. She shared that she struggled in a particular physics course that had multiple, seemingly disconnected topics, and expressed a desire for a thread to tie the topics of a course together. For her, instructors should attend to some thread that ties the topics of the course together for the student, an aspect of her frame of student learning.

For Andy, learning mathematics is a collaborative, social endeavor. She expressed that "because you remember certain things that stood out to you as elegant and useful, and other people remember different things from lecture," it was important for students to work and learn together. Thus, student-to-student interactions were highlighted in how she discussed learning.

The process of learning, to her, involves repetition and seeing the "underlying" structure of a problem, filling this "skeleton" with substance from the given information. Therefore, for her, the instructor is there to introduce the structure and choose examples that have clear substance.

When I asked Andy to complete the sentence, "Teaching mathematics means…" She bluntly answered "struggle" and explained further, "[Students] are expecting you to teach them a useful skill which to them will always only be a useful skill…knowing in your head [that] there is like a beautiful structure to it that they don't want you to give them… And you kind of have no right to

make them want more from it, and it's like a struggle." This spoke towards an interpretive context for where her teaching fits into students' career paths, grim as that context may be. Thus, as an incoming instructor, she conceptualized that teaching will be a struggle.

Focusing more on teaching, she believed that teaching is about passing down knowledge from the past, inviting students to participate and appreciate the subject. A skillful teacher, to her, is one with sufficient content knowledge that builds the cohesive story amongst the different topics in a mathematics course. Further, a skillful teacher can encourage students to see multiple points of view to help develop understanding of some mathematical structure. Andy believed that she had the necessary content knowledge. While she admitted that she lacked the necessary confidence, she was willing to try and motivate why we learn algebra to future students.

This was where Andy's frames of teaching and of learning were at, before entering her classroom. It is important to reiterate that she had never taught before, but with her experiences as a student, she was able to voice her conceptualizations of teaching and possible practices she can aspire to enact.

During the Semester

A few weeks passed and it was time for the first day of class. Andy walked into a tight room full of 40 students with varying levels of comfort with the subject. One student already expressed concern about failing and Andy quickly responded with assurance that they won't fail if they put in the work. Throughout the 75-minute class, Andy primarily lectured and often asked if explanations made sense or if anything needed to be reiterated.

In our discussion immediately afterward, she informed me that it didn't feel right to ask them to come to the board and present on the first day. Then, I asked Andy why she allowed some students to leave early when they asked for her permission. She responded that, "I'm providing a service, I'm not their mother," and she didn't feel it was her place to enforce them. This sentiment of providing a "service" was echoed again in her journal reflection at the end of the week, where she wrote: "I felt like I wasn't useful to my students" and "I felt like I didn't know what I was teaching." She wanted to be more useful to them through having clearer definitions and explanations. We agreed that perhaps it was just a consequence of the first day of classes.

However, as the weeks went by, it became clear that her students leaving early and not fully participating in the course was a reality attached to this teaching. The observation notes, the journal reflections, and our conversations mentioned this in some form or another. In our following interview, I asked her how she viewed her role in this classroom, and she shared:

> *Andy (Interview, Week 5)*: My role in the classroom is as someone who's seen the material before and is comfortable with it to try to relay what I know about it in a more approachable way to people who will need to make use of it in the future… I kind of feel like I am providing a resource by structuring the information in a way that I think helps get the idea across. But if they don't want to pay attention or do the work that I'm asking them to do, ultimately, that's them refusing a service they're paying for.

Andy's frame of teaching from before was still there (passing down knowledge), but it had gained a dimension that I labeled as "business." This "business" frame of teaching was apparent in almost all aspects of her teaching. To Andy, her role was still passing down past knowledge, but there is a pressure to package that knowledge neatly and succinctly. Her professional knowledge was focused on content knowledge, and how she can deliver this service with little confusion to the consumers. During observations and our conversations afterwards, it was clear

that she preferred to interact with students individually. She could provide the best service when she only had to attend to one person, rather than multiple, varying levels of proficiency. In the structured interviews throughout the semester, Andy expressed regrets about not being able to provide the best service. For example, after the second exam, she shared that she didn't know what old review material was allowed to be shared with her students. She expressed that it would not have been too much work to make her own review materials but, given her other responsibilities as a graduate student taking graduate-level courses, it was not doable.

Similar to her frames of teaching, Andy's frames of student learning also began to crystallize under a label. I labeled her semester's frame of learning as 'encode-decode'-ing languages and communication which she elaborated on multiple occasions:

> *Andy (Interview, Week 5)*: So, after some weeks teaching this class, I would say that learning math is learning how and why information is *encoded*, and how you would unambiguously *decode* that information.
>
> *Andy (Interview, Week 12)*: They should see like a conventional system for communication. And after seeing that convention in some context, see how it can... uh... illuminate, for lack of a better word, extra information and structures hidden in the information.

Since the goal of learning is to understand encoding and decoding communication, Andy would explain every step of a solution and being as unambiguous as possible whenever she wrote up a solution on the board. She shared in an interview that she hoped that her students learned from her that "you can express the same idea to as many people as possible" while being unambiguous.

In her journals, she consistently set "encourage students to talk to each other more" as a weekly goal. Andy began lessening the time she spent presenting on the board while students sat silently, and she shifted towards discussions at the individual or table-group level. Through this encode-decode frame, she would walk around the room addressing student questions without a writing utensil. When we discussed this, she shared that she wanted the students to be the ones writing as she facilitates their thinking aloud. Andy emphasized that if there was no one asking questions during group work time, she would slowly approach the table that had gone silent.

> *Andy (Interview, Week 5)*: I think usually that there's one of two things happening. The one that is more applicable, I think, to the "what do you look for if you don't hear obvious signs of help" is that both of them are stuck on the earlier question. But one of them moved forward rather than continuing to read onto the question that they didn't know how to do. The other one would be that the student that's ahead knew how to answer that question, but not how to explain it to their partner, or their partner didn't feel comfortable asking them to explain it.

With this 'encode-decode' frame of student learning, Andy also understood that learning is not a trivial task, and that language can be "ambiguous" and confusing. She was also aware of how college algebra is a graduation requirement for her students, and that the necessary skill this course imparted on students is the ability to decode seemingly ambiguous language. Another orientation Andy attended to is students' confidence to succeed. She recalled telling a student, "Frustration is allowed, but shame is not," when the student expressed feeling discouraged about their intelligence.

After the Semester

In light of her experience, Andy said she would like "to honor students experiences as people learning the material" as opposed to how she would have preferred to experience the material. Her 'encode-decode' frame of learning was not faulty, but rather she realized her explanations were too rigorous for what one might expect from a college algebra course. She still views mathematical learning as similar to learning a language and disambiguating information. However, because of her teaching and a particular experience in her own coursework this semester, she realized that there is value in adhering to some mild lack of rigor.

> *Andy (Interview, Post-Semester)*: [talking about squishing, lassos, and ropes] Seeing that picture just helped me like on a gut instinct. I see this picture and know what I have to write down… I think I've been overzealous rather than fundamentally wrong. Like, I do think that at the end of the day it's nice to arrive at a point where you can say this works because of XYZ… But I think I should have given more patience and importance to, "Here are some gut feelings that you can have about this."

On the other hand, Andy viewed her 'business' frame of teaching in a less favorable light. While framing her teaching as providing a well-crafted service did help her interact with individual students, it became stressful to manage her classroom. A consistent theme throughout the semester had been her apprehension in demanding students to engage, pay attention, and not leave class early. Andy unpacked where this 'business' frame stemmed from:

> *Andy (Interview, Post-Semester)*: For me, I had the luxury of being able to spend time on my schooling if I wanted to… and so, of course, it's easy for me to be like "oh, this is a business. If you want to learn what I'm teaching you in class, then you will dedicate the time to or you won't."

Andy does not believe this 'business' frame of teaching will change since, to her, this was a consequence of the current attitudes towards what a college education is. However, similar to her frames of learning, Andy realized that she needed to motivate her teaching, not just through her content knowledge, but by also drawing on more pedagogical content knowledge (Kunter et al., 2013). While she believed it was too late to change her classroom's dynamic, she realized it was part of her role as instructor to ask for students' engagement and attention.

Before the semester had begun, Andy shared that, to her, teaching mathematics meant "struggle" between wanting to show the beauty of mathematics and how students might only want to be shown the useful skills from mathematics. I did not remind her of this, but asked again, "Complete the sentence: teaching mathematics means…" She responded:

> *Andy (Interview, Post-Semester*): Acceptance, I think, like you're always gonna want your students to see the beautiful thing... I think I said something similar, but maybe a little bit more cynical at the beginning. It's like you want them to see the beautiful thing, they don't necessarily care about the beautiful thing. But you have to accept that you're gonna try to show them something nice, and maybe they won't get it, but they'll at least have had to have thought about it for a little bit, and that's something.

Discussion

This report aimed to gain insights into how frames change in a shorter time scale and in the

absence of intentional PD. I also aimed to address the question: *How do frames of teaching and learning compare, before, during, and after their first-time teaching as Instructors of Record?*

Andy's frame of teaching began as a 'I am passing down knowledge from the past to students, inviting them to appreciate the subject.' Then, as the semester progressed, her frames of teaching met with the realities of teaching, mostly the unexpected responsibilities with classroom management. While this new frame still had the essence of giving knowledge, it was packaged in this interpretation of teaching as a business. After the semester, Andy accepted her 'business' frame of teaching, while updating her understanding of what her role is in the classroom. She is both passing down knowledge and enforcing some classroom management.

Andy's frames of student learning began with three distinct themes: (1) there is a thread connecting the course topics together, (2) understanding an underlying mathematical structure comes from repetitive collaborative problem-solving, and (3) the 'struggle' between the beauty and immediate usefulness of mathematical concepts. Then, as the semester progressed, these three themes shaped or combined to become her 'encode-decode' frame of student learning.

Thus, this report reaffirmed that, even in the absence of intentional PD, frames of teaching and of student learning may still change within a semester. Andy's frames before and during teaching coalesced and crystallized because of her experience in the classroom. While she felt herself beholden to her early-formed frames during the semester, she also knew how to better them for her future courses by adhering less strictly to rigor and more on intuition building. At least in Andy's narrative, frames of teaching and of learning do not *drastically* change, but they do strengthen in their clarity and how it informed and will inform Andy.

Implications and Future Direction

One lesson learned from following Andy's semester is towards PD of novice instructors. Andy's main struggle in the semester had been classroom management, and how she was not aware that it was part of her responsibility as a college mathematics instructor. It is tempting to simply tell GSIs that it is 'par for the course,' but this lack of awareness may stem from a disconnect between instructors' expectations and realities of teaching. Therefore, PD might serve novice instructors like Andy better if PD includes stories from previous instructors that demystify the realities of teaching at their institution. In addition, asking instructors to reflect on their teaching and learning is one way to shift their frames.

This study was in a particular setting and context of a new instructor. Thus, exploration of experiences from different settings is necessary to grasp how frames change. By understanding how day-to-day or course-to-course experiences (re)shape instructors' frames of teaching and of learning, we may also further understand how teaching practices perpetuate. For example, Andy accepted that her 'business' frame was her reality because of larger societal forces, which may speak to instructors believing they have no power to change attitudes towards mathematics.

I mentioned how Andy felt regret about not providing students with more review materials before their exam because she had to attend to her own coursework. Andy was not the only GSI in the larger study who felt the pressures of competing responsibilities of a GSI. While GSI PD does prepare new GSIs with ample structure for content, materials, and assessment for their teaching responsibilities, it might better serve the GSIs if PD also included ways to juggle the competing roles of being an instructor and being a graduate student.

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