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Beyond Words: Leveraging Art and Metaphor to Teach and Learn

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Abstract

Art is a universal medium that provides a way to explore and discuss complex emotions—such as anxiety, frustration, joy, and the process of learning itself. Imagine a classroom where students use metaphors to express their thoughts, ideas, and fears about learning. Art, in this context, offers a safe, non-threatening space for students to connect and reflect on their feelings. Creativity is one of the most valuable skills we can develop, particularly for teachers, and it holds special importance for elementary pre-service teachers, who often feel uncertain about teaching subjects like mathematics. In an activity conducted within an elementary methods course, using art to express and communicate these emotions allowed future teachers to engage with their fears and concerns, leading them to discover strategies for teaching math. As the activity was used more often, it became a method for researchers to investigate thoughts and ideas. The metaphor-driven conversations helped create an opportunity for preservice teachers to safely explore their feelings, while also giving the professor an opportunity to inform their instruction to better prepare pre-service teachers for their future classrooms.

Key Words: *elementary pre-service teachers, multiliteracy, art, mathematics, metaphor*

Imagine walking through an art gallery and gazing upon the sculptures, paintings, and artistic creations. You may not simply see lines, shapes, or colors; rather, you may experience emotion or have interesting thoughts about the art. The observers may experience a deeper meaning of what the artist wants to express or convey in their works of art. If teacher educators can think of their classrooms as art galleries, they could welcome reflection about personal experiences, thoughts, and concerns. Using art has been associated with the humanities, such as language arts or social studies, and even the natural world, such as science (Pantaleo, 2019). Pantaleo (2019) specifically suggests that art can lead to student learning through a variety of ways. If art can be a benefit to help students process and explain their thinking, why not consider this approach while teaching teachers?

Elementary teachers are asked to become the teachers of many contents, not all of which they enjoy or even envision themselves teaching. Stoher & Olsen (2023) found elementary teachers often struggle with teaching mathematics. Teaching students mathematics can be daunting, especially due to the performance pressures of teaching. Using art to engage preservice teachers in a meaningful and unique way is one method to allow teachers to express and view mathematics through a different lens. In a teacher preparation class, the first author's professor did just that (please see the acknowledgement). By providing space for conversation about our fear of teaching mathematics, we, as preservice teachers (PSTs), were able to use art to illustrate our thinking and emotions brought up by teaching content we struggled with ourselves. After experiencing the activity, Fields (the first author), used the method with future high school mathematics teachers. This activity can qualitatively connect with students by opening doors to multiliteracies that resonate with their individual identities and experiences prior to stepping into a classroom full of expectant students needing to learn mathematics.

When teacher educators incorporate the multiliteracies of metaphor through art to capture preservice teachers' feelings about teaching, powerful outcomes may occur. Instead of merely passively processing information about teaching methods, future teachers can use existing artwork as a springboard for analysis, reflection, and interdisciplinary connections. The art can allow a teacher and student to discuss many aspects of teaching, especially the concerns of teaching mathematics. This approach can empower anyone to take ownership of their educational journey, grounded in their own experiences and perceptions.

Context for Expression Through Art & Mathematics

Mathematics anxiety has consistently been found to inhibit an individual's mathematics performance and attitudes toward mathematics, including interest and confidence in learning mathematics (Novak & Tassel, 2017). PSTs sometimes worry about their ability to engage students or that their content knowledge is not strong enough to teach others. Throughout decades of research on PSTs, many have found that anxiety about doing and teaching mathematics contributes to pre-service teachers' (PSTs) performance (Al-Salouli, 2005; Boyd et. al., 2014; McCormick, Kapusuz, & Al-Salouli, (2004); Stoehr & Olson, 2023; Utley & Showalter, 2007; Zacharos et al., 2007). Identifying the various beliefs and attitudes toward learning and teaching mathematics can aid teacher educators to better prepare PSTs by scaffolding and differentiating instruction and field experiences. Fields, Williams, & Isbell (2017) found during a qualitative study among college STEM majors, expressing emotions through existing art can promote learning, generate connections, and cognitive processing of feelings about teaching early on. Not only was this approach informative to PSTs, but it also informed teacher educators' curriculum and teaching methods to meet PSTs where they were.

Course instructors were able to check in with PSTs throughout the semester and provide guidance and scaffolds to improve confidence and understanding when teaching.

The Art Expression Activity Overview & Steps

This lesson was initially used with elementary and secondary preservice teachers to find out about their feelings about teaching mathematics. However, this lesson could be incorporated in any setting in Pk-16 to elicit feelings or emotions about learning or teaching. The steps of the lesson outlined in this section are written in a way that allows educators of any content area or grade level (K-16) to use as an assessment of students' beliefs and feelings about a particular topic.

Steps for Implementation

1. Determine the affective objective regarding the learner's beliefs about a particular topic or subject area. For example, PSTs will express their beliefs and feelings regarding mathematics and teaching mathematics.
2. The teacher will either gather artifacts such as postcards and printed copies of a variety of art pieces or allow their students to visit a digital source such as the website art.com to identify art pieces. In selecting a set of artworks for students to choose from, consider works of art from multiple eras, cultures, styles, and forms, including paintings, sculptures, posters, etc.
3. Students choose works of art that represent their beliefs or feelings associated with the given prompt and discuss their choices.
    a. Example Prompt: Select two works of art that represent you as a mathematics learner and/or teacher.

b. Students explain their choices verbally or in writing. If shared verbally, it could be during a one-on-one interview with a teacher or among small groups of students and teachers. Possible prompts for reflection of choices include:
    i. Tell me about the art pieces you chose.
    ii. Why did you choose the pieces? How does it relate to…?
c. Teachers may ask more follow-up questions as needed. Teachers should take notes during interviews with students.

4. The teacher collects responses to the prompts to analyze for themes and findings.
    a. Consider the various beliefs and feelings expressed in the students' writing and/or interviews.
    b. What similarities do you find among students? What differences? Are these beliefs and feelings positive, negative, or neutral? What are the reasons for these beliefs and feelings?
5. The teacher uses the findings to generate discussion, engage learners, scaffold instruction, and provide feedback.
    a. The findings can help teachers find an entry point into learning the course content while recognizing their feelings.
    b. Open discussions about student self-efficacy in learning and doing specific content like mathematics and science can help older students build confidence and recognize the importance of pursuing challenging content.
    c. Teachers can become more intentional about planning lessons that provide encouragement and positive feedback, especially to those with negative feelings or beliefs about the content.

This lesson can be used at the start of a unit or semester as a pre-assessment activity to examine student beliefs and feelings but can also be used during the middle or end of a unit to gauge changes in their beliefs. The lesson is written generically to be easily used in various content areas and for all ages of students. The goal of this lesson is to not only understand the feelings and emotions related to course content but to use that knowledge to improve instruction and learning of the specific content.

Art Expression Activity Development

Application with Elementary PSTs

A teacher educator in a pre-service mathematics methods course at a large university in Texas was challenged with connecting students to mathematics learning and teaching. The students enrolled in the mathematics methods courses were college seniors pursuing elementary (K-6) teacher certification. Many did not always feel confident in doing and teaching mathematics. Students in the class would say things like:

- I don't want to teach math
- I am going to teach reading
- I am scared of teaching math
- I don't remember enough math
- This is hard, I don't think I will use this
- I took this class near the end because I was scared of it

Therefore, the professor, named in the acknowledgement, developed an activity using visual arts to encourage self-reflection and create a dialogue with students regarding their emotional perceptions of mathematics. The professor wanted to learn more about these simple phrases and allow students to elaborate on those types of statements, for math specifically. For

the instructor, art became a method to encourage her pre-service teachers to connect their feelings through metaphor. She often referenced the activity as an approach from her toolbox of teaching. The approach allowed students to find art, design art, use selected art, or whatever version of the activity as a method to encourage a deeper conversation into why they were fearful of teaching and learning mathematics.

Fields found that the pre-service teachers would use art as a metaphor or stories to elaborate on their feelings and ideas about teaching mathematics. Using metaphors allowed students to reflect more deeply on their perceptions of learning mathematics and going on to teach mathematics. The idea that art provides a unique way of knowing is not new in the field of education (Dewey, 1938; Reid, 1986). Eisner & Peshkin (1990) posed the question of whether knowledge should be considered a verb rather than a noun. Knowing and presenting what is known can take place through a multiplicity of representations. The method uses visual art as the vehicle for knowing and identifying emotions.

Application with Secondary PSTs

In addition to using the art activity with elementary PSTs, the Fields also used this as an activity when researching how college freshmen and sophomores felt about learning to teach high school math. The research study was conducted with the approval of the Institutional Review Board (IRB). These college students were enrolled in coursework that involved early field experience in K-12 classrooms to help them learn to teach. Specifically, the field experience required them to teach math lessons to elementary students. For these students, this was usually their first experience teaching math content to anyone. The program was intentional in sending these future teachers to learn about teaching in settings like elementary and middle school classrooms prior to sending them to high schools. The purpose of this was to provide an

opportunity to see what is taught prior to high school and give them a chance to teach fundamental mathematics or science before stepping into the advanced topics of high school. While these students were confident in learning mathematics and science, they found they were not as confident in their ability to teach the content to high school students after the experiences with elementary and middle school students. The art activity was used to identify their existing beliefs about teaching and how they changed during an extended and meaningful K-12 field experience. The findings and connections that emerged were both surprising and inspiring to Fields, reinforcing the value of continuing to use art and metaphor as a powerful activity.

Findings and Discussion

Developing the Craft

In disclosure, Fields led the research project involving the data that is shared, with Mills and Isbell collaborating on what the activity could mean holistically for us as teacher educators. When using *I*, it is Fields explaining the research aspect of the activity, and *we* identify when the co-authors collaborated to reflect on the activity. The discussion is a weaving of the research findings and Panteleo's framework (2019), which underscores the value of using art in a variety of ways: teaching, learning, and research.

While a few of the findings documented during the research will be shared, what holds the greatest significance for classroom teachers, teacher educators, and preservice teachers is what we learned about teaching through this activity. What follows is a connection to the framework described by Pantaleo (2019), paired with key insights from our study. Pantaleo explains that art can lead to student learning through a variety of ways, such as developing craft, engaging and persisting, observing, reflecting, expressing, stretching and exploring, envisioning, and understanding art worlds.

This unique combination of discussion and connections is meant to highlight not only the purpose and power of using art as a method to spark meaningful conversations, but also how such activities can prompt reflection and refinement of our pedagogical approaches—ensuring that our teaching remains relevant and responsive to students' needs. Much like Pantaleo's reflections (2019), using art as a means for students to express their understanding led us to evaluate our own teaching practices. While our findings diverged in some ways, they also revealed strong parallels to Pantaleo's framework. As researchers, we are always searching for deeper meaning within our data. This art-based expression method challenged us to think more expansively, both as educators and as researchers. Since its initial implementation, we have explored several iterations of this activity and have found that it has far-reaching applicability for both teachers and students.

Through careful observation of students engaging with the activity, we witnessed higher-order thinking and unexpected *aha* moments. Providing students in a math methods course the opportunity to explore their emotions through metaphor and art enabled them to reflect deeply—often leading to greater cognitive flexibility, creative problem-solving, and even shifts in their beliefs about teaching and learning. More than just student insights, this activity raised an important question: Can teachers, through these reflective moments, learn even more about their own instructional approaches, their reactions to student learning, and their capacity for flexibility? As former math teachers ourselves, we are intimately familiar with the challenges math presents for many students. But during this research, we asked ourselves: had we ever truly explored *why* students struggled or listened closely to *how* they described their experiences? The honest answer was no. Unexpectedly, this paper offered us, as educator-researchers, the same opportunity for reflection and growth that it provided to our students.

Engaging and Persisting – Intentional Listening and Questioning

As the preservice teachers began to tell me about their choices of art and the metaphors that allowed them to voice their feelings they were having, I found myself listening carefully and thoughtfully. Perhaps more than ever before. Their feelings were so raw and real. Each student was able to explain in-depth about their anxiety, joy, self-actualization, understanding, and significant *aha* moments that perhaps they had not explained before. While they were doing this, I was able to take notes, listen for understanding, and prompt for further reflection. Also, I found a new ability to listen intentionally to consider the next questions and ensure I was not just listening to respond, but rather to clarify and truly learn what they were feeling. I had my realization that as a teacher, I need to be intentional in all my lessons. By analyzing students' responses and choices in art to elaborate on their feelings toward a particular subject, I have been able to intentionally create space in my lessons for listening and questioning more effectively. The realization that I was beginning to design activities that meet them where they are and foster their confidence and efficacy for that subject was something I noticed.

From this observation and research-based conversations, *we* have been more intentional about creating student led activities and guiding questions for lessons that prompt open-ended responses. We have used this to improve how we help our preservice teachers use current revised strategies, such as Bloom's Taxonomy (Anderson & Krathwohl, 2001), to generate questions ahead of the lesson to use for in-depth conversation and build in time for listening to our students. When questions are built ahead of time, the teacher can create questions with a variety of levels for application, analysis, or evaluation of what they are learning.

A specific example from one of the research conversations, a painting by Edward Hopper called *City Sunlight,* was chosen by a student teacher, John (pseudonym), who was still deciding

if he wanted to teach high school. Due to copyright issues, we cannot share the photo here. Please refer to the link found in the citation for Hopper (1954) to see the artwork. John used the art piece to explain how he felt about his decision to teach. Overall, he was interested in finishing the program, but was not sure about teaching. John's thoughts about teaching were expressed in the metaphoric use of the painting when he said,

> It is just, this is just such a paradox. This woman is sitting here, she is so interested and disinterested at the same time. She honestly, there is something over here that is catching her vision, or she is in kind of a daze. And there is a chair pulled out like someone is with her. She is kind of alone, right? I don't know but to me it's kind of, I really don't know what I was doing when I started this. And obviously she is on the second floor or the third, she is not on the primary floor. Where she can't see anyone beneath her, so there is something in the distance that is catching her eye. But it doesn't, it is not obviously making her happy because she doesn't know exactly what it is. And that is kind of how I feel. This [teaching] is interesting to me, but I don't know why yet.

The metaphor selected in the final interview indicated a sense of contemplation about teaching. John still needed time to process and discuss his thoughts with someone willing to listen intently. This *aha* moment for John allowed him to realize it is ok to take time and consider his decision in teaching. He was also able to identify why he was struggling with the decision, which empowered him to continue in the program, even if unsure of his future. Interestingly, John is currently teaching dual credit courses and found his passion in teaching a mix of high school and college level courses. After a quick chat through Facebook, John explained that it was a pivotal moment in his college career to participate in the research and talk to someone in a neutral position, which led him to his ultimate decision and path to teaching in a

dual credit setting. John further elaborated that he uses many skills learned in his education courses to engage his students to learn mathematics, such as listening and questioning.

Stretching and Exploring – Observe, Monitor and Adjust

From the same interview, another theme emerged. While learning more about the issues surrounding a block in learning, anxiety, or even joy, I found I have learned to monitor and adjust my lessons and strategies more effectively. On-the-spot pivoting has found a place in my everyday teaching. If there are barriers, I am more flexible to change my line of questioning to get to the root of it and allow for those prime teachable moments. When teachers and students are on the same page, deeper learning can occur and lessen the stress the students might have in learning challenging content.

Figure 1 shows John's chosen piece to describe his journey. John suggested that this meant he still had a long way to go to get there. He noted, "Some of my content classes are hard, and I don't know if I will pass them. I also do not know if I need all of these upper-level courses to [actually] teach someday, so it is hard to stay focused", but it was his goal to reach the top of *Mount Fuji* (Hiroshegi, 1857). This allowed us to have a conversation on what supports he needed to continue to reach the peak. It allowed a teachable moment for me as both researcher and educator. I took time to offer John insight, advice, and comfort explaining we all have the same moments of feeling like we still have a lot to learn, but there is a way to get there. It also allowed the conversation to continue about his decision to teach. Each time John examined the art, he was able to explain his feelings with more precision. This piece of art allowed John to continue pondering beyond his connection with Hopper (1954); he still recognized 'completing his education to teach was important and the peak of his journey', thanks to his selection of *Mount Fuji* (Hiroshegi, 1857).

Figure 1

John's Chosen Artwork by Hiroshige (1857)

Hiroshige. New Miniature Mount Fuji in Meguro, from *One Hundred Views of Edo.*

As teacher educators, it is a hard task to teach our preservice teachers what it means to *monitor and adjust*. We can highlight the skill of *monitoring and adjusting* in real time as preservice teachers are explaining about their feelings in more thoughtful ways, as opposed to, "I don't like math," or, "I plan to teach lower than 3rd grade, so I won't have to know the hard math." We can stop letting them go deeper than just those general emotions; we can help them find ways to believe they can learn the content and how to teach the content. We can break down the barriers in real time and adjust the instruction for the students to both learn the math and increase their efficacy.

Organic Reflection, Expression, and Authentic Assessment

As teachers, it is our job to reflect on what our students know regularly. I found students enjoy looking at art and creating metaphors for themselves, which is an organic opportunity for student reflection. The students seem to enjoy talking about their emotions through the art

because it allows them to expand on their thoughts, rather than outright saying, “I hate mathematics,” or “I don’t understand.” They can use the art to elaborate and explain why they hate math or do not understand a concept. In one of the interviews, Sunni (pseudonym) chose a piece of art with a beach and waves. Specifically, she said things such as, “you see these crashing waves, that is how I feel, like my brain is just crashing when trying to learn [that] math,” or “do you see this odd pattern, that is how I feel about math, it is a pattern I can’t ever quite get during some of the classes.” Sunni was able to express and assess her own feelings about learning some of the upper-level college math classes.

When we recognize that students feel inadequate because they do not understand what they should be learning, or that they feel frustrated like waves crashing, we can look for a different side of their thinking through art. The metaphor can tell a story for the student to illustrate reason and rationale and explain the “how” of their learning dilemmas. Like Sunni, for example, she was able to reflect that it was more than ‘hate’, but fear of failure, because she knew she wanted to teach, but the classes were imposing a potential barrier to her goal. Through the art approach, she was able to explain her feelings through imagery and metaphor. Ultimately, she pressed on until she completed her courses and program.

Also, when presenting this method at a conference, we received positive feedback from the audience of teachers and teacher educators. For example, one educator stated, “Wow, I could use this for (insert blank) to guide my students to tell me (insert blank).” It prompted reflection and discussion about teaching students who had negative perceptions about any content area. Teachers are anxious too. It is a hard job to teach a tough crowd, knowing they hate your content, but not you. As teachers, we can take negative comments personally, but what if we

allowed these moments of authentic assessment to take the personal out of their musings and give our students a chance to explain what they hate or fear?

Envisioning through Open Discourse

This art-based approach has opened the eyes and minds of many of my students because they didn't even know what they were thinking. Moreover, they did not know their own barriers, but once they discussed their ideas, then we could face those issues together in a safe space for conversation to happen. Through open discourse, I can help students at any age realize their innermost thoughts and fears about learning and then help them go forward in their learning journey. Showing genuine care about their thoughts and ideas provides opportunities for meaningful discussions to further their emotional growth and strength toward learning. Allowing a student an opportunity to face their innermost feelings can allow them to envision a different outcome or unrealized potential.

An interesting postcard chosen by Sunni in her final interview revealed the deep emotions associated with her early field teaching experiences in elementary and middle schools. The Latin folk-art postcard she chose, which appears to be a Christmas tree, was perfect for her to explain her thoughts and emotions. Sunni said to me:

> …I [finally knew] was in the right program. I am really excited, and I feel like this looks like a Christmas tree, so I feel like this whole experience is like a Christmas present, I don't know what is in it, like once I opened it, I was filled with joy.

Allowing Sunni to envision and explain her feelings through art gave her a chance to share her excitement and desire to teach. Without the art, I do not think I would have ever understood the

depth of emotions she had; teaching was her calling. Like John, I reached out to Sunni through Facebook. She is still teaching middle school mathematics and believes each day, and each year, is just like she said in the interview, “It’s like a Christmas present; I never know what gifts I will get.” To view the unknown artist’s postcard, click the link associated with the n.d. Latin folk-art reference.

As we engaged in open discourse about this research and article, we began to envision the impact this method had on our students, participants, and us. Especially in content areas such as math, because we know students struggle, but do we always know why? If we use art to help them discuss their thinking, then we allow for a multiliteracy approach to gain their trust in themselves and the teacher to guide them in learning the content.

Stretching and Exploring – Teaching Take Aways

Based on our research and observations, we encourage the use of this activity across a variety of educational contexts. In teacher education programs, this lesson can be a powerful method for surveying preservice teachers’ beliefs about teaching and learning. It provides a space for expression that goes beyond traditional discussion or written reflection, allowing participants to communicate complex emotions—such as anxiety, uncertainty, or even excitement—that they may not be able to articulate directly. We found that when preservice teachers used art to represent their feelings about teaching, they often revealed deeper insights than when simply asked how they felt.

Although our study focused on teaching and learning mathematics, this activity can easily be adapted for other subject areas. Its flexibility makes it a useful strategy in a wide range of educational settings. In professional development sessions for in-service teachers, for example, it can serve as a reflective pre-assessment, encouraging participants to explore and share their

beliefs about challenging or sensitive issues in education. By prompting honest dialogue and reflection, this activity creates opportunities for deeper understanding and professional growth.

We also recommend that K–12 teachers consider using this approach in their own classrooms to better understand how students feel about particular content areas. As former classroom teachers, we recognize that students' beliefs and self-confidence—especially in subjects like mathematics—play a critical role in their academic performance. This activity provides a non-threatening way for students to express their emotions about learning, which in turn equips teachers with meaningful data to inform instruction. When teachers understand how students perceive a subject, they are better positioned to scaffold learning experiences that foster positive dispositions and support student growth.

For both teacher educators and classroom teachers, this activity promotes a reflective stance toward practice. Rather than relying on assumptions about why learners may be struggling, educators can use students' or preservice teachers' artistic representations to initiate open, meaningful conversations. These insights support more accurate interpretations of learners' needs and make it easier to adjust instruction accordingly. Reflection, ongoing monitoring, and thoughtful adjustments become central to the learning process—for both teachers and students.

Ultimately, this method invites educators to meet learners where they are. Whether a preservice teacher is expressing anxiety about teaching math, or a student is showing disinterest in a subject, the artwork can help reveal what kind of instructional support is most needed. A student experiencing anxiety may benefit from low-stakes opportunities to build confidence, while a disengaged learner may need creative, personally relevant lessons to spark interest. This activity allows educators to listen more deeply, respond with empathy, and design learning

experiences that build both confidence and connection. It reminds us that teaching is not just about content.

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