The Journal on Empowering Teaching Excellence (JETE) is a bi-annual publication released in the Fall and Spring. We accept articles and multimedia submissions from higher education professionals who have practical, experience-based insights to share with their peers. We value material that is up-to-date, proven, and easy to implement in today's teaching environments.

JETE is a publication of the Office on Empowering Teaching Excellence and the Center for Innovative Design and Instruction, units of Academic and Instructional Services at Utah State University. It is produced in connection with the Empowering Teaching Excellence faculty development program.

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Academic and Instructional Services
Utah State University
5100 Old Main Hill
Logan, UT 84322

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Journal on Empowering Teaching Excellence, Spring 2022

JOURNAL ON EMPOWERING TEACHING EXCELLENCE, SPRING 2022

DIANA L. MOSS, PH.D.; RACHEL WILSON, PH.D.; DANIELLE DIVIS; SAMANTHA SOMMERS; MICHELLE UNIGARRO; DANIELLE VANTASSEL; CLAUDIA BERTOLONE-SMITH, PH.D.; ALISON PULIATTE, PH.D.; JENNIFER ZAKRZEWSKI, PH.D.; BRIANNE NEWTON, MLIS; JULIAN LEDFORD; TIJÁ ODOMS; MORGAN ROBERTSON; MARLA K. ROBERTSON, PH.D.; AND JASON OLSEN, PH.D.

Utah State University, Office of Empowering Teaching Excellence
Logan, UT

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INTRODUCTION

Jason Olsen, Ph.D.

Ralph Waldo Emerson once wrote, “if I have lost confidence in myself, I have the universe against me.” While we can safely assume that Emerson wasn’t thinking about any insecurities toward classroom technology or his perceived shortcomings in math or science, his quote rings true for our Spring 2022 issue of the Journal on Empowering Teaching Excellence. If there is one theme that carries through the research at the heart of this issue, it is that without confidence—and that is, confidence built on recognizing the value of the things teachers study and do—educators may not have the universe against them, but they’ll lose their ability to teach their students effectively. In that situation, the universe itself might as well be lost.

One thing that is most certainly not lost is our admiration for the work we’ve received and can share in this issue of JETE. This issue is my first as Editor-in-Chief, and I would like to welcome Nichelle Frank as our incoming Assistant Editor. Nichelle and I are excited to take the reins and continue JETE’s dedication to sharing vital research on higher education pedagogy. One of the key figures in shaping JETE over the last several years has been Kim Hales, our outgoing Editor-in-Chief. Kim’s contributions to both JETE and me personally as her successor cannot be overstated. Kim’s impact on this journal is felt in this issue and will be felt in all issues that follow.

To continue the outstanding research and writing that makes up JETE, we need you. We always encourage submissions, and we are always reading for our future issues. Please click the *follow* button on our homepage, https://digitalcommons.usu.edu/jete, for updates on new issues and calls for articles. You are always encouraged to send us your work.

You are also encouraged to send reviews of recently published (within the last three years) academic books. I wrote a review in this current issue (I discuss Karen Costa’s fantastic 2020 release, 99 Tips for Creating Simple and Sustainable Educational Videos), and I encourage our readers to submit reviews of recent books for us to consider for future issues. Whenever you read a book that really speaks to you, you want to share that book with as many people as you can (that’s certainly how I felt with Costa’s book). Let JETE help you be that messenger by submitting your book reviews to us.

The articles featured in this issue provide great examples of significant research in higher education teaching today. Two of these articles share research and valuable reflection on utilizing self-portraits in college courses for students and instructors to better understand student relationships with the course subject. In “Pre-Service Elementary Teacher’s Perceptions of Themselves as Learners of Math and Science,” researchers Diana Moss, Rachel Wilson, and Danielle Divis discuss how pre-service elementary education teachers see themselves as learners of mathematics and science through before–and–after drawings that depict their relationships with those subjects. Samantha Sommers, Michelle Unigarro, Danielle Vantassel, Claudia M. Bertolone-Smith, and Alison Puliatte’s “Draw a Picture of Yourself Learning Math: What Pre-Service Teachers’ Self-Portraits Illustrate About Their Complex Relationships with Mathematics” also looks at self-portraits as a means of understanding a pre-service teacher’s relationship with the subject material, focusing exclusively on math (including insight on how math is learned). The two articles are fascinating in tandem, each discussing a unique study at a different institution. In the article by Moss, Wilson, and Divis, they explain that “limited research exists on using drawings to explore the images and experiences that pre-service teachers associate with mathematics.” We are excited to say that this issue of JETE is fortunate to be able to expand that now less-limited area of research.

One of the recurring motifs of the articles discussed in the previous paragraph is the importance of those pre-service teachers gaining personal confidence in their subject matter in order to teach it more effectively. That theme is also present in “Technology in Teacher Education: Student Perceptions of Instructional Technology in the Classroom” by

Jennifer Zakrzewski and BriAnne Newton. The researchers discuss a study that gathered data on pre-service teachers' perceptions of classroom technologies and the benefits of those technologies. The article compellingly lays out the benefits of technology integration and the essential information found via their research, including how matching confidence with experience is a crucial step toward effective teaching with technology.

The benefits of language learning at the college level are at the heart of "Checking In: Learner Perceptions of the Value of Language Study in College" by Julian Ledford and Tijá Odoms. Ledford and Odoms share research that gathers student perceptions of the value of second language study and subsequently analyze said research to show the importance of language learning at the college level. As with the above articles, it includes specific student feedback that gives readers a clear sense of how students view course contents.

We also are pleased to share "Transforming Curriculum: A Process for Implementing Problem-Based Learning in a College-Level Course" by Morgan Robertson and Marla K. Robertson, an engaging approach to teacher processes. By sharing and analyzing an assignment built around Problem-Based Learning, educators can better understand the process of incorporating similar projects into their syllabi. Especially beneficial is the hands-on, process-oriented nature of the article—including a valuable discussion of how student feedback and responses compelled the authors to adjust the assignment analyzed in the project.

While Emerson might not have had to travail the landscapes of changing technologies and declining support for language programs (among other challenges), his emphasis on confidence still rings true. We grow our own confidence—and instill confidence in our students—by showing them the value of what they are learning. To close with another quote from Emerson: "The mind, once stretched by a new idea, never returns to its original dimensions." The articles in this issue will stretch our minds in ways that will inevitably lead to success in our classrooms.

PRE-SERVICE ELEMENTARY SCHOOL TEACHERS' PERCEPTION OF THEMSELVES AS LEARNERS OF MATHEMATICS AND SCIENCE

Diana L. Moss, Ph.D.; Rachel Wilson, Ph.D.; and Danielle Divis

Abstract

This study investigated how prospective elementary teachers view themselves as learners of mathematics and science during their last year in a teacher preparation program at an American university. Using drawing and reflections as the method for collecting data, prospective teachers were prompted to draw themselves and reflect on learning mathematics and draw themselves and reflect on learning science prior to and after their mathematics and science methods courses. Drawings (n = 147) were coded according to the presence or absence of several themes including physical objects, teachers, students, and environment. The drawings and reflections indicated that the experience of participating in mathematics and science methods courses taught from a social constructivist perspective positively impacted prospective teachers' conceptions of themselves as learners and in ways consistent with current research-based pedagogies. The research study described here proposes that prospective teachers' learning experiences in mathematics and science methods classes might impact how they will teach mathematics and science in their future elementary classrooms.

Keywords: prospective elementary teachers, mathematics education, science education, pre-service teacher identity

Pre-service elementary teachers (PSETs) enter their methods courses with beliefs about learning mathematics and science based on prior education and life experiences (Hsu, Reis, & Monarrez, 2017). These beliefs can affect how pre-service teachers view themselves as learners as well as how they navigate the process of becoming a teacher (Lortie, 1975). The *becoming a teacher* process is influenced by the "experience of schools and teaching that [PSETs] bring with them to teacher preparation courses" (Beltman et al., 2015). Teacher educators are challenged to navigate PSETs' beliefs and prior experiences to prepare them to become effective classroom teachers.

Using drawings and written descriptions, this study investigated how PSETs view themselves as learners of mathematics and science during their last year in a teacher preparation program. Specifically, how do PSETs' perspectives on learning change after taking methods courses in mathematics and science?

Literature Review

Social Constructivism Learning and Environment

The constructivist learning theory supports teaching mathematics and science through inquiry where learning is student-centered, rather than lecture-based (Fosnot, 1996). A shared intention in mathematics and science teacher education is to prepare PSETs to teach from a social constructivist (Vygotsky, 1978) perspective (National Research Council [NRC], 2007). In the theory of social constructivism, the central tenet is that learners construct their own understanding by participating in meaningful shared discourse. Although Vygotsky (1978) used speech as the primary mediation tool upon which to focus his studies, he noted other mediation tools such as symbols, algebraic systems, art, drawing, writing, and diagrams (Brooks, 2009). Brooks (2009) theorizes that "drawing might contribute to the formulation of thinking and meaning" (p. 2).

Further, learners are limited in what they can learn independently, and more can be learned with assistance from teachers and collaboration with others (Carlile & Jordan, 2005). In an environment conducive to learning mathematics and science, the teacher plays a vital role. The teacher not only needs to use interesting and engaging problems, but also encourage discussion and provide representations of multiple methods, support conceptual understanding, and encourage critical thinking (Davis et al., 2006; Picone-Zocchia & Martin-Kniep, 2008). Social constructivism accounts for the interactive communications that occur between teaching and learning, where teachers and students are "active meaning makers who continually give contextually based meanings to each other's words and actions as they interact" (Cobb, 1988, p. 88). Moreover, the NRC (2001) contended that students must develop a "productive disposition" toward mathematics and believe that they are capable of learning and using mathematics (p. 131). Teachers that have a productive disposition are confident doers of mathematics and science who? encourage and support their students. Students who are learning in a positive environment should feel comfortable expressing their learning approaches and engaging in problem solving. Moreover, the teaching of mathematics and science should not focus entirely on the content but should consider the interactions that occur between teachers, students, and content as well (Cohen & Ball, 1999; Davis et al., 2006; Windschitl, 1999). These valuable interactions set the stage for productive thinking and learning.

Teacher Professional Identity Construction

A common challenge in both mathematics and science education is developing new teachers' professional identities in line with research regarding mathematics and science thinking, teaching, and learning. Lave and Wenger (1991) and Wenger (1999) approached identity research from a sociocultural perspective where they framed? identity as dynamic (being reformed over time based on experience and personal meaning-making) and formed in communities with social and historical influences. In this perspective, identity links? to learning because "learning is conceptualized as the *process of becoming* a certain kind of person in relation to mathematical activity" (Langer-Osuna & Esmonde, 2017, p. 637). Researchers have suggested that new teachers tend to teach mathematics and science the way that they have been taught (Avraamidou, 2014a; Clift & Brady, 2005; Eick & Reed, 2002; NCTM, 2014; Zeichner & Tabachnick, 1981). Moreover, Avraamidou (2014b) and Luehmann (2007) have argued that by examining the identity work of teachers, we, teacher educators, can examine teacher learning and the factors that affect the development of teacher identity related to teaching science. By using an identity framework in research with pre-service and beginning teachers, researchers recognize that content-specific learning experiences within teacher education programs and in their previous schooling impact teacher beliefs about and emotions related to teaching that content (Wilson & Kittleson, 2012; Carrier et al., 2017; Timoštšuk & Ugaste, 2010).

PSETs' Epistemological Beliefs

PSETs' professional identity embodies and is embodied by their epistemological beliefs. Although content impacts learning in mathematics and science, the experiences that occur in the classroom also shape and influence the learning that takes place (NCTM, 2014; NRC, 2012). These experiences that occur in teacher education courses play an essential role in integrating beliefs and theory (Huang et al., 2021). For instance, negative experiences in mathematics classrooms influence PSETs' perceptions of the subject, and sometimes cause negative feelings or anxiety toward learning and teaching mathematics. Mathematics anxiety is persistent among pre-service teachers (Bekdemir, 2010; Gresham, 2007; Hembree, 1990). Bekdemir's (2010) study found that PSETs' negative experiences in learning mathematics not only cause anxiety towards mathematics, but the anxiety towards mathematics increases as the grade levels progress. Studies have also found that anxiety towards mathematics is caused by teachers' behaviors and approaches to teaching mathematics (Andrew, 2004; Bekdemir, 2010; Frank, 1990; Hadfield & McNeil, 1994; Harper & Daane, 1998; Hembree, 1990; Jackson & Leffingwell, 1999; Perry, 2004). These prior mathematics experiences influence PSETs' beliefs about learning in their methods courses. Thus, a cycle of mathematics anxiety is present where the educators' anxiety impacts the students' anxiety (Vinson, 2001). This occurs because anxiety can impact teachers' abilities to teach mathematics with confidence (Akerson, 2017). Further, teachers cannot be expected to generate enthusiasm and excitement for a subject for which they have fear and anxiety. If the cycle of math phobia is to be broken, it must be broken in the teacher education institution (Mihalko, 1978, p. 36).

Studies have found that PSETs' prior learning experiences in science influence their beliefs toward the subject content, their ability to learn the subject, and their views about how to teach it to students (Carrier et al, 2017; Cavallo et al., 2002; Hsu et al., 2017; Kazempour, 2008, 2013). When PSETs describe their beliefs towards science learning as negative or neutral, these beliefs are associated with experiences of learning science through passive means, including lectures, worksheets, textbooks, and/or lack of collaborative learning (Hsu et al, 2017; Kazempour, 2008; Mensah, 2011). These negative beliefs, as a result of their own learning experiences, have been linked by researchers as influences on PSETs' beginning teaching identities (Carrier et al., 2017), their ideas about how to teach science (Hsu et al., 2017), and how often they are willing to teach science (Cavallo et al., 2002). When methods courses include an element of reflection for PSETs about their prior learning experiences in science, along with models of inquiry-based teaching and collaborative learning, PSETs with previously negative learning experiences were able to make significant improvements in their beliefs toward the subject (Kazempour, 2008) and include research-based practices as a part of their beginning teaching identity (Mensah, 2011).

Therefore, our study seeks to determine how PSETs' learning experiences in their mathematics and science methods courses impact their perceptions of learning mathematics and science, and in turn, how this might influence how they teach mathematics and science to their future students.

Theoretical Framework

Narrative Identity

Narrative identities are stories from students and teachers that help them make sense of their learning experiences. Sfard and Prusak (2005) argue that identities are a "collection of stories told about persons" and that these stories are influenced by participation in different contexts. However, narrative identity can focus on "stories told about the self" (Langer-Osuna, 2017) and complements positioning theories where participation in social practices is linked to individual formation of identities (Lave & Wenger, 1991). Sfard and Prusak's (2005) definition of narrative identities differs from Wenger's (1999) theory in that Wenger focused on experiences rather than stories. For example, research (Bartholomew et al., 2011; Rodd & Bartholomew, 2006; Solomon, 2007) indicated that "students' stories about mathematics tend to focus on how they develop a sense of belonging or exclusion" (Langer-Osuna, 2017). Teachers' narrative identities demonstrate how their own learning experiences relate to their approaches to teaching mathematics and science (Adams, 2013; Mensah, 2011; Rivera Maulucci, 2013; Williams, 2011). It is unclear from the research if and how teacher and student identities relate to each other (Langer-Osuna, 2017). Narrative approaches to studying identity can provide a lens into how PSETs envision themselves as teachers of mathematics and science. We propose that drawing used in conjunction with written explanation can be a narrative approach that serves to analyze the stories of many individuals, "enabling analysis of patterns of experiences and stories" (Langer-Osuna & Esmonde, 2017, p. 641). PSETs' drawings in mathematics and science methods courses can be used to study their identities and beliefs about learning mathematics and science.

Drawings are most often used in the elementary setting to observe children's thoughts and emotions towards different content areas. Limited research exists on using drawings to explore the images and experiences that pre-service teachers associate with mathematics (Burton, 2012; Lee & Zeppelin, 2014; Rule & Harrell, 2006). Research has explored the drawings of PSETs and their perspectives on science teaching (Katz et al., 2010; Mensah, 2011; Mensah & Fleshman, 2017), but not necessarily as a way to document the science learning experiences of PSETs. Others (Akerson, 2017; Burton, 2012) have used drawings to investigate pre-service teachers' internship experiences. Drawings have also been used as a form of narrative writing for second- and third-grade students (Caldwell & Moore, 1991) and can be particularly useful in regulating emotions (Drake & Winner, 2013). Rule and Harrell (2006) recommend that drawings be included in mathematics methods courses to connect pre-service teachers to their unconscious images of mathematics and to help shift their emotions towards mathematics to a more positive mindset.

A Framework for the Scholarship of Teaching and Learning

PSETs' drawings completed before and after methods courses can be used as evidence of student learning to ensure that the learning goal of the methods courses are being met. In the scholarship of teaching and learning, student learning should be based on the teacher's teaching philosophy (Stipek et al., 2001). The following figure offers a model that connects our (Teacher Educators') teaching philosophy with the learning goal for PSETs, teaching activity for PSETs in methods courses, and evidence of PSETs' learning.

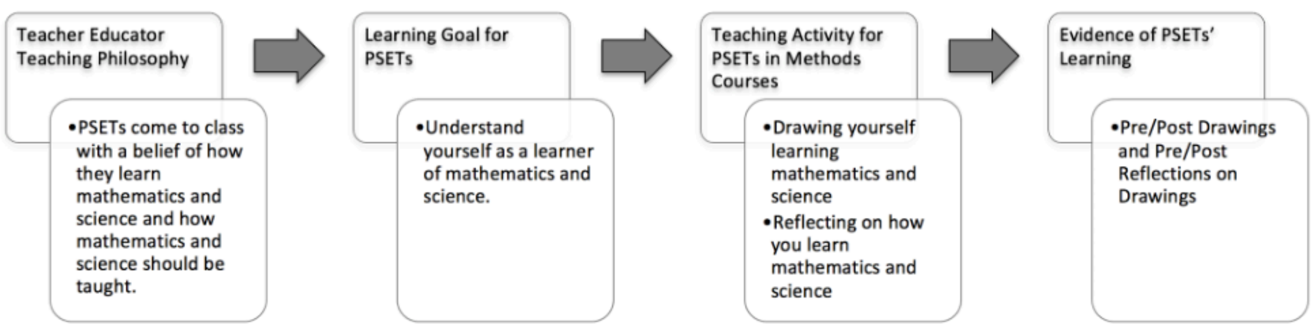


Figure 1. A model that connects our (Teacher Educators') teaching philosophy, learning goal for PSETs, teaching activity for PSETs in method courses, and evidence of PSETs' learning.

A major learning goal in our methods courses is for PSETs to understand themselves as learners of mathematics and science. This means that we want the PSETs to reflect on how they learned mathematics and science in their pasts and compare and contrast these teaching approaches to instructional practices that they hope to develop. We encourage them to revise and challenge their assumptions about learning and teaching mathematics and science. Based on this framework, this study aims to examine PSETs' perceptions of themselves as learners of mathematics and science by analyzing PSETs' stories through pre- and post-drawings as well as descriptions of their drawings.

Methods

Context

The context for the study was an undergraduate elementary education program at a regional comprehensive master's university in the southeastern United States. We, a mathematics teacher educator and a science teacher educator, each were teaching a methods course in the program: a) the first of two mathematics methods courses taken in the third year of the program, and b) the only science methods course taken in the fourth year of the program. The program, and the College, have social constructivism as a core philosophy. Therefore, classes are structured where teacher candidates participate as "students" in model activities, develop their pedagogical content knowledge, and analyze, deconstruct, and discuss activities in light of pedagogical strategies and content topics (Luehmann, 2007). This course structure is meant to address the possible scenario that PSETs might not have experienced such social constructivist learning environments and to encourage their confidence within this philosophy of teaching and learning. A course goal that is central to both the mathematics and the science methods courses is for PSETs to reflect on how they learned mathematics and science in their prior school experiences. We encourage them to compare and contrast the kinds of instructions that they experienced to the approaches to teaching in our methods courses. Thus, learning to pay attention to their own learning experiences will help PSETs articulate, challenge, and revise their assumptions about teaching and learning mathematics and science.

We exposed PSETs to discipline-specific practices (e.g., science: scientific and engineering practices and science process skills; math: e.g., the standards for mathematical practices (CCSSM, 2010). Additionally, in facilitating model activities for PSETs to highlight research-based pedagogical strategies, we use general and discipline-specific materials while students work in cooperative-learning groups. In both courses, students complete a field experience internship in a local public school. In the mathematics methods course, PSETs complete the internship at the end of the course and are responsible for conducting a diagnostic interview with three students. The purpose of the diagnostic interview is to assess what the students know and can do rather than report what they cannot do. In the science course, PSETs are responsible for creating and implementing a 3-day 5E unit in their internship classroom. In this internship experience, PSETs have a chance to teach using strategies they experienced as students in the science methods course and to see how elementary students respond to such teaching practices.

Participants

Participants in the study are all elementary education majors, therefore, they are all pre-service elementary teachers (PSETs). At the time of data collection, PSETs enrolled in each of the teacher educators' courses were asked by an outside visitor if their drawings and written descriptions from two class activities during the semester could be collected for research. The outside instructor kept the signed consent forms in their office until the end of the semester. In this way, the instructors did not know who had agreed to participate until after final grades were turned in. Seventy-two students from three sections of the mathematics methods course consented to participate, while 75 students from four sections of the science methods course consented to participate.

Data Colleciton

On the first day of class, PSETs were given the first prompt: "Draw yourself learning math" or "Draw yourself learning science" and asked to "Explain your drawing below" in written text. This style of prompt is similar to that used in other studies investigating PSETs identities related to science teaching (Katz et al., 2010). On the last day of class, students were asked to repeat the prompt. They did not have their initial response available to them when they completed their final prompt.

Data Analysis

Drawings and written descriptions were collected from all PSETs enrolled in the mathematics and science methods courses. At the end of the semester, only those PSETs that provided consent for their classwork to be used for research were used in the data analysis. First, the student work was de-identified and labeled with numbers to keep track of matching initial and final course drawings and written descriptions and to keep PSETs' participation confidential. All names used in the findings section (below) are pseudonyms. We chose a subset of science (n = 16) and mathematics (n = 16) drawings and written descriptions to develop emergent codes and categories (Charmaz, 2008). Though we allowed the codes and categories to emerge from the data, as teacher educators, we focused on labeling ideas within the drawings with words or phrases that are pertinent to evidence-based teaching strategies. For example, when students included pencils and paper in their drawings, instead of labeling them individually, we coded them as generic classroom materials, whereas when students included math manipulatives or hand lenses, we coded these as materials for hands-on learning. Emergent codes and categories for each set of drawings were compared across content courses and a shared coding scheme for drawings and written descriptions was developed. All initial science and mathematics drawings and written descriptions were then coded with the shared coding scheme. Elements in drawing and writing were coded as present (1) or absent (0). Results for each PSETs' initial and final work were recorded in a spreadsheet, which was then exported to SPSS for analysis to compare the results of the presence/absence of elements in the initial vs. final drawings and written descriptions. Once in SPSS, we performed a McNemar test (Siegal & Castellan, 1988), assuming course activities are a "treatment," to determine if there were significant changes across PSETs' work between their initial and final drawings and written descriptions. All codes for the drawings are included in Appendix A and all codes for the written descriptions are included in Appendix B. The codes that showed significance, $p < .05$, for both mathematics and science drawings and written descriptions are reported and discussed in the following section.

Findings

Drawing Results

Analysis of the pre/post mathematics and science drawings data resulted in a significant difference, $p < .05$, in the proportion of eight categories in pre- and post- methods courses. Table 1 indicates the categories, descriptions, and significant quantitative results for the categories found in the drawings. The presence of these categories in the pre/post drawings will be described with illustrative examples.

Table 1. ***Drawing coding categories, descriptions, and significant results.***

Drawing Category Name	**Drawing Category Description**	**Pre/Post Significant Results for Mathematics (n = 72) and Science Drawings (n = 75)**
Increase in Teaching Students as a Component of Learning	Drawing clearly includes a teacher with student(s)	Math: $p = .039$ Science: $p = .004$
Decrease in Board/Lecture	Drawing includes a board or teacher at the board	Math: $p = .026$ Science: $p = .009$
Increase in Materials for Hands-on Teaching	Drawing contains mathematics manipulative or science materials	Math: $p < .001$ Science: $p = .018$
Increase in Students Working Together	Drawing depicts two or more students working together	Math: $p = .039$ Science: $p < .001$
Decrease in Uncertainty of Student(s)	Drawing contains question marks, straight face, sad face, text that indicates uncertainty	Math: $p < .001$ Science: $p = .019$
Increase in Positive Expression	Drawing contains student(s) with happy face	Math: $p = .005$ Science: $p = .026$
Decrease Negative Expression	Drawing contains student(s) with unahppy face	Math: $p < .001$ Science: $p = .008$
Increase in Inclusion of Recent Content	Drawing depicts content recently learned in college methods course	Math: $p < .001$ Science: $p = .001$

Written Descriptions

The pre/post writing data resulted in three significant categories. Analysis of the pre/post mathematics and science written descriptions data resulted in a significant difference, $p < .05$, in the proportion of three categories pre- and post- methods courses. Table 2 indicates the categories, descriptions, and significant quantitative results for the categories found in the writing. Examples of the writing that show these themes will be provided.

Table 2. ***Writing coding categories, descriptions, and results.***

Written Description Themes	**Theme Description**	**Pre/Post Results for Mathematics (n = 72) and Science Written Descriptions (n = 75)**
Increase in Collaboration	Writing contains examples of working together with other students, discussions, inclusion of hands-on materials, etc.	Mathematics: $p = .031$ Science: $p = .004$
Decrease in Negative Emotions	Writing describes negative feelings about learning mathematics or science (e.g., giving up, frustration, irritation, sadness, boredom).	Math: $p < .001$ Science: $p < .001$
Increase in Subject-Specific Practices	Writing includes specific pedagogies or practices learned in math/science methods courses (Math: Problem Solving/ Science: 5E)	Math: $p = .003$ Science: $p < .001$

Increase in Teaching Students as a Component of Learning

PSETs' drawings of learning mathematics and science showed a significant increase in the presence of a teacher. For example, a pre-drawing could contain a student at a desk with no teacher present and a post-drawing could contain a teacher helping a student at a desk. In math, eight PSETs did not include a teacher before the methods class but included a teacher after the methods class. Figure 2 is an example of a pre-post mathematics drawing. This PSET depicted a student sitting at a desk alone before completing the math methods course and depicted a student at a desk with a teacher after completing the mathematics methods course.

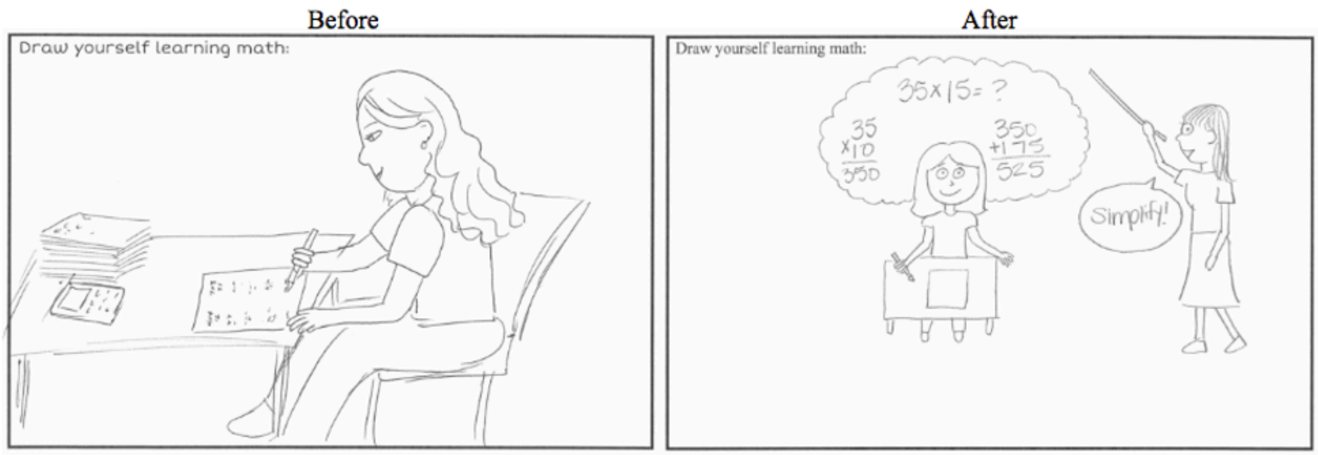


Figure 2. An example of an Increase of Teaching Students as a Component of Learning in Math.

In science, nine drawings that did not contain a teacher in the pre-drawing included a teacher in the post-drawing. Figure 3 is an example of a pre-post science drawing. The PSET included a student alone in the pre-drawing and a group of students with a teacher in the post-drawing.

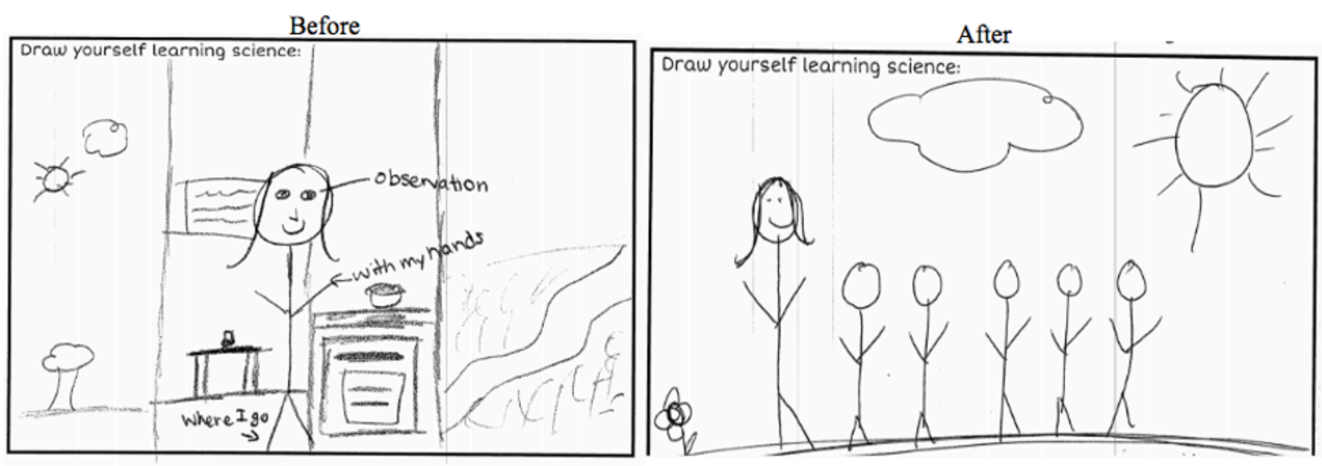


Figure 3. An example of an Increase of Teaching Students as a Component of Learning in Science.

Decrease in Board/Lecture and Increase in Materials for Hands-on Teaching

The PSETs' drawings indicated a decrease in lecture-based teaching and an increase in materials for hands-on teaching. In mathematics and science, many PSETs included a board or a teacher at the board in the pre-drawing and, in the post-drawings, included mathematics manipulatives or science materials without a board. In math, 21 PSETs did not include a board after taking the mathematics methods course, and, in science, 22 PSETs did not include a board after taking the science methods course. Figure 4 shows a pre mathematics drawing where the teacher is at the board and students are sitting in rows at desks that are facing the board, a lecture-based teaching setting. Although three PSETs included manipulatives in both their pre and post-drawings, 18 PSETs that did not have manipulatives in their pre-drawing added manipulatives to their post-drawings. The post-drawing shows hands using mathematics manipulatives that include base-ten blocks, counters, fraction circles, and connecting cubes, a reform-based teaching setting.

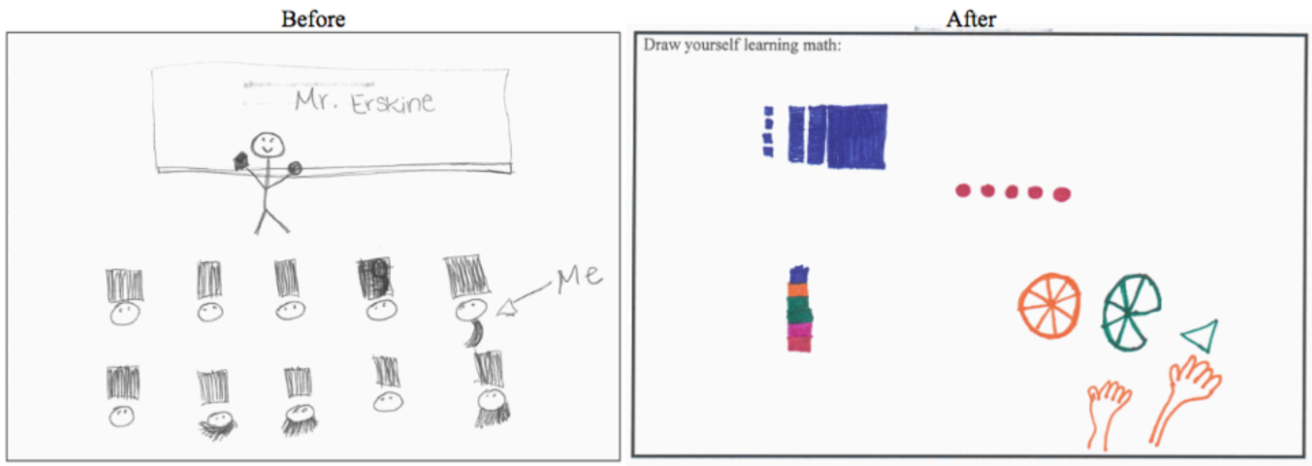


Figure 4. An example of a Decrease in Board/Lecture and an Increase in Materials for Hands-on Teaching in Math.

The PSETs' science drawings also showed a decrease in lecture and an increase in science materials, similar to the mathematics drawings. Eighteen PSETs included science materials in their pre and post-drawings, but 28 students that did not have science materials in their pre-drawings, added science materials to their post-drawings. Figure 5 shows a PSETs' pre and post science drawing.

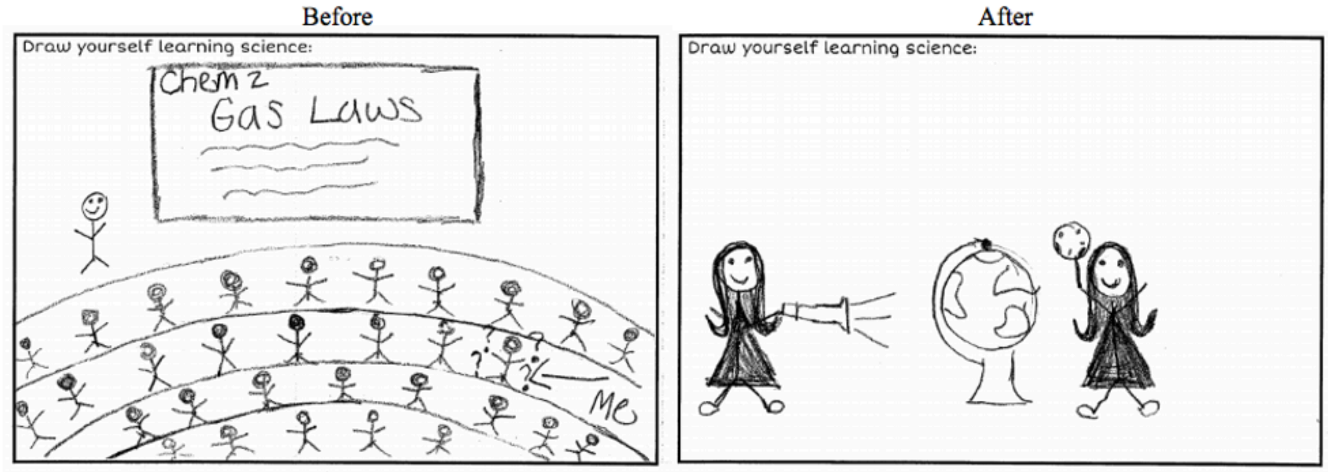
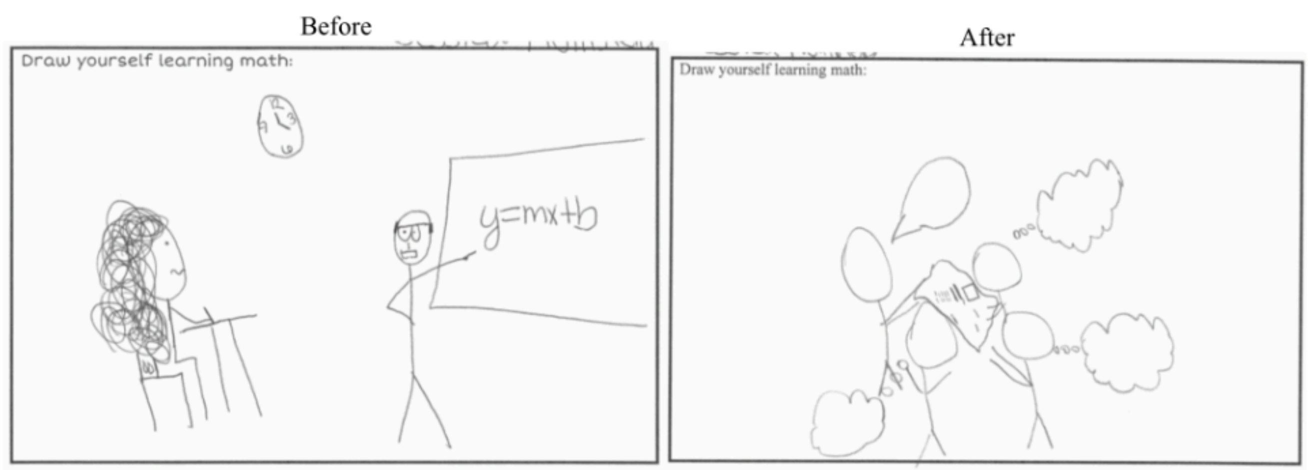


Figure 5. An example of pre/post science drawing that show a decrease in board/lecture and an increase in materials for hands-on teaching.

Increase in Students Working Together

We found that the PSETs' pre-drawings contained individuals, whereas the post-drawings contained groups of people working together. The groups of students collaborating were often depicted as having discussions, indicated with speaking bubbles. In the mathematics drawings, 10 PSETs that did not include students working together in their pre-drawing showed students working together in their post-drawing. Twenty-two PSETs that did not depict students working together in the science pre-drawing drew students working together in the science post-drawing. Figure 6 shows an example of Julia's pre mathematics and Astrid's pre science drawing with an individual and Julia's post mathematics and Astrid's post science drawing with a group of students.



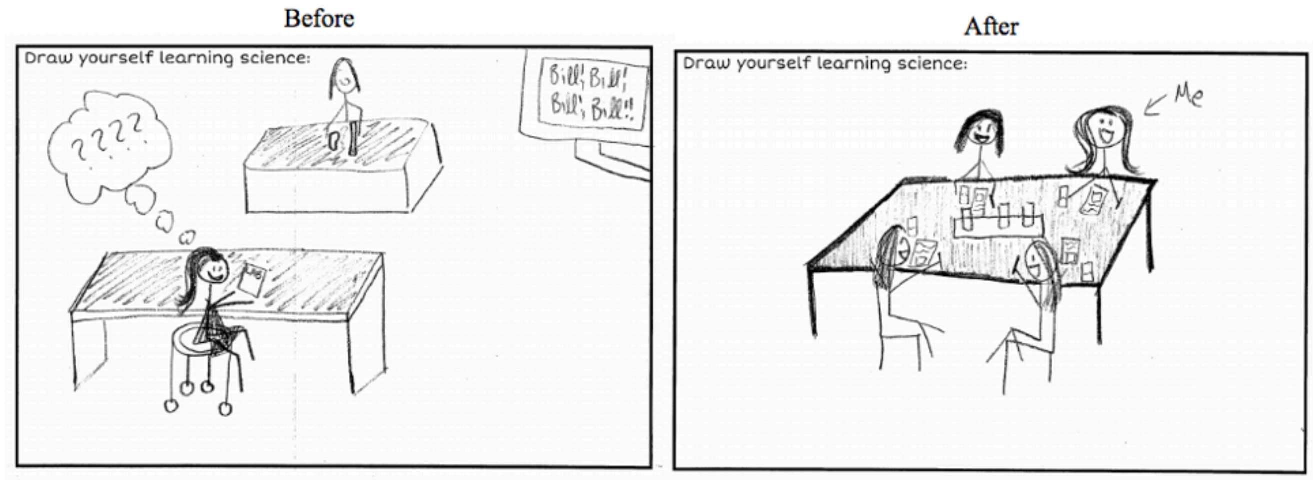


Figure 6. An example of pre/post drawings that show an increase of both students working together in mathematics (top) and science (bottom).

We also found that PSETs description of their drawings included an increase in collaboration. For example, one PSET, Julia, described her pre-drawing as, "I am sitting in a desk taking notes as the teacher writes important information on the board." She writes about her post-drawing by saying, "In groups, my classmates and I discuss how we think about mathematics and we use manipulatives to help us figure it out." Astrid writes, "I picture sitting at a black lab table watching my teacher demonstrate something. In this picture I have to write a lab report and I have no idea what I'm doing" as she describes her pre-drawing. For her post-drawing, she says, "I am working in a group with a lot of hands-on materials. We are writing down our observations about what we notice."

Decrease in Uncertainty of Students

The mathematics and science pre-drawings depicted students as unsure, and the post-drawings indicated confidence. Uncertainty was shown using a straight or sad face, question marks, or text indicating uncertainty. Confidence was shown with a happy face, exclamation points, or text indicating confidence. This category was seen across the mathematics and science drawings. Although 43 PSETs did not show uncertainty in the pre or post mathematics drawings, 23 PSETs showed uncertainty in their pre-drawings but did not show uncertainty in their post-drawings. In science, 56 PSETs did not depict uncertainty in their pre- or post-drawings, but 15 PSETs showed uncertainty in their pre-drawings, but not in their post-drawings. Figure 7 shows examples from mathematics and science.

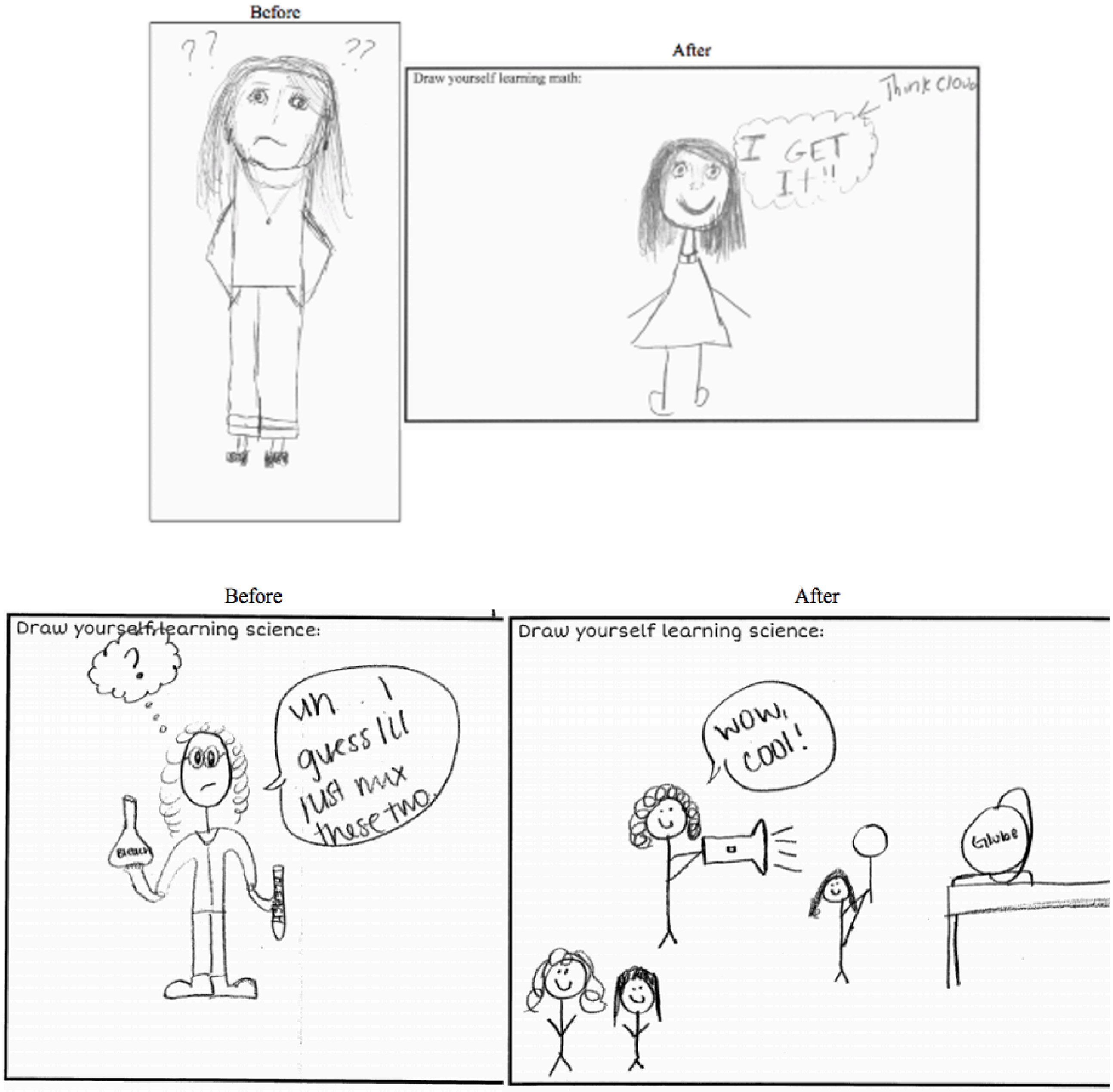


Figure 7. An example of pre/post drawings that show a decrease in uncertainty and an increase in confidence in mathematics (top) and science (bottom).

Increase in Positive Expression/Decrease in Negative Expression

The drawings showed that there was an increase in positive expressions and a decrease in negative expressions from before the mathematics and science methods classes and after the mathematics and science methods classes. A positive expression is indicated with the presence of a happy face and a negative expression is indicated with the presence of a frown. In both mathematics and science, the number of drawings with a positive expression increased from pre to post and the number of drawings with a negative expression decreased from pre to post. Sixteen PSETs depicted positive expressions in their pre- and post-drawings. However, 27 PSETs that did not show positive expressions in their pre-drawing drew positive expressions in their post-drawing. The science drawings were similar with 34 PSETs showing positive expressions in their pre- and post-drawings, but 21 PSETs that did not have a positive expression in their pre-drawing added a positive expression to their post-drawing. In addition, 70 PSETs' pre- and post-drawings did not contain a negative expression, but two PSETs that had a negative expression before the mathematics course did not draw a negative expression after the mathematics course. Similarly, in science, 67 PSETs did not have a negative expression in their pre- or post-drawing, but 8 PSETs that had a negative expression before the science course, dropped the negative expression after the science course. Figure 8 shows an increase in a positive expression and a drop in a negative expression in math. The science drawings were very similar.

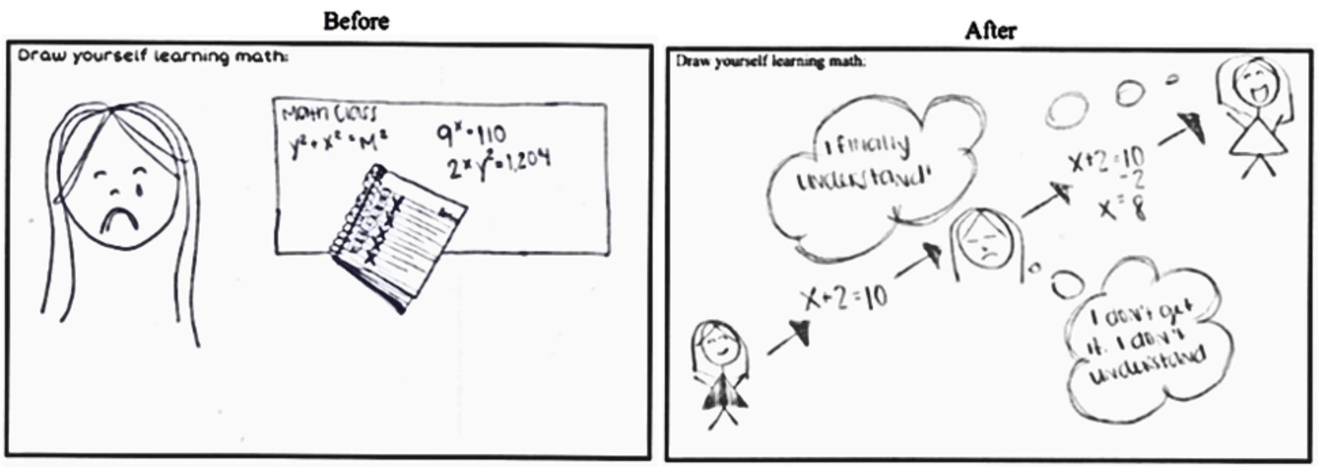


Figure 8. An example of pre/post drawings that show an increase in a positive expression and a decrease in a negative expression.

We also found that PSETs' descriptions of their drawings included a decrease in negative emotions. In math, Kathy described her pre-drawing as, "My drawing is a picture of me, very sad because I made a bad grade on a test. There are also a few complicated problems written on the whiteboard. Let's say math isn't my best subject." However, her post-drawing showed, "As I am introduced to a problem I am frustrated I don't understand, but that is a part of my process. I finally understand the equation and I am content. The cloud bubbles also represent not just what is written, but my thinking processes to get the new answer" (see Figure 8). Similarly, Tamara, a PSET in science wrote, "I have a bad relationship with science...it was almost as if I didn't try at it for so long that I gave up." Her post-drawing shows a definite change in negative emotions, and she described it as, "I still need to work on total content understanding, but I have gotten SO MUCH better with science, both in understanding and my feelings towards it. I feel like I understand major concepts and don't cry every time I see or hear a science question."

Increase of Inclusion of Recent Content

The pre-drawings in mathematics most often depicted the content area of algebra because this was the most recent mathematics class that students had taken. Post mathematics drawings contained the content area of numbers and operations because that was the focus of the methods course in which the drawings were collected. Figure 9 shows a pre-drawing that contains algebra and a post-drawing that contains numbers and operations. Twenty-one PSETs in mathematics that showed algebra or calculus in their pre-drawings did not include algebra or calculus from their post-drawings but included the recent content of numbers and operations. Twenty-five PSETs in science that did not have recent content in their pre-drawing added recent course activities to their post-drawing. The pre-drawing in science shows many different content areas including chemistry and biology. The post-drawing shows the most recent content from the methods class (e.g., a recent course activity) (see Figure 10).

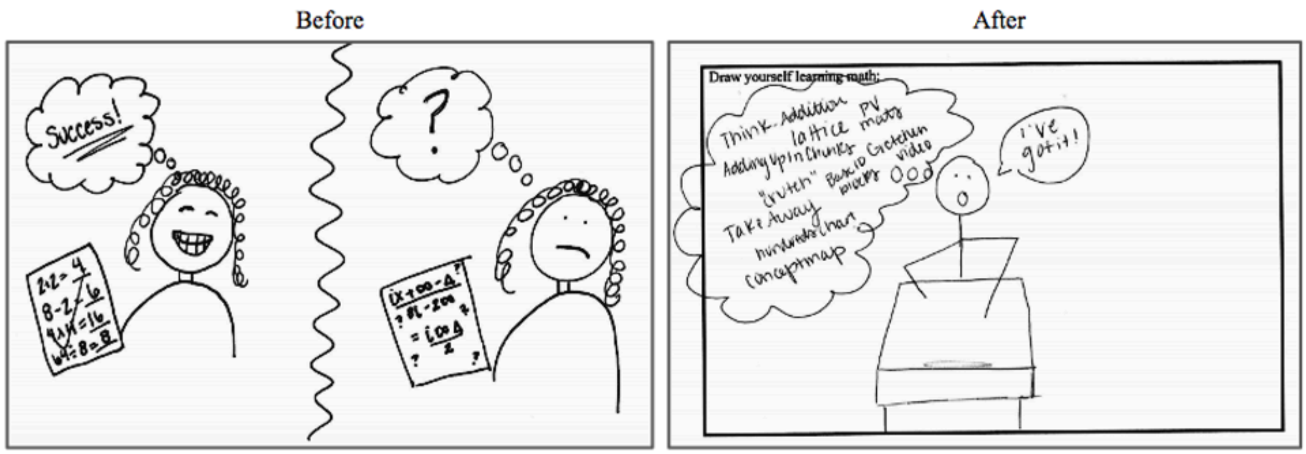


Figure 9. An example of pre/post mathematics drawings that show the most recent content.

Figure 10. An example of pre/post science drawings that show the most recent content.

Similar to the inclusion of most recent content in PSETs' drawings, PSETs' writing showed a significant increase in subject-specific practices. Jamie described her pre math drawing in Figure 9:

> One of the many reasons I plan to become an elementary teacher is the lack of complex math classes required. My math background would consist of the typical honors high school courses with some AP calculus involved. If I were to define my feelings towards math, I would say that the effort is there, the lessons are usually retained with work and practice but the interest area is lacking beyond your basic, life-applicable math problem.

When writing about her post mathematics drawing, she remarked, "From this course, I have learned so many new ways to solve problems. Each way provides a different perspective and process to cater to what fits the student best."

A student in the science methods class, Hilary, commented on her pre-drawing (Figure 10), "I believe science should be hands-on and interactive. This is a picture of myself exploring the world around me." She remarked about her post science drawing, and said, "This is a picture of me learning science through hands-on activities. The best way to learn science is to ask a question and explore activities to find evidence. Science is [a] way to help us understand the world around us."

Discussion

Based on the results of this study, PSETs' experiences in constructivist content-focused methods courses with an internship component seemed to influence PSETs' perceptions of learning mathematics and science. In particular, PSETs significantly increased their positive emotions and/or decreased their negative emotions related to learning mathematics and science content in their drawings. There was also a decrease in PSETs' negative emotions in their written explanations. Katz et al. (2010) studied PSETs' drawings in science after a semester of after-school internship which used constructivist learning tenets in the design. They found an increase in the inclusion of positive expressions and/or a decrease in the inclusion of negative expressions in the PSETs' drawings (Katz et al., 2010). These findings also align with Akerson's (2016) results where PSETs' perceptions towards mathematics shifted from a negative toward a positive experience after completing a field experience where PSETs observed classroom settings where students were learning mathematics in a collaborative setting and engaged in discussion with each other. These findings have important implications for how enthusiastic PSETs feel about teaching these content areas, given that researchers have found links between PSETs' attitudes towards their content, their approaches to teaching the subject (Wilson & Kittleson, 2012; Hsu et al., 2017), and in the case of science, even how often they are willing to teach it (Cavallo et al., 2002).

Additionally, we saw significant increases about content-related understanding. Content understanding is an important component in the development of a constructivist teaching identity, as this strategy of attending to student ideas requires higher-level knowledge of the teacher (Windschitl, 1999). In PSETs' drawings, from pre- to post- they increased the inclusion of recent content from the model constructivist activities used in class as well as decreased the uncertainty expressed about their content understanding. In their written explanations, PSETs showed an increase in discussion of subject-specific practices.

We agree with Langer-Osuna & Esmonde (2017) that as PSETs reflected and made sense of their experiences of learning mathematics and science through drawing and written descriptions, they told stories about their mathematical and scientific selves. Similar to Battey and Franke's (2008) findings that shifts existed in teacher identities based on stories before and after participating in professional development, we found that PSETs showed evidence of shifting identities based on drawings completed before and after engaging in methods courses.

Implications for Teaching

The results of this study provide implications for mathematics and science teacher educators, especially those that teach methods courses to PSETs. Providing model experiences related to reform-based teaching is what pre-service teachers expect (Timoštšuk & Ugaste, 2010) and may be an important element in shifting their emotional responses to content-area teaching. After experiencing model constructivist mathematics or science teaching, PSETs increased their inclusion of elements associated with constructivist learning environments (materials for hands-on teaching and students working together) and decreased their inclusion of passive elements of learning (board/lecture) in their drawings as well as included an increase in written expressions of collaboration with peers as a component of learning.

While we saw significant increases in PSETs' inclusion of aspects of reform-based teaching practices in their post-drawings and explanations, we are only cautiously optimistic that this will result in the consistent use of these practices in their classroom teaching. Research has found that new science teachers will often espouse the use of reform-based practices in their classrooms, but not implement these (Davis et al., 2006). Despite being exposed to constructivist ideas in university classes, teachers tend to use strategies based on their personal learning histories (Eick & Reed, 2002). In addition, if PSETs have had negative emotions about their learning of the subject, they may choose to plan more passive learning for their students to prevent them from struggling (Wilson & Kittleson, 2012). Finally, even science teacher enthusiasts, who have expressed positive experiences about learning and teaching science, struggle to consistently teach science because of constraints related to time, resource availability, and testing for other subjects (Bradbury & Wilson, 2020). Therefore, even though we see potential in using both modeling of reform-based teaching strategies and reflection on their perspectives of content-area learning throughout the semester, their experiences in the methods courses are only one small set of their learning experiences.

Limitations and Suggestions for Future Research

This study gave us a glimpse into how PSETs' identities related to learning mathematics and science develop in a social context like a classroom. Limitations exist connected to PSETs' abilities and willingness to draw themselves. Thus, the method of using drawings as evidence of learning could be paired with using narrative identities where PSETs reflect and make sense of their experiences of learning mathematics and science through telling stories (Langer-Osuna & Esmonde, 2017; Battey & Franke, 2008). In future studies, it would be beneficial to explore how PSETs' identities develop in other instructional settings, such as field experiences and online, asynchronous, and blended mathematics methods courses. Research should also be done to examine drawings before and after methods courses, as well as after student teaching, to locate possible shifts in instructional practice and for teacher educators to improve their courses. In addition, future studies should also address how PSETs' perceptions of themselves as learners of mathematics and science impact how they design and teach lessons to students. In future research, mathematics and science teacher educators could use pre- and post-course drawings of students learning along with drawings of students teaching to try to analyze connections between PSETs' ideas about learning and teaching elementary mathematics and science.

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Appendix A

All Codes for Drawings and *p*-values

Drawing Category Name for Mathematics and Science	**Pre/Post Results for Mathematics (n = 72) and Science Drawings (n = 75)**	
	Mathematics p =	**Science p =**
Books/papers	.359	.441
Computer/internet	1.000	.289
Drawing on paper/board	.375	1.000
Writing on paper/board	.690	.332
Symbols on paper/board	.250	1.000
Teaching students	.039	.004
Desk/table	1.000	.164
Board	.026	.009
Windows	1.000	.219
Mathematics Manipulatives/Science Materials	<.001	.018
Pencil	.481	.754
Ruler	1.000	.625
Calculator	.031	1.000
No person	1.000	1.000
Student alone	.700	.429
Teacher alone	1.000	1.000
With other students working separately	.289	.180
With other students working together	.039	<.001
With a teacher (unknown gender)	1.000	.064
With a teacher (known male)	1.000	1.000
With a teacher (known female)	.388	1.000
Parent/expert	.500	1.000
Teacher in front of class	.383	.064
Teacher off to the side	1.000	1.000
Teacher with a student	1.000	1.000
Student at the board	.238	1.000
Student at desk/table	.845	.441
Centers	1.000	.250
Indoors	1.000	1.000

Student thinking cloud: connections to content	<.001	.289
Student thinking cloud:? or uncertainty	<.001	.019
Student speaking bubble: ? or uncertainty	.375	.453
Student positive expression	.005	.026
Student negative expression	<.001	.008
Student neutral or no expression	1.000	.201
Teacher positive expression	.629	.454
Teacher negative expression	.500	1.000
Teacher neutral or no expression	1.000	.289

Pre/Post Results for Mathematics (*n* = 72)

Drawing Category Name for Math	***p*** **=**
Basic operations present	1.000
Algebra present	<.001
Geometry present	.625
Contrast between arithmetic and "other" mathematics content	.063

Pre/Post Results for Science (*n* = 75)

Drawing Category Name for Science	***p*** **=**
Earth science	.001
Biology	.009
Physical science	.405
5E	.063

Appendix B

All Codes for Written Descriptions and *p*-values

Drawing Category Name for Mathematics and Science	**Pre/Post Results for Mathematics (n = 72) and Science Drawings (n = 75)**	
	Mathematics p =	**Science p =**
Hands-on	.002	.188
Text	1.000	.049
Media	1.000	.021
Writing	.092	.092
Collaboration	.031	.004
Lecture	.008	.070
Activity from class	1.000	.832
Positive	.230	.596
Negative	$< .001$	$< .001$
World outside	1.000	

Pre/Post Results for Mathematics (n = 72)

Writing Category Name for Math	**p =**
Problem solving	.003
Reasoning and proof	.039
Communication	.500
Connections	.063
Representations	.688
Numbers and operations	.549
Geometry	.500
Fractions	.250

Pre/Post Results for Mathematics (*n* = 72)

Writing Category Name for Math	***p*** **=**
Problem solving	.003
Reasoning and proof	.039
Communication	.500
Connections	.063
Representations	.688
Numbers and operations	.549
Geometry	.500
Fractions	.250

Pre/Post Results for Science (*n* = 75)

Writing Category Name for Science	***p*** **=**
5E	< .001
Experimenting	.571
Recording	.219
Observing	.804
Data collection	.375
Engaging in argument from evidence	.500
Asking questions	.031
Mathematical thinking	1.000
Inferring	.500
Measuring	1.000
Modeling	.125
Earth science	1.000
Life science	<.001
Physical science	.041

DRAW A PICTURE OF YOURSELF LEARNING MATH

What Pre-Service Teachers' Self-Portraits Illustrate About Their Complex Relationship With Mathematics

Samantha Sommers; Michelle Unigarro; Danielle Vantassel; Claudia Bertolone-Smith, Ph.D.; and Alison Puliatte, Ph.D.

Abstract

The purpose of this study was to examine factors that may influence pre-service teachers' relationships with mathematics. Elementary pre-service teachers who were enrolled in a mathematics methods course (n = 52) wrote a letter to math and drew a picture of themselves learning math. The self-portraits were analyzed by a team of undergraduate student researchers and teacher educators to identify themes related to the types of emotions, experiences, and situations displayed. The results of the self-portrait analysis indicated a higher percentage of negative emotions as compared to positive and neutral emotions. Additionally, the portraits indicated the influence of early elementary experiences on developing the participants' math identity and relationships with mathematics. Implications for teacher preparation coursework and elementary mathematics pedagogy are discussed.

Keywords: pre-service teachers; math methods, math anxiety, math identity

Introduction

Many pre-service teachers (PSTs) enter math methods courses with trepidation and anxiety, and this can be a result of their past experiences with learning mathematics (Brady & Bowd, 2005). To investigate this phenomenon, elementary PSTs (n = 52) in a math methods course were asked to write a letter directly to "Math". This was done to personify the discipline of mathematics to elicit a personal reflection of the PST's relationship and opinion about math

(Zazkis, 2016). To supplement the letter to "Math", PSTs were also asked to draw a picture of themselves learning math and provide a caption explaining what was happening. The professors of the methods course encouraged their students to write honestly and to create a true selfportrait of a learning experience with math. Some students typed their letters, while others wrote them out by hand. Some students took pictures of themselves showing their reactions to math (i.e. crying, or excitedly working on a math problem) or they drew pictures. There was room for expression which provided a spectrum of emotions, perspectives, and experiences revolving around learning mathematics. This assignment aimed to uncover the experiences that PSTs had while learning math and their current attitudes towards math.

This was part of a larger study which analyzed both the letters and the self-portraits. Our study examined the perspectives and relationships which emerged in the self-portraits. The research and analysis presented in this article was conducted by three teacher-education students who were also research participants. Our positionality in doing this work was to acknowledge our own mindsets about math, while simultaneously investigating our peers' responses. We found that because we are *of* the research group, we could rely on our funds of knowledge about our peer group. We also sought to know more about becoming better math teachers in the future, and this project helped shed light on this goal.

Literature Review

PSTs' relationship with math can be attributed to a variety of factors related to their past experiences learning math. In this literature review, we discuss math anxiety, motivation, and instructional practices. Math anxiety and anxiety about teaching math in PSTs and in-service teachers can impact instructional choices and student achievement (Hadley & Dorward, 2011). PSTs can be hesitant about math content and methods courses depending on their past experiences learning mathematics. Pedagogical choices made by their teachers may have had a positive or negative impact on the PST. Motivation to persevere in learning mathematics requires teachers to carefully consider how to best accomplish this (Gojak, 2013). Instructional practices in mathematics are relevant in this case because PSTs are both impacted by the conditions in which they learned mathematics and are also learning to be mathematics teachers. Math anxiety, motivation, and instructional practices are a key part of understanding PSTs' perspectives on mathematics.

Math Anxiety

Math anxiety is present when feelings of tension and self-doubt interfere with the ability to work with numbers and solve problems. Math anxiety can cause one to forget what they know about math and lose self-confidence (Tobias, 1993). Perspectives and relationships with math are first formed in early childhood. Negative experiences involving math can lead to the early development of math anxiety and greatly hinder working memory (Mutlu, 2019). Math anxiety can occur in the primary grades and peak in middle school or early high school, but its effects can remain well into adulthood and affect the quality of teaching from elementary teachers (Schubert, 2019). Elementary teachers can pass on negative perspectives of math if they experience math anxiety as well. Math anxiety is prevalent in PSTs, impacts their confidence in their abilities, and is correlated with a lack of self-confidence when teaching math (Karunakaran, 2020). Past research has identified that elementary PSTs, especially women, demonstrate high levels of math anxiety (McGlynn-Stewart, 2010; Stoehr & Olson, 2015). PSTs' previous educational experiences as well as their parents' outlook toward math impact the PSTs' selfconfidence and ability to teach mathematics (Karunakaran, 2020).

There are steps that teachers and schools can take to lessen math anxiety for themselves and their students. One step is to adopt a variety of pedagogical approaches to teaching mathematics. For example, instead of relying primarily on lectures and notetaking in math lessons, teachers can position students as active rather than passive learners (Spikell, 1993).

Math can be made relevant to students' lives and students can be encouraged to explore, conjecture, and propose solutions rather than engaging solely in rote learning of math rules and procedures (Small, 2019).

Student Motivation

Students are often blamed for lacking motivation; however, teachers can examine their pedagogical approaches to understand why students may lose their curiosity and initiative during mathematics learning (Gojak, 2013). For example, if the goals of learning mathematics shift from being curious about content and their environment to finding the right answer, motivation may decrease. Additionally, fostering a competitive environment during math instruction (i.e. posting student scores in public, praise focused on being fast, timed tests with reward systems) can increase stress and lessen motivation (San Giovanni et al., 2020). Teachers can encourage persistence and positive motivation in the classroom by providing activities that are challenging, allowing more time to complete tasks, carefully selecting classwork and homework assignments, and occasionally allowing students to choose assignments (Boaler, 2016). By encouraging students to be intrinsic motivators, math becomes less of a task and more of an exploration (Gojak, 2013).

The way a teacher presents materials and reassures a student that they are capable of learning and carrying out a task affects the student's self-efficacy. Teachers need to foster students' self-efficacy to help improve performance (Rongrong & Singh, 2018). Students' selfefficacy, positive mindset, and intrinsic motivation can be increased when engaged in creative tasks (Du et al., 2019). Using creative tasks with math can motivate students to put more effort into completing activities they find challenging (Du et al., 2019)

Instructional Practices

Math can be presented as a creative task by using multiple modalities to meet the needs of all students. Math learning falls into two categories, auditory sequential and visual spatial

(Rapp, 2009). Auditory sequential math learners "think primarily in words, are step-by-step learners, memorize linear instructions, and follow oral directions well" (Rapp, 2009, p. 4). Visual spatial learners "think in pictures, are whole concept learners, learn through seeing patterns and relationships and have a unique method of organization" (Rapp, 2009, p. 4). Many educators tend to write a math problem on the board, solve it, and then ask students to solve problems like it. While most students can memorize the steps and solve future problems through this method, a disservice is done to visual spatial learners. Spatial learners benefit most from learning math that is taught using hands-on, or physical movement, activities, and games. Spatial learners also benefit from lessons that include the real-world implications of mathematics. Educators cannot teach math with a singular strategy, rather we must strive to meet the needs of all learners.

Incorporating writing when teaching math fosters metacognition in students when teachers ask students to write out their thinking (Costello, 2020). The writing process asks students to prewrite, draft, revise, edit and publish their work; students can apply this process to mathematics. Students can use the prewriting stage to think through the math problem and analyze what is being asked. Drafting can be used to work through the problem and revision should serve as the part of the process where one asks, "What could have been done better?" Editing should serve as the time to ensure the problem is error-free and publishing is when the work has been thoroughly examined and is ready for others to see (Costello, 2020). Making connections between mathematics and other subjects as well as everyday life will help grasp the attention of more learners and make it feel more worthwhile (Larson & Rumsey 2018). Math anxiety, student motivation, and instructional practices played a part in how our peers arrived at their perspective and relationship with mathematics. Drawings can provide insights into students' perceptions of what was happening during episodes of learning including emotions, social dynamics, and the criticality of the event (Cappello, Wiseman, & Turner, 2019). To gain a deeper understanding of how the PSTs viewed themselves as math learners, we examined PSTs' self-portraits and captions for evidence of emotions involved in the math learning episode, relationships with math that are indicated in the portrait and captions, and how other people (i.e. teachers, students) were incorporated into the pictures.

Methodology

Task

As part of a course assignment, PSTs were asked to create a self-portrait that showed themselves learning math. The self-portraits accompanied letters to math that were written by the PSTs. PSTs were asked to complete the following assignment:

Write a letter to math, including experiences you have had that have shaped your relationship with math. Discuss your future with math as you become an elementary school teacher. Draw a picture of yourself LEARNING math and write a caption describing what is happening in your picture.

Participants

The study was conducted at a public comprehensive college in the northeastern United States. The participants in this study were part of a larger study. The full set of participants for the larger study ($n = 54$) had a mean age of 20.71 years (range 19-23 years) and they were all enrolled in a junior level six-credit course focusing on the teaching methods of elementary math and science. All participants were pursuing a degree to be eligible to teach elementary education. Twenty-five participants attended a rural K-12 school, four participants attended an urban K-12 school, and 22 attended a suburban K-12 school. Ten participants took at least one accelerated math course in middle school and three participants took an accelerated math course in high school. The average number of college math courses the participants took was 2.35 (range 1-6), not including the math and science methods course where this research was conducted.

Two of the participants from the larger study did not submit a self-portrait. The data set for this study consisted of 52 undergraduate students (1 male, 51 female). Informed consent was obtained from all participants to participate in the study and publish their letters and pictures.

Data Collection

Data came from a larger study that focused on the participants' letters to mathematics, as well as self-portraits of themselves learning math. For this study, only the self-portraits were analyzed. Three of the participants submitted a photo instead of a drawing. There was not a population difference between the portrait drawers and portrait takers. All portraits (including photos) were coded by a third party to protect the identity of the participants. Before the initial viewing of the portraits were conducted, we divided the portraits into equal groups. We placed researchers' personal portraits in the group that they would not analyze. This ensured that all the portraits were viewed in an unbiased manner.

Data Analysis

The portraits and captions were analyzed for emerging themes relying on what participants chose to show in their portraits and writing included to further explain the picture. The portraits were open coded to identify themes and commonalities among portraits. After portraits were coded by one researcher, a second researcher coded the same portraits to ensure inter-rater reliability. Discrepancies in coding were discussed and adjusted based on agreement between the researchers. The writing accompanying the portraits was analyzed both in correlation with the drawing, and separately to determine emerging themes and categories (Corbin & Strauss, 2014). See Figure 1 for an example analysis of one portrait.

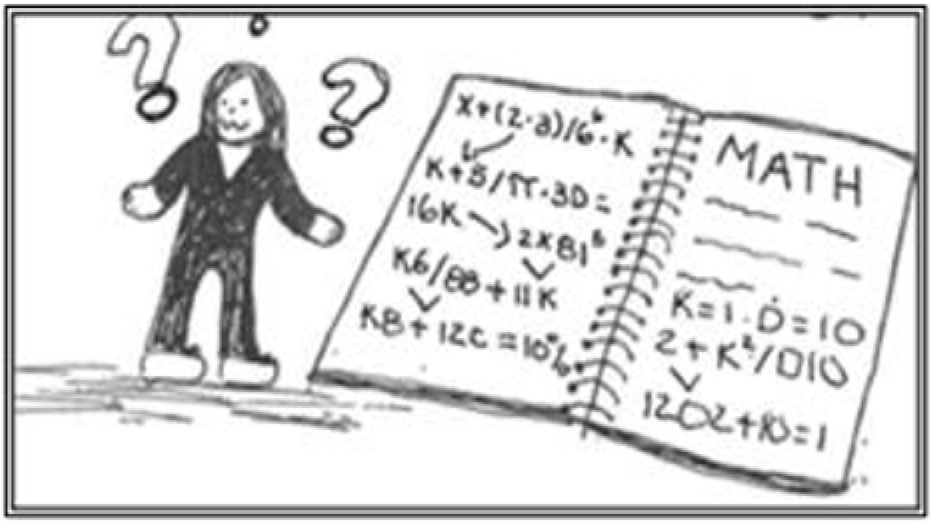

Figure 1. *Example portrait analysis. This self-portrait indicates a negative emotion, the student alone, math depicted as larger than the student, the writing (question marks) indicates confusion, the writing and picture are related, there is not a setting, change is not indicated, and the interpretation of the picture was classified as frustration.*

Results

Categories from Portraits

As a result of the portrait analysis, several categories emerged as ways to organize what was evidenced. The categories we identified were emotions displayed, people in the portraits (i.e. who else was present), writing, writing and picture relationship, setting, and change over time. Researchers created a chart listing all the categories and entered descriptive examples of each from the examination of the self-portraits.

Emotions displayed refers to the emotions that the participants drew themselves experiencing. *People in the portraits* refers to who was present in the portraits and their prevalence. *Writing accompanying the self-portraits* refers to the caption or text within the portrait. *Relationship between the pictures and the writing* was organized into four groups: unavailable, used to aid understanding, provided a positive relationship, or provided a negative relationship. We interpreted how the writing and picture related to the different emotions that were depicted in the picture. *Setting* refers to where the math learning occurred. Settings included the classroom, in an alternate setting, or showed a change in setting over time. *Change over time* refers to portraits that indicate a timeline or frame that is centered around a change in perspectives, experiences, or emotions towards mathematics. We will discuss each category and the types of indicators present in the portraits and comments.

Emotions Displayed

The self-portraits displayed a range of emotions which were categorized as positive, negative, and neutral. Negative emotions made up more than half (55.3%) of the emotions identified in the self-portraits. Negative emotions had the largest prevalence in the self-portraits and included emotions such as confusion, sadness, and frustration as the most prevalent emotions. Confusion was classified as a negative emotion because in the classroom setting, confusion can have an adverse impact on performance when it is not addressed, as seen in Figure 2. When confusion was present in a portrait, it was always portrayed as a negative emotion (29.8% of the negative emotions consisted of confusion).

Figure 2. *This portrait shows a participant who has a negative relationship and perception of math, as shown by the cloud above their head, angry face, and question marks.*

Positive emotions had the second largest prevalence (32.9%) with happy, positive (as in the participant expressed understanding of math in their portrait), and love being the most recurring. Figure 3 depicts a positive emotion as is seen through the smile on the PST's face.

Figure 3. *This self-portrait shows a participant expressing a positive relationship/perception of math by drawing themselves smiling.*

Neutral emotions were the least prevalent (11.8%) of the type of emotion in the portraits. Portraits coded as neutral did not show a facial expression that indicates a positive or negative reaction. Portraits showing the PST "focused" were coded as neutral and were the most common for this category. We considered "focused" as neutral, but not necessarily negative.

People in the Portraits

Portraits included PSTs with other people (n = 31), by themselves (n = 20), or with no person (n = 1). The most common people in the participants' self-portraits were teachers (n = 13), the entire class (n = 4), and classmates (n = 3). Interestingly, all the portraits that included the entire class displayed negative emotions.

Writing Accompanying the Self-portraits

Most of the participants (85%) chose to accompany their drawing with labels and explanations to further enhance the message of the portrait. For example, some participants wrote "teacher" next to the instructor, and then had arrows that pointed to themself alongside the words "me." Several participants labeled the classroom "math," stated where they were (home, self-contained classroom, school), and many disclosed the type of math they were doing (i.e. "long division" or "algebra"). The emotions in the writing fell within six categories: confusion (31.8%), love (18.2%), confidence (6.8%), change in emotions (20.5%), hope (13.6%), and hate (9%).

Participants who were confused placed question marks throughout their drawings and in their thought bubbles. Figure 4 shows a participant whose writing was categorized as confused. Common words in these participants' drawings were *frustrated*, *confused*, *anxiety*, and *slow down*. Participants who were confused had drawings that were asking for help.

For example, these participants were saying “I need more examples”, “Am I the only one who does not understand?”, and “Math is easy for everyone else.” Most of these drawings showed sadness, hopelessness, and one showed anger with the phrase, “I hate math.” Participants who reported being confused also had a negative relationship with math and many wrote that they felt helpless. These participants may be illustrating a fixed perspective on math, as they tended to focus on their struggle to understand the math concepts, rather than an ability to grow and understand material (see Figure 4).

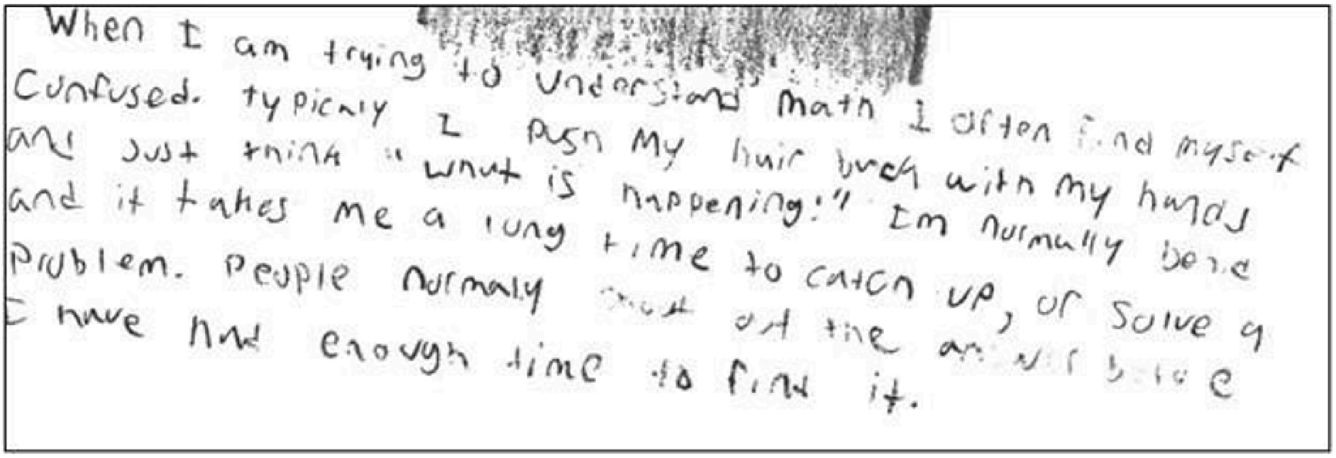

Figure 4. *When I am trying to understand math, I often find myself confused. Typically I push my hair back with my hands and just think “What is happening?” I’m normally bored and it takes me a long time to catch up or solve a problem. People normally find out the answer before I have had enough time to find it.”*

The participants who loved math included words such as “love,” “yay”, and “thinking and learning.” The participants who were confident in their math abilities showed themselves enjoying the subject, called math “easy,” had pictures with an “A” or “100%” on them, and raised their hands with the correct answer. Some of these participants’ abilities caused them to feel proud and, in some cases, their descriptions came across as a feeling of superiority. Statements that stood out from these participants’ work were “I basically taught myself math” and “teacher would take a break from teaching… and I would explain it to others.” Their writing showed they were good at math, and they scored higher and knew more than others (see Figure 5).

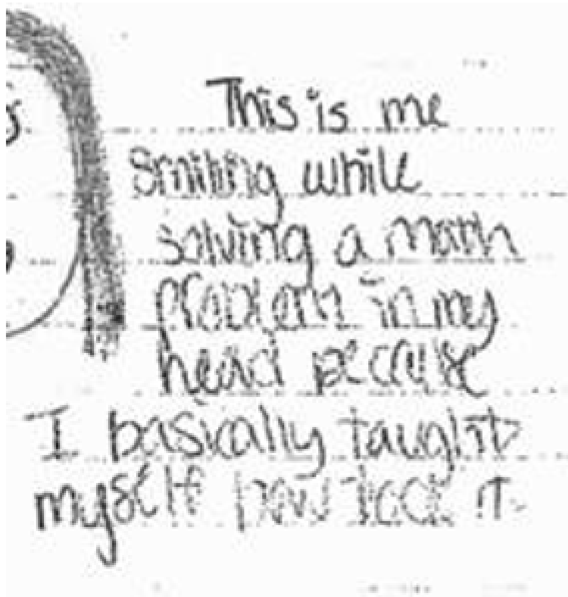

Figure 5. *This is me smiling while solving a math problem in my head because I basically taught myself how to do it.*

Participants who had a change in emotions as time passed indicated they loved math but due to an experience where they became frustrated, their love for it decreased (see Figure 6). This writing shows a change in a student's emotions towards math. As math was "ruined" for this participant by a negative experience with a teacher.

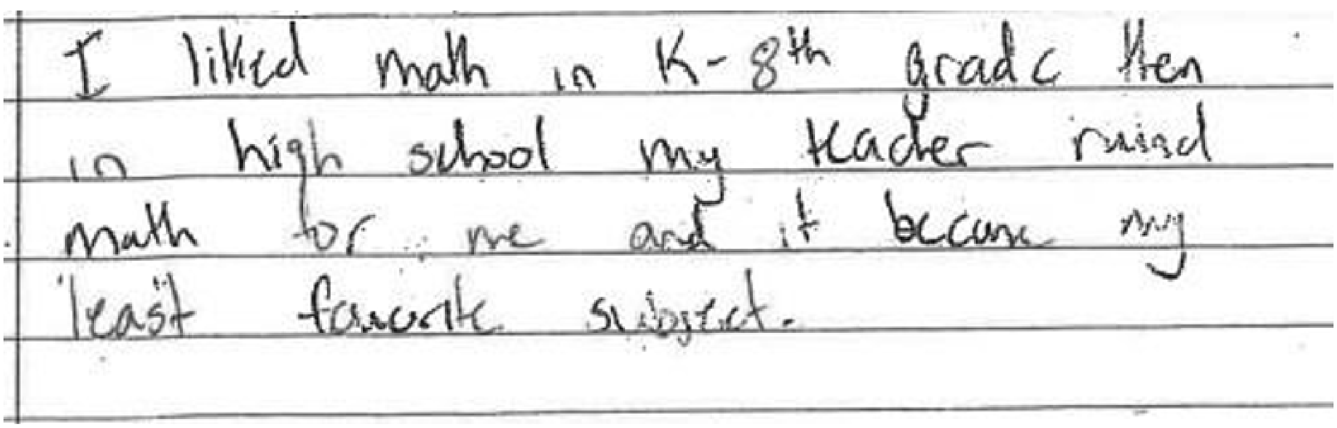

Figure 6. *I liked math in k-8th grade then in high school my teacher ruined math for me, and it became my least favorite subject.*

Others showed the opposite, as they went from hating math to liking it. From this group we were able to identify another group – participants who were hopeful. Participants in this group said, "I CAN DO IT," "whiteboards help me understand," and "I will one day teach it." These participants hope for a better understanding of math, signifying a belief that their math ability will experience future growth (see Figure 7).

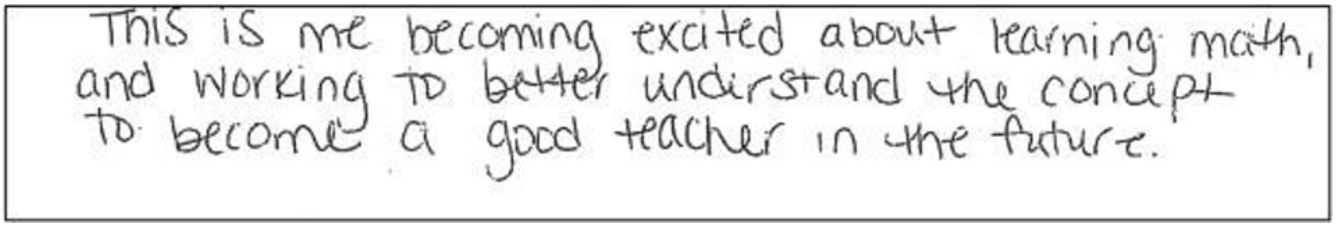

Figure 7. *This is me becoming excited about learning math and working to better understand the concept to become a good teacher in the future.*

Written Descriptions and Portrait Relationships

The writing corresponded to what the self-portrait showed in about half (57.7%) of the participants. For example, a participant drew themselves doing math surrounded with question marks and with a perplexed face and wrote that math was confusing. Fifteen participants (28.9%) provided writing that aided the understanding of the picture. For these participants, it was difficult to tell their feelings towards math with just the picture alone and the writing allowed for a fuller clarification. An example of this is a participant who drew themselves solving a problem and accompanied it with a caption explaining math came easy for them. Without the words, it would have been difficult to decipher how they were feeling.

In Figure 8, a participant drew herself smiling while doing work. The writing besides it shows their hope to become better in math so that they can improve their ability to teach it. This enthusiasm and growth mindset is evident in their writing but could not have been derived by their image alone.

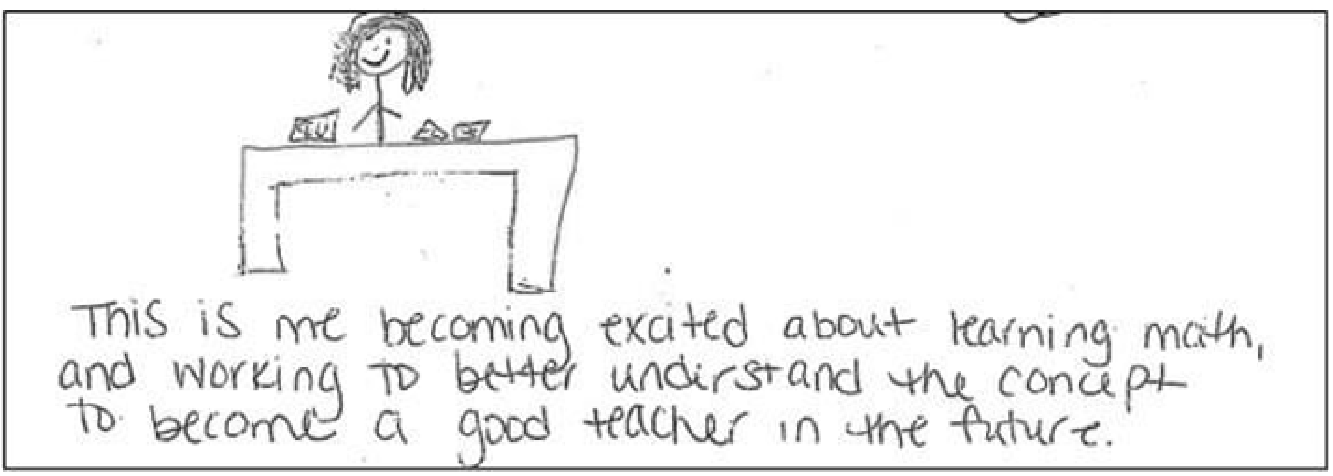

Figure 8. *Writing aids the understanding of the picture, as the drawing is vague.*

One participant provided a picture whose writing and picture did not relate. This participant showed herself sitting at a desk attempting to solve a problem, with a thought bubble that mentions that although it would take them a while to solve the problem, they will sit there until they get it. While this illustration showed the participant struggling, it also showed their determination to succeed. The writing was puzzling because while the participant tried to keep a positive outlook, they still labeled math as their weakness. This participant said "Looking back, I came to the realization that I started to have a growth mindset. I took the negative thoughts and would tell myself that if I did not start to have faith in my work, I would not retain any more information. Today, math is my weakness, however, I have learned not to hate it." (See Figure 9).

Figure 9. *The drawing and the writing do not relate. The image is positive, but the writing shows an internal struggle between the participant and math.*

Combining interpretations of the drawing, the words that accompanied the drawing, and the placement of themselves and others in the picture, resulted in seven math perspectives: indifference towards math (19.2%), hopeful (9.6%), anxiety (9.6%), love for math (19.2%), frustration (30.8%), positive outlook caused by a positive change (5.8%), and a negative outlook caused by a negative experience (5.8%). Indifference towards math was shown in pictures of participants doing the work without any negative or positive emotions. This may indicate that these participants may not have faced any positive or negative critical experiences that led them to feel strongly about mathematics. Pictures that illustrated a hopeful relationship included a mention of a negative outlook on math but also a willingness to try different strategies to better themselves to become great teachers (see Figure 8). This motivation to become a great teacher seems to have shifted their math perspective. Participants who experienced confusion and frustration drew pictures of being unable to solve a problem. Participants who had a negative relationship with math often attributed it to a negative experience with a teacher, a class, or the subject in general. Participants who showed a positive relationship with math illustrated a positive experience they had with the subject or a teacher. Participants who showed anxiety indicated that math caused a negative impact and raised their anxiety level, signifying the perception of distress related to math (see Figure 10).

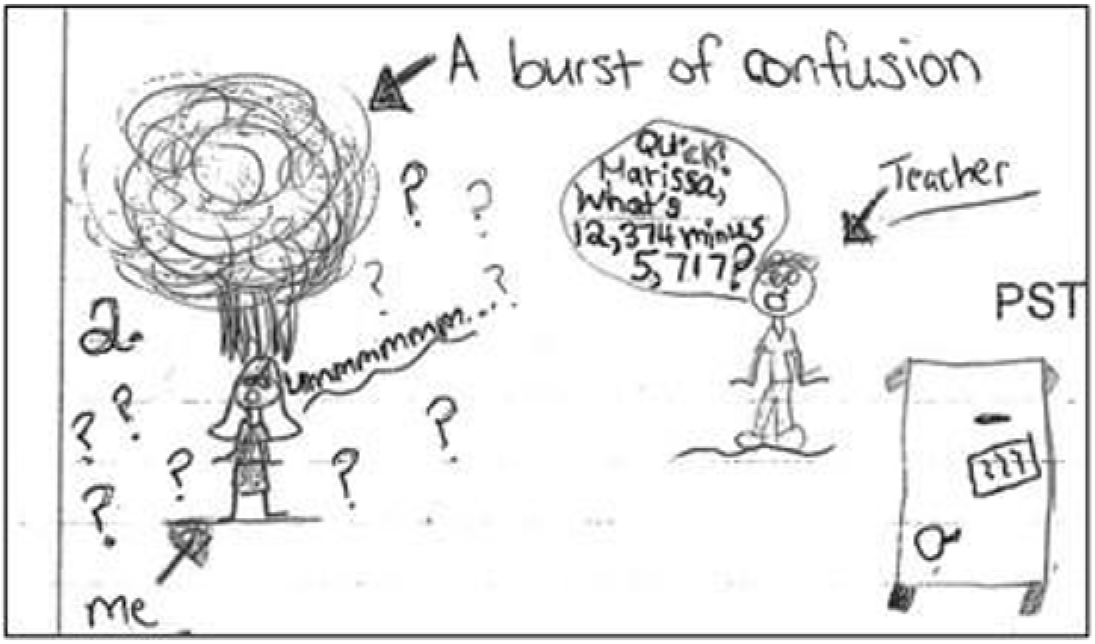

Figure 10. *Student is experiencing "a burst of confusion" while the teacher asks, "Quick, what is 12,734 minus 5,717?".*

Participants who displayed a love for math used words to describe their mathematical journey such as "love," "passion," "enjoy," and "yay" (see Figure 11).

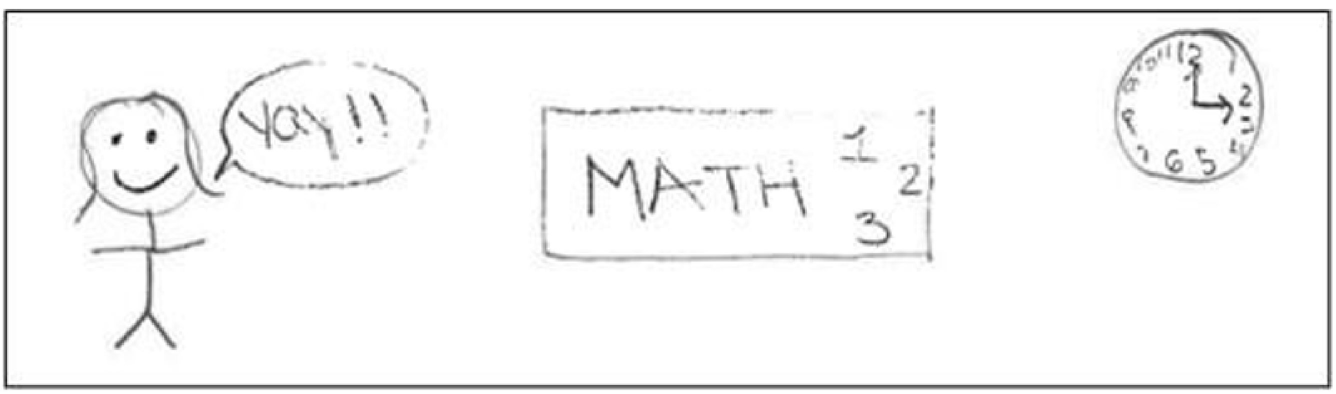

Figure 11. Participant's "yay" and smiling face reflect a love for math.

Setting

Where participants chose to place themselves learning mathematics and what they included in the background of the portraits was also investigated. Most participants chose experiences that happened in the classroom. These depictions included objects in the drawing being enlarged (clocks, white boards, math work or posters), different math concepts, classmates, and teachers. Certain objects being enlarged may indicate how that object was a stressor as the main focus of the picture. For example, one showed a large math textbook with a tiny participant standing next to it looking confused and sad (see Figure 1). The size of the book and participant may indicate that this participant's relationship with math was unequal in nature, with the amount of math to know and do making them feel small and confused.

Positive portraits showed participants smiling, lightbulbs above the participants head, hearts, the participant sitting in front of the class, and the teacher being present. In one portrait, there were other participants surrounding them talking to one another and being distracting. This participant may be showing that they were not affected by all the distractions going on in the room. Positive portraits such as these indicate that the participants were actively engaged and thinking about the math lesson (see Figure 12).

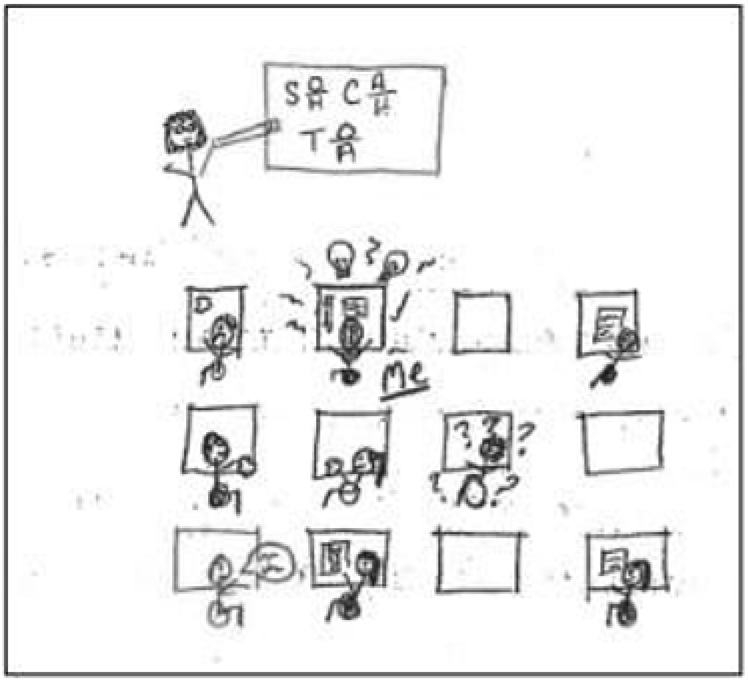

Figure 12. *This self-portrait shows the participant having a positive experience in their classroom. The student is sitting in front of the room with light bulbs above their head.*

Some participants drew non-classroom settings that had similar aspects to the classroom settings. Participants placed themselves at desks or tables, in their bedroom, or drew one object that symbolized their experience. One of the drawings showed the person sitting on their bed with a large moon outside the window, clocks everywhere, papers spread about, and the participant looking sad and tired. This drawing shows that this participant worked on their math homework all night and still felt confused. One participant chose to draw their brain "on math" (see Figure 13). The brain drawing and captions may indicate a love and hate relationship with math.

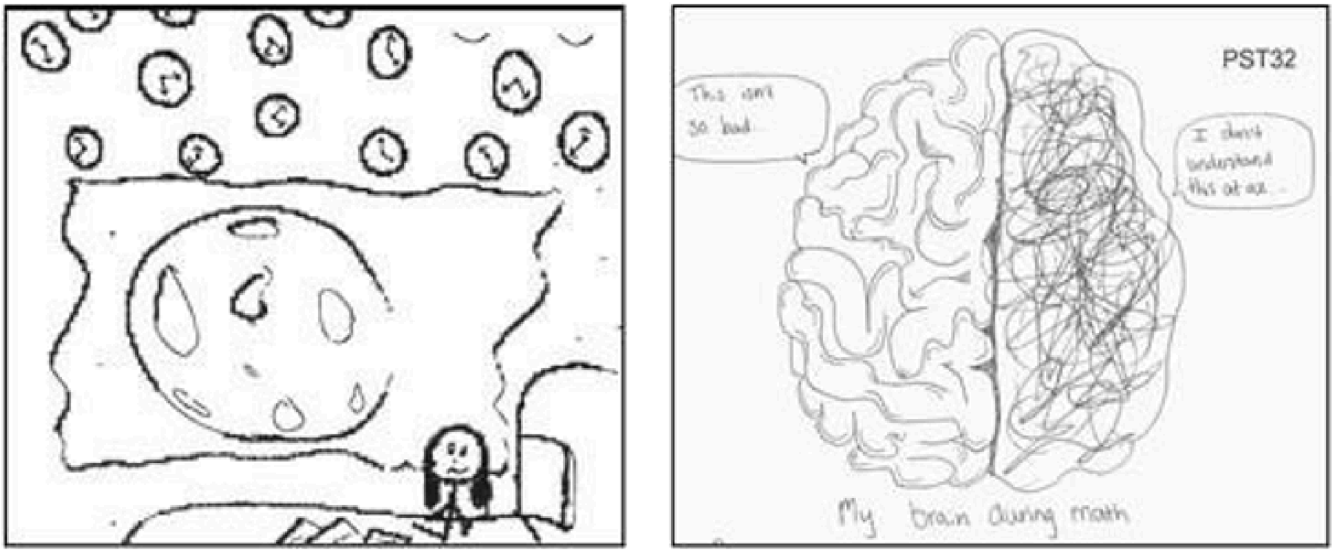

Figure 13. *Left: This self-portrait shows a participant sitting in their bed late at night struggling with math work. Right: On the right side of the brain it says, "I don't understand this at all". On the left side it says, "This isn't so bad". On the bottom it clarifies, "My brain during math.".*

Change over Time

Many participants drew a time span of mathematics learning, indicating a change that occurred. Some participants' relationships with math started off positive and became negative later in their academic experience. For example, one participant expressed that math came easy to them throughout elementary and middle school but when they were introduced to trigonometry in high school, they became discouraged and less confident about math (see Figure 14, left). The participant appears to be smiling and has a text bubble above their head saying, "easy!" while they review multiplication. The other picture shows a similar setting, but the subject is trigonometry. The participant's facial expression changes from smiling to sad and the text bubble says, "Ugh!"

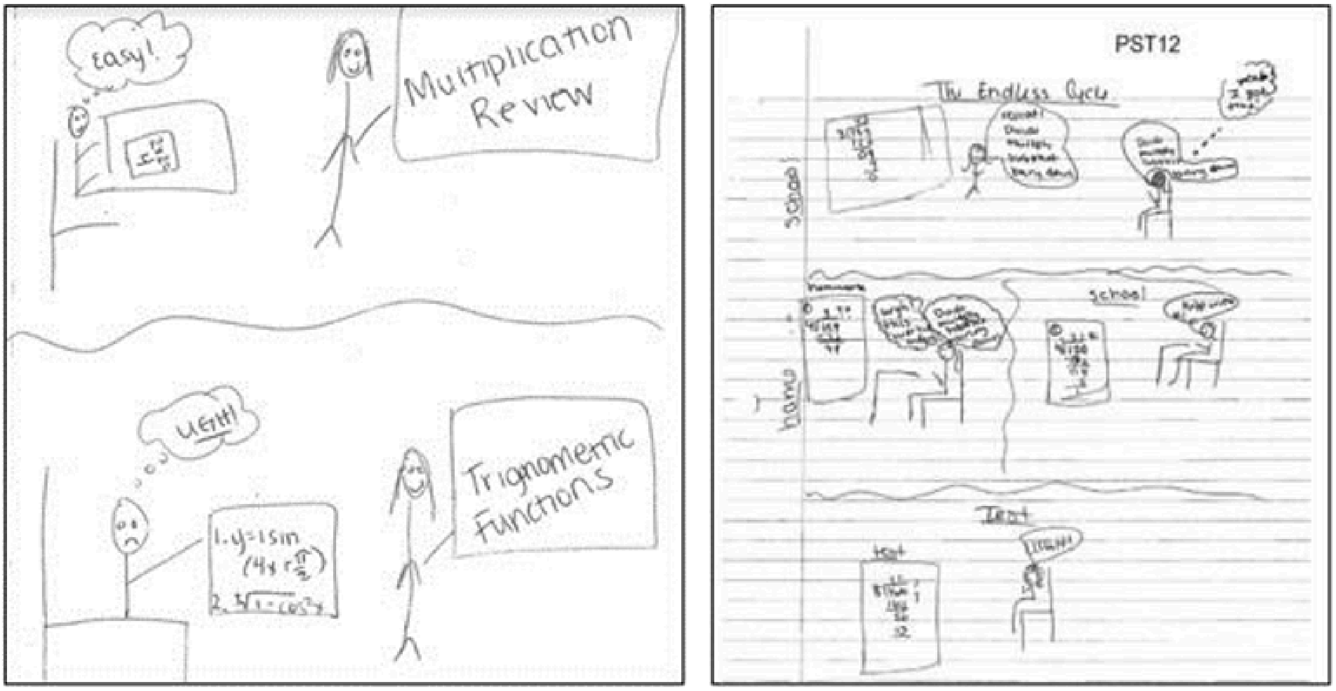

Figure 14. *Left: This self-portrait shows a participant having both a positive and negative experience with different math subjects. Right: A participant going through a negative experience with long division.*

One participant chose to draw their math journey through the lens of learning long division (see Figure 14, right). Their drawings showed they lacked understanding with long division and labeled their drawing an "endless cycle". The participant illustrates struggling with division in school, at home, and during a test. The way the participant portrayed their experience with long division indicates that repeated episodes of frustration may have a negative impact on an overall relationship with mathematics.

Discussion

The results show that PSTs' self-portraits in this study illustrate negative emotions and experiences more often than positive and neutral experiences. The emotions that were depicted in the self-portraits were primarily negative including confusion, anger, and sadness. Positive and neutral emotions, such as "happy" and "focused," were less prevalent. The portraits showed the ways in which math can be intimidating and cause stress for many students. We believe it is increasingly important for PSTs to understand their own relationship with math to avoid imparting possible negative emotions or attitudes on their future students. This needs to occur before PSTs can make math instruction relevant, inclusive, and engaging.

The analysis of the self-portraits indicated that relationships with math and perceived ability to perform math can be formed from an early age, as many PSTs drew themselves as young children. One such relationship that emerged is math anxiety. Math anxiety has been defined as the tension and anxiety that have a negative impact on the ability to solve mathematical problems (Mutlu, 2019). The portraits showed that PSTs continue to hold onto their own math anxiety, even after time has passed. Part of a PST's math-anxiety dilemma can be attributed to prior experiences with their own teachers, lack of subject knowledge, and inadequate teacher preparation programs (Schubert, 2019). When math anxiety is not addressed for PSTs, they may feel overwhelmed and stressed in math methods courses. Approaches to addressing students' math anxiety include increasing students' math skills, increasing student engagement with math, and instruction that aims to develop a growth mindset which views failure and struggle as a means to improvement (Ramirez et al., 2018).

While many of the relationships were characterized as being negative and filled with anxiety, others were seen as more positive. These relationships resulted in students feeling confident in their ability to perform math. However, on occasion, these relationships demonstrated an inflated sense of self-assurance. Some participants believed that they had a natural ability to perform math which illustrated a fixed mindset. This view reinforces an overarching theme to both positive and negative relationships in the study: that despite knowing that growth is possible, the idea that one may be a "math person" or not often prevails.

One significant and influential factor is the other people participants included in their portraits. Teachers were often drawn to be larger than the participants and students. Teachers were also usually drawn smiling, saying something at a board or in front of the class, or directing a question to be answered. Very rarely were the teachers drawn frowning, with angry expressions, or as expressionless. However, several of the class peers included in drawings had negative or conflicting expressions, such as smiling with furrowed brows. Often, other classmates were drawn smiling and expressing an answer to a problem, while the PST was quietly imploding. This illuminates the isolation a student can feel when others are perceived as understanding the lesson, and the student believes they are the only person in the class who is struggling. Interestingly, all the portraits in this study showed students working in isolation, in a whole-class teacher-directed lesson, or with a teacher. We did not see evidence of a participant working in a group or collaborating during episodes of math learning.

A common theme among the participants was the motivation to learn due to a teacher's enthusiasm and instructional strategies. This shows how important it is for teachers to remain excited about math and to spread positive feelings to others during math lessons. Teachers must encourage their students to be intrinsically motivated, to want to participate because the activity or topic is something that interests the student, as opposed to being extrinsically motivated (Gojak, 2013). A teachers' pedagogical decisions and disposition towards mathematics have a large and lasting impact on students. Therefore, what happens during math lessons should be carefully analyzed to ensure that all students can access the learning and feel supported in the process of doing so.

Math instruction that is interdisciplinary, hands-on, and innovative promotes intrinsic motivation. Teachers can also incorporate stories, music, and art into math to provide a wider lens on how math intersects with other subjects (Larson & Rumsey, 2018). To accommodate multiple perceptions of math content, teachers can be prepared to offer more than one strategy or solution path in math lessons (Small, 2019). Students can be encouraged to use a strategy that makes sense, rather than adopt a single approach that they might not understand yet (Boaler, 2016). Children often see math in more than one way, and teachers can capitalize on their mathematical insights and creativity to build a richer and more inclusive learning experience. It's the author's experience that these approaches will help convince students that they are "math people."

Student Researcher Reflections

Being both participants and researchers, we were able to closely examine our own relationships with math with more honesty. We want to foster a growth mindset in our future students so that they can view failures, not as roadblocks, but as steppingstones. We realized that the way we speak, act, and teach math sends messages to our students. We will have students who have vastly different experiences from us and some who might be experiencing similar reactions from our own time as math students. This research increased our ability to understand our own math-learning journey and that of others. We believe this will be immensely helpful to us as future educators.

Each of us brought a different perspective to the research. One of us experienced success all through school in mathematics and feels confident in their ability to teach and learn math. Another of us is a math-learner with significant dyscalculia, who is on a personal journey to support other students like them to learn to do math well. Our third researcher takes a pragmatic approach to math and recognizes its usefulness in the world but remains neutral about the subject. Through this research, we all learned that our decisions as future teachers of math matter. We recognize we must build a math community that accounts for all learners. We know we must pay close attention to the perspectives and relationships we are helping our students build with mathematics. We reflect that there is a need to facilitate deeper connections and understandings of mathematics to teach math well. However, we feel that in our teacher preparation experience, only a handful of math courses for pre-service teachers may not truly provide the time and preparation needed.

Study Limitations

We recognize that the study participant size is small (n = 52) and does not reflect a wide diversity either in gender (51 female, 1 male), or race (participants are mostly white) which limits the opportunity to generalize these findings to a larger population of PSTs. The location of the institution is in a rural region of a northeastern state, and this contributed to the population demographic. Moreover, many of the students come to this university from small and mostly homogeneous towns to attend. However, the results in this smaller population mirror what research indicates about PSTs' math anxiety and concern about teaching mathematics in school (McGlynn-Stewart, 2010; Schubert, 2019; Stoehr & Olson, 2015). We recommend further investigation into a wider population to help broaden our understanding of this phenomenon. We believe this will increase the quality of math education instruction in teacher education institutions and for PSTs' future students.

Conclusion

The assignment to "Draw a picture of yourself learning math" allowed for an examination of how experiences, emotions, and reactions to learning math impact PSTs. Through this process, it has become clear that the prevalence of math anxiety, sources of motivation, and the instructional practices present in classrooms can have residual effects on PSTs. PSTs who had more negative experiences, emotions, relationships, and perspectives towards mathematics may worry the most about their ability to teach mathematics. We suggest it is essential for PSTs to examine their past experiences learning math, and creating self-portraits was an effective way to begin this conversation. In our math methods course, we were asked to share our portraits and the stories behind them with our classmates. This provided an opportunity to develop an understanding about the connections between mathematics instructional strategies and the lingering impacts (both positive and negative) which they can have. Moreover, the students in our class recognized the variation in experiences, learning differences, and the very real math anxiety often exhibited by their peers. Drawing self-portraits and providing opportunities for discussion and reflection can help PSTs approach mathematics teaching and learning in a more comprehensive manner. PSTs may come to better understand themselves and others as learners of mathematics, and thereby remain open to learning new strategies and practices in methods courses in teacher preparation programs. This will be a benefit to all stakeholders in the math learning process.

While we cannot change past experiences, we can examine them, and use this information to make sound pedagogical choices in our own classrooms. The PSTs' self-portraits illustrated the complexity of emotions and reactions that students can experience while learning mathematics. We recommend that teacher educators take similar opportunities to aid PSTs in recognizing, and often renegotiating, a past relationship with math. This may lessen anxiety and self-doubt, and help PSTs grow in knowledge and capacity to teach math well in their future classrooms.

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Student Perceptions of Instructional Technology in the Classroom

Jennifer Zakrzewski, Ph.D. and BriAnne Newton, MLIS

Abstract

Instructional technology continues to become more prevalent in classrooms around the globe. However, it is unclear whether teachers are prepared and have the self-efficacy to incorporate instructional technology into the classroom. This study reviews an instructional technology course for preservice teachers and whether student comfort increased with instructional technology throughout the course. In addition, data were collected regarding preferences pertaining to instructional technology. The data shows preservice teachers' comfort increased throughout this course in terms of instructional technology. In addition, the data show preservice teachers are more comfortable working with instructional technology that includes templates rather than instructional technology activities that require ground-up design.

Key Words: instructional technology, teacher education, perceptions, educational technology

Introduction

As evidenced by the global COVID-19 pandemic, understanding how to incorporate technology into education has become imperative. School closures due to COVID-19 required teachers to modify their curriculum through technology use at a moment's notice (Mielgo-Conde et al., 2021). According to Lepp et al. (2021), teachers were not prepared for pivoting to technology-based teaching. In schools, technology changes are typically made incrementally with multiple levels of support (Winter et al., 2021). However, this did not occur during the COVID-19 pandemic due to the haste in which schools closed.

As an educator, incorporating technology into the classroom is no longer an option. This is due to the fact that being technologically literate is no longer a benefit in the 21st century, but a requirement (Dincer, 2018). Knowing how to use and engage with technology is critical for students as they enter the global economy (Kent & Giles, 2017). Therefore, teachers play a critical role in helping students learn about technology and how to use technology (Yazar & Karabekir, 2019).

In recent years, educational technology has become more common in classrooms and increasingly user-friendly (Kormos, 2019; Starkey, 2020). This has caused an impact not only on teachers and students, but on education as a whole (Starkey, 2020). Teachers are now faced with meeting the technological needs of society. Since there is such a demand for technological knowledge in the global economy, technology must be incorporated into classrooms (Durson, 2019). In addition, technology has become the norm for many children, and they expect to use technology throughout their daily lives (Alelaimat et al., 2020).

According to Starkey (2020), "further advances have resulted in digital technologies that have the potential to change the work of an educator" (p. 37). Technology has the potential to support teaching and learning, but only if the teacher embraces and incorporates technology into the classroom (Dincer, 2018). Yazar and Karabekir (2019) state that:

> computer and other technological tools also play an important role in the accessing of information, creating rich learning environments, responding to different learning styles of students, transferring the learned, supporting high-level thinking skills, offering students the opportunity to compare with the real-life problems, by solving problems steering students to learn science based on inquiry, cooperation, communication and support lifelong learning. (p. 129).

Therefore, because of technology, information is widespread and widely available, further changing the horizon of education (Arseven et al., 2019).

One area of training that is becoming increasingly critical in teacher education is instructional technology (Kormos, 2019). Teacher education programs need to teach preservice teachers the skills necessary to incorporate technology effectively in their classrooms (Baran et al., 2019). Durson (2019) states that "it is very important to train successful teachers and promote the competencies required in the current era. Today, technologically-rich learning environments are developed to provide learners with higher-quality learning experiences" (p. 138). However, according to Cuhader (2018), while technology integration is critical in teacher preparation, it is not widely researched.

Integrating technology is currently one of the greatest challenges in teaching (Kent & Giles, 2017). This is partially due to the fact that technology integration takes time as it is a complex endeavor (Koromos, 2019). Because of the integration of information communication technology (ICT) in education, the landscape of the classroom has begun to evolve (Arseven et al., 2019). It has become apparent that technology affects every aspect of our lives (Alanazy & Alrusaiyes, 2021; Dinc, 2019). Therefore, technology plays a critical role in education, causing research on methods to support future educators in the use of technology in the classroom to become increasingly important.

Conceptual Framework

According to Dinc (2019), technology has been found to increase test scores, student engagement, student independent work-time, and has allowed teachers to support students with disabilities. Arseven et al. (2019) state that, often the teaching and learning process closely linked to technology use as technology have become more prominent in classrooms. Due to the increased use of technology in the classroom, knowledge of technology has become increasingly important in teacher education programs (Ebersole, 2019).

Baran (2014) conducted a literature review regarding integration of mobile learning. During this study, the author found most research in teacher preparation programs fell into two categories: learning about mobile learning or implementing mobile learning. Therefore, one can infer that instruction on other technologies in teacher preparation programs likely falls into one of the two categories.

Literature Review

Challenges of Technology

Often, teaching focuses on presentation or communication (Starkey, 2020). However, the method of presentation and communication is rapidly changing as technology becomes more entrenched in education. Because technology has improved so quickly, teachers must be prepared to use it in the classrooms (Tondeur et al., 2017). Therefore, it is critical that teacher education programs include technology so that when preservice teachers graduate, they are confident in incorporating technology into the classroom (Starkey, 2020).

Teachers must be technologically proficient in order to effectively incorporate technology into the classroom (Dincer, 2018). However, research has shown that, even when teachers are technology literate, they do not necessarily effectively implement technology in the classroom (Dincer, 2018). Therefore, in order to effectively use technology in the classroom, teachers must be trained during teacher education (Dincer, 2018). According to Starkey (2020), there are three methods to integrating digital competence into teacher education: integrating digital tools into existing pedagogies, considering critically where to incorporate technology, and using technology to effectively support student learning. To effectively support teachers in enhancing student engagement and learning, these competencies might be considered in teacher education programs.

Koromos (2019) states that technology allows students to collaborate and learn in real-time. Finally, Bai (2019) found that the adoption of mobile devices has greatly influenced education with positive results in several subject areas. These results show that teachers have the desire to incorporate technology and that technology can support learning. However, preparation of teachers to use technology in the classroom still needs further research.

Challenges of Technology, Pedagogy, and Content Knowledge (TPACK)

Technology, Pedagogy, and Content Knowledge (TPACK) is a technology integration framework used to develop understanding of how to include technology into teaching with consideration to pedagogy and content knowledge. However, according to Starkey (2020), TPACK is often studied with relation to content only and not pedagogy. Further, Dincer (2018) asserts that TPACK expresses the importance of technology integration, but does not describe the technological knowledge necessary of the teacher to appropriately incorporate technology. Therefore, it is unclear whether TPACK is being used effectively to teach educators how to incorporate technology into the classroom.

While many teachers have an understanding of how to use technology, they often struggle with using technology to support teaching and learning (Arseven et al., 2019; Bai, 2019). However, "when used meaningfully to support innovative pedagogy, educational technology can provide enriching and highly encouraging educational opportunities." (Yazar & Karabekir, 2019, p. 130). Therefore, teaching preservice teachers to use technology efficiently and effectively in teacher education programs is imperative. According to Starkey (2020), teachers should be able to use technologies, select and critique technologies, and plan to teach through digital tools. Providing this skill set in teacher education programs will allow for increased success for both teachers and students in the classroom.

Yazar and Karabekir (2019) state that teachers often know about technologies but are unsure of how to incorporate them into their classrooms to support learning. In addition, though teachers are often taught using a TPACK model, they need understanding of how to incorporate pedagogy into the lesson as well (Tondeur et al., 2017). Unfortunately, novelty is often focused upon rather than how to integrate technology appropriately while considering pedagogy (Cuhader, 2018). Or, in other cases, technology is used for drill and feedback in schools rather than personalized learning (Bai, 2019).

Benefits of Technology Integration

While there are many struggles to appropriately incorporate technology into the classroom, research has shown benefits of technology integration when implemented effectively. According to Yazar and Karabekir (2019), the use of technology can make teaching more efficient. Alanazy and Alrusaiyes (2021) found that when technology is incorporated effectively, it can cause success personally and publicly, in addition to making confusing concepts clearer for students. Consequently, the use of technology can boost teaching methodologies and learning (Alanazy & Alrusaiyes, 2021). Therefore, appropriate understanding of technology and how to use it to increase student learning and engagement becomes even more critical to teacher education programs.

Motivation is also important in education for teachers and for students. In relation to technology, Dincer (2018) found that student motivation is directly associated with technology, which indicates that using technology in the classroom would increase student motivation. In addition, Dinc (2019) states that technology increases student motivation and engagement to learn. However, Bai (2019) asserts that teachers are not motivated to use technology if they do not understand the benefits or see the ability to create student-centered lessons.

Preservice Teacher Education

According to the research conducted by Alelaimat et al. (2020), early childhood preservice teachers believe technology improves the teaching and learning process and should be used in classrooms. However, Kent and Giles (2017) found that new teachers often struggle to incorporate technology into the classroom though it is the expectation. Therefore, helping preservice teachers understand how to support technology increases in importance because then teachers are more motivated to incorporate technology (Ebersole, 2019).

Dincer (2018) states that teacher educators should use technology in their teaching because research has found that increased experience increases use. However, according to Banas and York (2014), teacher education programs may not be exposing preservice teachers enough to technology use throughout their programs. Throughout a teacher education program, it is challenging to provide preservice teachers with all of the information and experience they need regarding technology (Yazar & Karabekir, 2019). This is especially true as technology continues to evolve and quickly becomes outdated. Therefore, teachers need to be trained to integrate technology into the classroom, causing technology integration in teacher preparation programs to be of great importance (Aslan & Zhu, 2015).

According to Bai (2019), preservice teachers need experience choosing apps since there are so many to choose from and more are being developed daily. In addition, preservice teachers need help in learning to find and select technology to use in the classroom (Kent & Giles, 2017). Cuhader (2018) states that preservice teachers do not feel they get enough instruction with instructional technology during their courses. In contrast, Alanazy and Alrusaiyes (2021) state that preservice teachers are receiving technology instruction, but they continue to need more knowledge in regards to technology integration. Aslan and Zhu (2015) promote small class sizes to support increased comfort with ICT for preservice teachers. However, while the university has some control over what and how technology is taught to be integrated into the college classroom, they cannot control what happens beyond graduation (Ebersole, 2019).

Ebsersole (2019) asserts that, in order for preservice teachers to understand how to integrate technology into the classroom, they need authentic experiences. Kent and Giles (2017) affirm that, the more preservice teachers are expected to use technology, the more comfortable and likely they are to use it in their own classrooms. According to Banas and York (2014), authentic learning supports engagement with technology in a manner that allows preservice teachers to understand its benefits in instruction. Therefore, authentic experiences provided teachers with more confidence in using ICT (Tondeur et al., 2017).

Preservice teachers need experience with technology to aid them in understanding its pedagogical use in the classroom (Banas & York, 2014). However, when tested, preservice teachers were found to have more knowledge than experience with technology (Dincer, 2018). Therefore, it is critical to provide authentic learning experiences to preservice teachers to increase experience and knowledge with content and pedagogy.

Self-Efficacy

Self-efficacy is another factor that affects the inclusion of technology in the classroom (Ebersole, 2019; Kent & Giles, 2017). According to Aslan and Zhu (2015), often self-efficacy, technology attitudes, and computer anxieties are measured in studies. However, this can be challenging to measure as technology integration differs by teacher depending on self-efficacy, among other factors (Banas & York, 2014). Preservice teachers will have varying self-efficacy entering teacher preparation programs based on their own educational background (Ebersole, 2019).

Studies with preservice teachers show that the more they experience work with instructional technology, the more confident they are in using instructional technology (Yazar & Karabekir, 2019). Research shows that the more self-confident teachers are, the more likely they are to incorporate technology into the classroom (Banas & York, 2014). In a study conducted by Yazak and Karabekir (2019), the researchers found that teachers in primary school education had higher perceptions of their understanding of technology than in other programs. Additionally, when preservice teachers are provided experience, they feel more confident incorporating technology (Arseven et al., 2019).

According to Durson (2019), it is impossible for teachers to integrate technology into the classroom when they have low self-efficacy. One significant outcome for students is that if a teacher has low-self efficacy with technology, students in their classroom may also have low-self efficacy with technology (Kent & Giles, 2017). Therefore, it is critical that preservice teachers learn about technology in their undergraduate programs to increase self-efficacy and interest with technology (Durson, 2019). When students see others that are similar to themselves persevere and succeed, they are more likely to try (Ebersole, 2019).

Purpose

Based on the research, it is clear instructional technology integration is critical in the classroom and, therefore, in teacher education programs. In addition, preservice teachers need an understanding of how to select and critique technology prior to its use in the classroom. Once preservice teachers have the ability to select and critique technology, they still need to understand how to incorporate technology into the classroom so that it creates authentic learning experiences that integrate pedagogy and support learning. While preservice teachers all have various starting points with instructional technology, it is clear that the aforementioned items are critical components surrounding teacher preparation. Therefore, the purpose of this study was to provide preservice teachers with support in learning a variety of instructional technologies while considering authentic learning, pedagogy, and student learning, all while increasing preservice teacher self-efficacy.

Methods

Participants

Participants in this study were a convenience sample as preservice teachers in the College of Education are required to take Technology for Teachers. The course included preservice teachers from the following majors: Child Development, Early Childhood Education, Elementary Education, Middle Grades Education, and High School Education. Throughout the 2020-2021 school year, a total of 31 preservice teachers participated in the study. A breakdown of the participants is provided in Table 1.

Table 1. ***Participants by Year and Major***

Year	***n* = 31**	**Child Development**	**Early Childhood Education**	**Elementary Education**	**Middle Grades Education**	**High School Education**	**Physical Education**
Freshman	$n = 5$	$n = 0$	$n = 2$	$n = 0$	$n = 1$	$n = 2$	$n = 0$
Sophmore	$n = 15$	$n = 1$	$n = 6$	$n = 4$	$n = 0$	$n = 4$	$n = 0$
Junior	$n = 10$	$n = 0$	$n = 8$	$n = 1$	$n = 1$	$n = 0$	$n = 0$
Senior	$n = 1$	$n = 0$	$n = 0$	$n = 1$	$n = 0$	$n = 0$	$n = 0$

Materials

Participants completed a 14-question survey (Table 2). Eight of the questions were Likert Scale questions, while four questions were open-ended. The Likert Scale questions explored preservice teacher opinions regarding various types of instructional technologies used throughout the course. Two of the open-ended questions sought opinions regarding benefits and drawbacks of incorporating technology into lessons in the future. The other two-open ended questions sought to determine how preservice teacher self-efficacy increased throughout the course, and whether the participants would continue to investigate new instructional technologies.

Table 2. ***Participant Survey Questions***

Question	Response Option
How beneficial did you find Google Drive for teacher use (organizing files, preparing lessons, collaborating with other teachers, etc.)?	5 Point Likert Scale from Not Beneficial to Incredibly Beneficial
How beneficial did you find Google Drive for student use (student collaboration, presentations, etc.)?	5 Point Likert Scale from Not Beneficial to Incredibly Beneficial
How beneficial did you find screen recording tools (Loom, Screencast-o-matic, Screencastify) for classroom use?	5 Point Likert Scale from Not Beneficial to Incredibly Beneficial
How beneficial did you find quizzing platforms (Kahoot, Gimkit, Quizziz, Plickers, Socrative, Quizalize, Quizlet, Flippity, Quizshow.io, Poll Everywhere, Triventy) for classroom use?	5 Point Likert Scale from Not Beneficial to Incredibly Beneficial
How beneficial did you find creation platforms (Jamboard, Canva, Popplet, Easely, Padlet, Snappa, Design Bold) for classroom use?	5 Point Likert Scale from Not Beneficial to Incredibly Beneficial
How beneficial did you find interaction platforms (Smartboard, Nearpod, Peardeck, EdPuzzle, QR Codes, Escape Rooms, Flipgrid) for classroom use?	5 Point Likert Scale from Not Beneficial to Incredibly Beneficial
How beneficial did you find the technology kits from the SC state library (Kubo, Snap Circuit Kit, Green Screen, Drone, BeeBot, Botley, VR Goggles, Merge Cube) for classroom use?	5 Point Likert Scale from Not Beneficial to Incredibly Beneficial
How beneficial did you find LMS systems (Edmodo, Schoology, Google Classroom, Moodle, Showbie, Docebo, Sportlyzer) for classroom use?	5 Point Likert Scale from Not Beneficial to Incredibly Beneficial
What are some of the benefits of adding technology to a lesson as a future teacher?	Open Response
What are some of the drawbacks to adding instructional technology to a lesson as a future teacher?	Open Response
Which three instructional technology tools that you learned about this semester did you find most useful for the classroom? Explain.	Open Response
Which three instructional technology tools that you learned about this semester did you find least useful for the classroom? Explain.	Open Response
What could have been done in this course to increase your comfort with integrating instructional technology into your classroom?	Open Response
Do you think you will continue to learn on your own time about instructional technology tools to incorporate into your classroom? Why or why not?	Open Response

Procedure

At the start of the course, the professor modeled how to use technology in the classroom. Each week, preservice teachers were required to complete an assignment using instructional technology. Prior to completing the assignment, preservice teachers had an opportunity to see the technology used from the student perspective. Then, the preservice teachers were required to complete assignments from the teacher perspective, which allowed them to understand how each side of a platform interacts with the user.

As preservice teachers completed assignments for the course, they were required to engage with instructional technology to design lessons and activities, increase parent communication, and evaluate tools. Within each assignment, preservice teachers were required to discuss the benefits and drawbacks of the tool in a reflection piece. The initial focus of each assignment was to develop activities that were appropriate for the chosen standard. Once preservice teachers developed activities, technology was layered into the assignment to assure appropriate pedagogy.

Preservice teachers were expected to design assignments that would be beneficial in their classroom to support authentic learning. During the first class session of the week, assignments and technology were introduced. The second session of the week was used as a work session. During this time, preservice teachers worked on their technology assignments. They used this time to explore the technology and ask questions of classmates and the professor. This allowed preservice teachers a safe environment to investigate instructional technology. During this time, preservice teachers also increased their self-efficacy with technology as they worked together to discover the abilities of various instructional technology tools. Throughout the course, all preservice teachers were required to complete the same assignments. At the end of the semester, all preservice teachers in the course were asked to participate in a survey regarding the course.

Results

The analysis began with a review of the descriptive statistics from the Likert Scale questions embedded within the survey (Table 3). Likert Scale options for responding ranged from "Not Beneficial" to "Incredibly Beneficial." Based on the results, all mean's were above a 4 on the Likert Scale. Standard deviations ranged from 0.34 to 0.94, which shows some variability within the data. However, overall, preservice teachers found the instructional technology tools beneficial for use in their future classrooms.

Table 2. *Participant Survey Questions*

Survey Question	N	Mean	SD
How beneficial did you find Google Drive for teacher use (organizing files, preparing lessons, collaborating with other teachers, etc.)?	31	4.98	0.56
How beneficial did you find Google Drive for student use (student collaboration, presentations, etc.)?	31	4.87	0.34
How beneficial did you find screen recording tools (Loom, Screencast-o-matic, Screencastify) for classroom use?	31	4.39	0.80
How beneficial did you find quizzing platforms (Kahoot, Gimkit, Quizziz, Plickers, Socrative, Quizalize, Quizlet, Flippity, Quizshow.io, Poll Everywhere, Triventy) for classroom use?	31	4.63	0.61
How beneficial did you find creation platforms (Jamboard, Canva, Popplet, Easely, Padlet, Snappa, Design Bold) for classroom use?	31	4.33	0.80
How beneficial did you find interaction platforms (Smartboard, Nearpod, Peardeck, EdPuzzle, QR Codes, Escape Rooms, Flipgrid) for classroom use?	31	4.63	0.56
How beneficial did you find the technology kits from the SC state library (Kubo, Snap Circuit Kit, Green Screen, Drone, BeeBot, Botley, VR Goggles, Merge Cube) for classroom use?	31	4.07	0.94
How beneficial did you find LMS systems (Edmodo, Schoology, Google Classroom, Moodle, Showbie, Docebo, Sportlyzer) for classroom use?	31	4.47	0.73

The remainder of the results were analyzed using a Grounded-Theory approach, as they were open-ended responses. The first question reviewed was, "what are some of the benefits of adding technology to a lesson as a future teacher?" After reviewing the data for themes, three themes arose. The most prominent theme was engagement and fun. Most preservice teachers responded that they felt incorporating technology into the classroom created a more fun and engaging lesson for their students. One preservice teacher responded by saying, "it makes learning fun." Another response was that technology "keeps kids interested." The other two themes that emerged were differentiation and being prepared for the real world upon completion of a K-12 education.

The second question reviewed was, "what are some of the drawbacks to adding instructional technology to a lesson as a future teacher?" Within the responses to this question, two themes arose. The first theme was that technology does not always work as expected. One preservice teacher responded by saying, "there can be technology issues." Another stated that "technology fails sometimes." The secondary theme that arose was distraction. Preservice teachers seemed relatively concerned that students would become distracted by technology, and they would then have to address off-task behaviors.

When reviewing the question, "what could have been done in this course to increase your comfort with integrating instructional technology into your classroom?" One main theme was consistent. The majority of the preservice teachers felt that nothing further could have been done in the course to increase their comfort with instructional technology integration. One preservice teacher stated, "I learned a lot of information that can be used in the future." Another said, "this course made me pretty comfortable." While some preservice teachers did say they wanted more time to review technology or learn about a specific technology, there were few responses related to that theme.

The fourth question reviewed was, "do you think you will continue to learn on your own time about instructional technology tools to incorporate into your classroom? Why or why not?" After analyzing these results, one main theme arose with one sub-theme. The main theme was that preservice teachers would continue to learn about instructional technology. One preservice teacher said, "yes technology is changing all the time and my students will want fun engaging lessons." Another stated, "yes because I want to learn more." The sub-theme that arose was "probably." A small subset of preservice teachers stated they would probably continue learning. Interestingly, no preservice teachers said they would not continue learning about instructional technology after the conclusion of the course.

The final section of analysis reviewed the data from the following questions: "which three instructional technology tools that you learned about this semester did you find most useful for the classroom? Explain." and "which three instructional technology tools that you learned about this semester did you find least useful for the classroom? Explain." These were both analyzed across year in college (i.e., Freshman, Sophomore, Junior, Senior) and then again by major (i.e., Early Childhood, Elementary Childhood, Middle Grades, High School). In terms of the best instructional technology, preservice teachers, in general, were strongly in favor of Nearpod, Peardeck, Canva, screencasting software, Google Suites, and Flipgrid. Sophomores felt most strongly in favor of Canva, screencasting software, and Google Suites. However, the majority of participants were sophomores. In terms of the least useful instructional technology, the majority of preservice teachers said there were no technologies they found least beneficial. Of those that found some of the technologies less useful, the following themes emerged. Preservice teachers found the escape room, QR codes, and technology kits the least useful. Escape rooms and QR codes were found least useful by elementary and early childhood majors. Across majors and years, preservice teachers found the technology kits (free kits provided through the South Carolina State Library, including a variety of tools such as Bee-Bot, Merge Cubes, Circuit Kits, etc.) less helpful than other technologies. Again, this data had the potential to be a bit skewed, as most preservice teachers in the course were early childhood education majors.

Discussion

The descriptive statistics show that most preservice teachers found instructional technologies introduced in the course beneficial. However, when the final section of qualitative results was reviewed, it was clear that some preservice teachers found certain technologies less useful than others. This created some discrepancy in the data. Overall, preservice teachers found Nearpod and Peardeck to be the most useful software introduced in the course. They also found Canva, screencasting, and Google Suites to be beneficial. Interestingly, these tools are relatively easy to engage with on the user side. Most of the tools that were found beneficial increase interaction and engagement simply and easily. Nearpod and Peardeck allow the user to add student response slides to already existing presentations. Google Suites allows for collaboration and easy sharing of documents. Canva uses templates to create beautiful designs quickly and easily to share information. Therefore, this data aligns with Alanazy and Alrusaiyes (2021), who found that preservice teachers were most comfortable with presentation software, search engines, internet communication, word processors, and hypermedia applications.

In considering least useful tools, most preservice teachers cited none. This is helpful to see that preservice teachers found some benefit to all of the tools introduced in one way or another. According to Alanazy and Alrusaiyes (2021), preservice teachers are least comfortable with webpage design, video editing software, concept mapping, drill programs, and databases.

Of the subset of preservice teachers who did list some less useful tools: escape rooms, QR codes, and technology kits were listed. Interestingly, these tools require much more creativity to incorporate into the classroom to ensure appropriate pedagogy and content inclusion. In addition, it can be time-consuming to incorporate the technologies listed, as they often require ground-up creation. Therefore, preservice teachers may be interested in more user-friendly instructional technologies that include templates rather than technologies that require more development.

According to Starkey (2020), one type of digital competence is to integrate digital technology into teaching practices. However, before teachers integrate digital technology, they need to have increased self-efficacy with instructional technology and have a willingness to learn about said technology. Since one of the goals of the course was to increase comfort with technology, it was positive that data showed preservice teachers found little could be done to improve the course in terms of increasing their own comfort with instructional technology. In addition, the fact that preservice teachers want to continue to learn about instructional technology is beneficial. Technology continues to change rapidly, and the tools introduced in this course will likely be obsolete by the time these preservice teachers enter the classroom as teachers.

In terms of benefits and drawbacks, preservice teachers see the benefits of engaging with technology in the classroom. It is clear that preservice teachers see that future generations have an interest in technology that crosses over to the classroom. Therefore, it will be a benefit to have teachers use technology in their classrooms to increase engagement. While preservice teachers found distractibility to be a concern as well as technology failure, it is clear they have a desire to continue to learn about technology. Hopefully, this desire to engage with technology will overcome nervousness about technology issues and distractibility to help increase fun and engagement in the classroom.

Future Research

It is clear research is still needed in this area, especially in light of the COVID-19 pandemic. While preservice teachers claim they want to continue to learn about instructional technology, it might be of interest to follow up to determine whether these preservice teachers incorporate technology into their classrooms in the future and how they chose to implement technology. In addition, tracking comfort with instructional technology from the beginning of the course to the end may help see how much instructional technology courses are improving teacher persistence with technology over time. Finally, it may be of use to track these preservice teachers as they enter the classroom to determine what technologies they use when they become teachers.

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CHECKING IN

Learner Perceptions of the Value of Language Study in College

Julian Ledford and Tijá Odoms

Abstract

An understanding of the products that Generation Z students value the most from their college-level language study is essential for instructors who must effectively unpack second language theories within the context of their classroom instruction. This preliminary study examines the value system regarding language study as revealed in the language-learning perceptions of a group of current language learners (n = 53) and recent college graduates (n = 49) at a small, private, liberal arts college in the southeast. Through qualitative analysis of student responses, the following emerged as language-learning products that students valued the most: (a) practical application of a specific language to vocational activities and to everyday life, (b) representation of and engagement with the cultures of the people whose languages (L2) they study, and (c) engagement with speech communities in which the second language (L2) is spoken with varying levels of proficiency. The study concludes with suggestions for areas of further study that will be of value to second language researchers and instructors alike.

Keywords: generation Z students, language-learner engagement, perceptions of learners, perceived importance of language

Introduction

Student perceptions of college-level study are in high demand as colleges prepare to navigate purported demographic shifts, namely an overall decrease in college-aged Generation Z students and an increase in Hispanic collegegoers beginning in 2026 (Grawe, 2018a; Campion, 2020). College administrators and language departments alike are relying heavily on student perceptions to restructure many aspects of their operational systems in hopes of attaining desired enrollment and providing a learning environment that supports today's students. Within the discipline of language study, reports on student perceptions aren't new. As Tse (2000) noted, between 1973 and 2000, roughly, researchers carried out many investigations on the opinions and dispositions of language students regarding several aspects of the language-learning environment (p. 69). Today, the opinions of students regarding the effectiveness of their language instruction are constantly requested. What is less common in second language literature are studies pertaining to student perceptions of the overall importance of language study at the college level. To be clear, this preliminary study does not ask whether language study is an essential part of postsecondary education. Rather, through qualitative analysis of student responses to an online survey, the study seeks to ascertain the aspects of language study that today's students perceive as being the most important. We believe that this knowledge will be beneficial in many ways as it will: (1) reveal students' knowledge and perceptions of language learning; (2) provide researchers with new vocabulary with which to rewrite the contextualizing frameworks of established language theories; (3) reveal areas in which various interventions might take place to optimize students' engagement with and appreciation of not only language learning but of all aspects of their academic pursuits, and (4) provide a useful context to facilitate the move from the theoretical—second language theories— to the practical—pedagogical approaches.

Background

Troublesome times

Generations of language teacher-scholars who completed their undergraduate or graduate degrees in the almost eight decades after the end of the Second World War have undoubtedly heard rumors about the survival of language studies programs within secondary and postsecondary curricula. For recent language teacher-scholars, it would seem as if crisis preparedness and militant second language advocacy were informal, built-in aspects of their training. Brown, Caruso, Arvidsson, & Forsberg-Lundell (2019), considering the attribution of the word *crisis* to language studies as pessimistic and alarmist, noted the beginnings of crisis discourse in the March 1942 paper delivered by American educator Isaac Leon Kandel at the Foreign Languages Teachers' Conference in New York (p. 41). The paper, entitled "Study of Foreign Languages in the Present Crisis," though delivered during the throes of the Second World War, focused instead on another ongoing war waged between traditional disciplines that focused on their own interests rather than engaging students in a course of study that "transcend[ed] preparation for immediate use" (Kandel 16). The war of "mentalities" (23) regarding language instruction and its outcomes for Kandel was the substance of the crisis within the study of foreign languages at that time. Since then, as Brown, Caruso, Arvidsson, & Forsberg-Lundell (2019) noted, the nature of the crisis has changed. We note, however, that the feeling of language studies' demise at the hands of an antagonistic other still exists.

This feeling of impending doom felt within language studies is understood within the wider context of crisis within the humanities. Schmidt (2018), listing language studies as one of the four major humanities fields, noted a decline in majors within humanities-related disciplines between 2010 and 2017. Additionally, he noted that this decline within liberal arts colleges, where all disciplines are purportedly kept in a certain equilibrium, is even more dramatic. Though Schmidt attributed this decline in humanities majors to, among other things, an increased interest in science-focused fields and disciplines that provided practical training related to vocational goals, Agudo (2020) would seem to attribute the decline, with specific regard to language studies majors, to inequalities in administrative treatment. Describing language departments as "the poor relative on campuses," Agudo (2020) noted that language departments are traditionally under-resourced and face a greater volume of inequalities when compared to other disciplines. While a causal relationship between declining numbers in language studies majors and in administrative support for language departments is difficult to substantiate, the feeling of demise among language teacher-scholars is validated.

Irrespective of the empirical and theoretical contributors to the negative disposition of the language study collective, it is true that the field of second language studies has undergone several interrogations to not only guarantee its survival but to better serve the interests of learners. Among these lines of inquiry is an introspective look at internal tensions within language studies itself and how they impact language learners. For one, the use of the term *foreign* as an epistemological determiner for language studies is one of Osborn's (2000) concerns. Osborn, who attributes the failure of language education in the U.S. to sociological rather than methodological issues (p. 8), argues that the ideological goal of language learning as expressed as the requirement to experience foreignness foists the hegemonic view of the elite minority upon all learners (pp. 11-12). Added to Osborn's discussion of the word *foreign* is Agudo's (2021) argument relating to the same word. For him, not only is the term reflective of a pedagogical agenda that is devoid of cultural framing but of pedagogical approaches that are best "meaningless" and, at worst, "harmful." For Agudo (2021), and ostensibly for Osborn, the harm inflicted by the word *foreign* stems from the thought processes used to conceptualize what is not foreign. By that, as Agudo (2021) explained, the ideology that constructs the foreign/non-foreign binary is often rooted in simplistic, essentialist worldviews that make false assumptions about the learners present in the classroom. Thus, Kandel's (1942) description of warring ideologies is imperfectly recreated here. Whereas Kandel's argument concerned institutional and national culture surrounding the goals of language learning in secondary and postsecondary education, Osborn's (2000) and Agudo's (2021) arguments focused on the role of culture in repositioning second language education within frameworks of diversity, equity, and inclusion.

The triumvirate ideological structure conjured by the terms *diversity*, *equity*, and *inclusion* can also be seen as one of the guiding principles behind the *World-Readiness Standards* created by the American Council on the Teaching of Foreign Languages (ACTFL): Communication, Cultures, Connections, Comparisons, and Communities (National Standards Collaborative Board, 2015). And the beneficiaries of this framing are two-fold: language learners and language study. The latter beneficiary, described previously by scholars as having a tenuous existence in education and under threat from more robust disciplines, is now conceived as a lifelong academic experience that provides cognitive enhancement applicable to all disciplines and vocational pursuits. The Connections standard, positing that learners "connect with other disciplines and acquire information and diverse perspectives in order to use the language to function in academic and career related situations" (National Standards Collaborative Board, 2015), thus recalls and diffuses the tension presented in Kandel's (1942) use of the term *études désintéressées*, defined as "studies which are valuable irrespective of time and place and therefore available resources when special occasions arise" (p. 23) to describe language studies. By that, the notion of preparing ways for students to become lifelong users and learners of language, regardless of the practical, day-to-day use of said language (L2) in their vocation, is central to the world-readiness standard. So important is this ideal that scholars, such as Simonsen (2020), argue for more deliberate restructuring of language curriculums to fulfill the Connections standard more clearly. Focusing on career-readiness and the requisite and complementary expertise and areas of knowledge within the healthcare system and business-related fields, for example, Simonsen would seem to see benefit in forging ties with disciplines that, for Schmidt (2018) and Agudo (2020), were considered inimical to the survival of college language-study programs. By these *World-Readiness Standards,* the goals of language learning and instruction have centered on empowering language learners to respectfully describe, investigate, and reflect critically upon the philosophical objects related to the people whose language they are learning to speak (L2) and those that animate their own lives. As such, the *World-Readiness Standards* purports to dismantle notions of language studies as being in an antagonistic relationship with itself and with other disciplines by harmoniously tethering language studies to the core and to all the resultant constructs of the academy. Thus positioned, any attack on language study should be seen as an attack on the academy itself.

Notwithstanding language studies' attempts to rebrand and reposition itself within the foundation of secondary and postsecondary education, in recent years, American colleges have eliminated or reduced foreign language programs. Johnson (2019), for one, reports that colleges closed 651 language programs between 2013 and 2016. Johnson (2019), like Schmidt (2018), also reports that cuts in language programs are consistent with declining enrollment in language classes during the same period. And as Bauman (2020) reports, it stands to good reason that the 2019 pandemic will provoke some college administrators to take additional drastic measures to secure the fiscal solvency of their institutions and, consequently, guarantee uninterrupted employment for language teacher-scholars. The trouble in humanities, and specifically in language studies, therefore seems to have taken on a new dimension, the yet-untenable nature of which extends beyond the scope of this article. That significant changes have taken place in language studies since Kandel's paper in 1942, and the quelling of the 2019 pandemic is a given. To be sure, though, the nature of things dictates that paradigm shifts present a complex system of dialogistic parts that conspire to provoke arrhythmic and aleatory change. Incidentally, as university systems contemplate their financial books, they are also preparing to fully meet the needs of a new generation of students.

Perception Discourse

This preliminary study on student perceptions of second language learning aligns itself loosely with previous work done on the subject, though not much has been published on students' perceptions of the importance of language studies. Tse's (2000) study sought to ascertain students' perceptions of their foreign language study through qualitative analysis of student autobiographies. Grounding her work in Gardner's (1985) socioeducational theoretical frameworks and research on affective filters of second language acquisition forwarded by Horowitz, Horowitz, & Cope (1986), Krashen (1981), MacIntyre (1995), and Young (1991), Tse (2000) did not seek to ascertain learner perceptions of the importance of language studies rather learner perceptions of instructional methods notions of language learner success and failure. Similarly, Tapfenhart's (2011) work on learner perceptions contributed to second language learning motivation discourse by investigating student perceptions of instructional practices. More recently, two studies on student perceptions contribute more pointedly to this current study. The first, Thompson, Eodice, & Tran (2015) focused on student opinions of general education requirements. Agreeing with Reardon, Lenz, Sampson, Johnston, & Kramer (1990), Thompson, Eodice, & Tran (2015) stated that student voices were often underrepresented in matters regarding general education reform (p. 279). In the second study, de Saint-Léger & McGregor (2015) investigated student perceptions of pedagogical practices related to intercultural, transcultural, and translingual competencies. In more recent years, besides work done on student opinions of the instructor and their bearing on language learner motivation (Drakulić, 2019), additional research relating to learner perceptions of established (Menke & Anderson, 2019) and emergent (Crane & Sosulski, 2020) pedagogical approaches within second language teaching and learning has been published.

This preliminary study thus attempts to understand the perceptions of the importance of second language learning among Generation Z students at a small liberal arts college that has a language requirement. By ascertaining student perceptions of overall importance of language studies in their undergraduate career and in their post-graduation lives, we seek to validate and challenge prevailing knowledge relative to today's postsecondary language learner and identify useful areas of inquiry as teacher-scholars continue to move from theory to practice.

The Study

This study sought to gain insight into the perceptions of current students (CURR) and recent graduates (ALUM) concerning the importance of language study within the composite experiences of their long undergraduate career. The term *composite experiences* grounds itself in flourishing discourse proposed by Keyes (2002) and Keyes (2007) that focuses on achieving branches on emotional, psychological, and social wellbeing to preserve and promote mental health. The term *long undergraduate career* borrows from historians who refuse the primacy of chronology as the determiner of the start and end points of phenomena, preferring instead to focus on key contributive and resultant occurrences relative to an established epicenter. Correspondingly, rather than a focus on the period between matriculation and graduation, the long undergraduate career would also include discussions of high-school and post-graduation experiences that have an impact on college experiences expected, imagined, actualized, and remembered. For our purposes, we sought to focus on how Generation Z students valorize language study within the complex network of dialoguing forces that determine their undergraduate lives. A reflection on students' opinions of college-level language study will help teacher-scholars to not only recalibrate recently established theoretical frameworks but also unpack them using terminology and references that speak to the students that populate their language classes. Ultimately, student retention, success, and providing instructors with tools that foster efficient engagement with essential information are aspirational goals. For now, however, the following questions were addressed in this preliminary study:

1. What are student perceptions of the value of their language study?
2. What are student perceptions of the value of cross-cultural understanding?
3. What changes do students believe should be made to language study?

Methodology

Participants

In spring 2021, between April 29 and June 16, undergraduate students currently enrolled in classes at the Institution and students who graduated from the same Institution between May 2016 and May 2020 received an email invitation to participate in an Institutional Review Board-approved study by completing an online survey. Of note, the Institution was a small, private liberal arts college whose general education curriculum required that most students complete a sequence of language study within at least one language. Typically, students who chose to study a language for the first time at the Institution devoted approximately four semesters to this endeavor. However, students who had studied language formally in high school sat a placement exam and, depending on their placement, completed their language sequence in fewer semesters. From the student responses gathered, we only considered those from current students who had taken at least one language class at the Institution (n = 53) or recent graduates (n = 49) who took at least one language class at the Institution. Regarding the occupation of the recent graduates, 1% (1) were unemployed, 22% (10) were in graduate school, and 77% (38) were employed (as shown in Figure 1). Among the current undergraduate students, approximately 25% (13) were first-year students, 28% (15) were sophomores, 26% (14) were juniors, and 21% (11) were seniors.

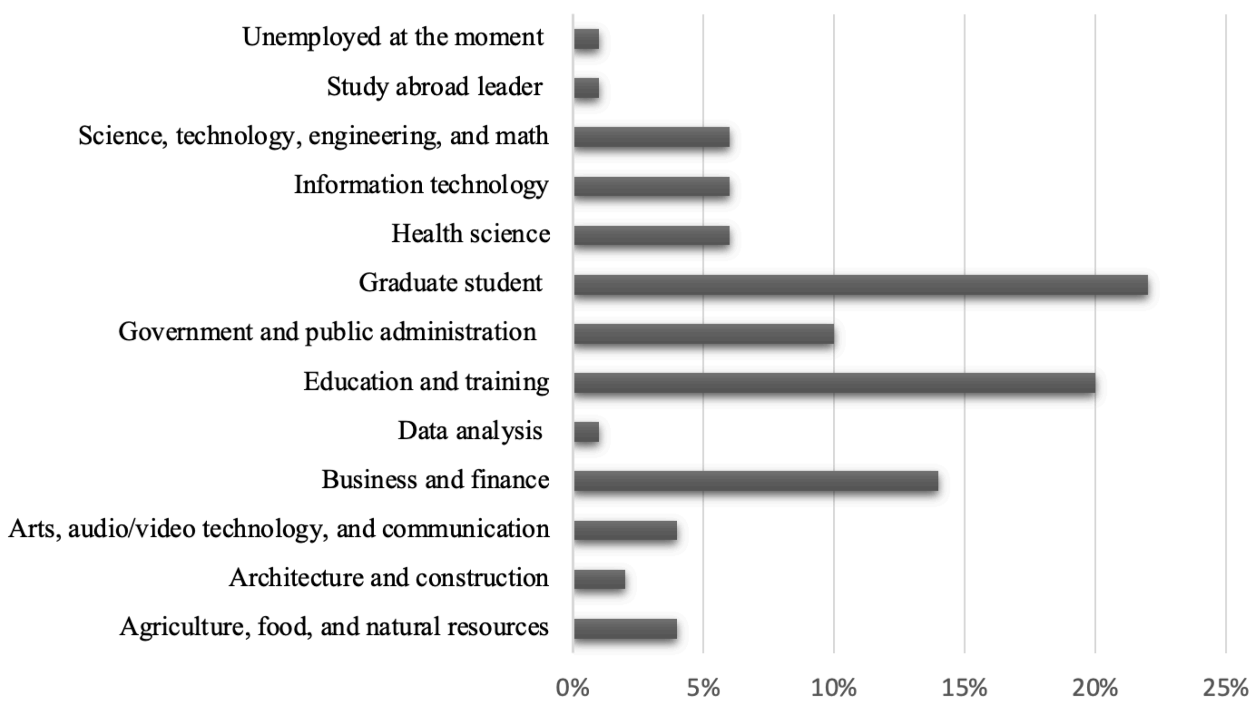

Figure 1. Vocational Activities of Recent Graduates.

Among both sets of participants, approximately 61% (62) expressed that they were very familiar with the general education requirements, 31% (32) stated that they were moderately familiar, and approximately 8% (4) stated that they were only slightly or not at all familiar with the general education requirements. With specific regard to the general education requirement relating to language study, approximately 92% (94) were aware that their language study contributed to the completion of one of their general education requirements. Only 8% (8) were unaware of this fact. For undergraduate students who had already completed the language requirement, approximately 57% (25) took additional classes in language study and 43% (44) did not. Among recent graduates, 65% took additional language classes post-completion of language requirements and 35% did not. Finally, as shown in Figure 2, the subject pool represented major and minor areas of study in four broadly conceived disciplines. Regarding participants who had already decided to pursue specializations in the humanities, 34% (44) had majors in language study and 70% (33) had minors. From this subject pool, it was determined that both sets of participants had sufficient knowledge of and experience with language study at the Institution, thus validating their empirical evidence. Additionally, the spread of major and minor areas of specialization avoided biases caused by the overrepresentation of any one discipline. It should be noted, though, that there were significantly fewer responses from students in disciplines housed in math, computer science, and science. Finally, among recent graduates, the diverse career sectors represented created a more veritable and balanced depiction of career destinations post-graduation.

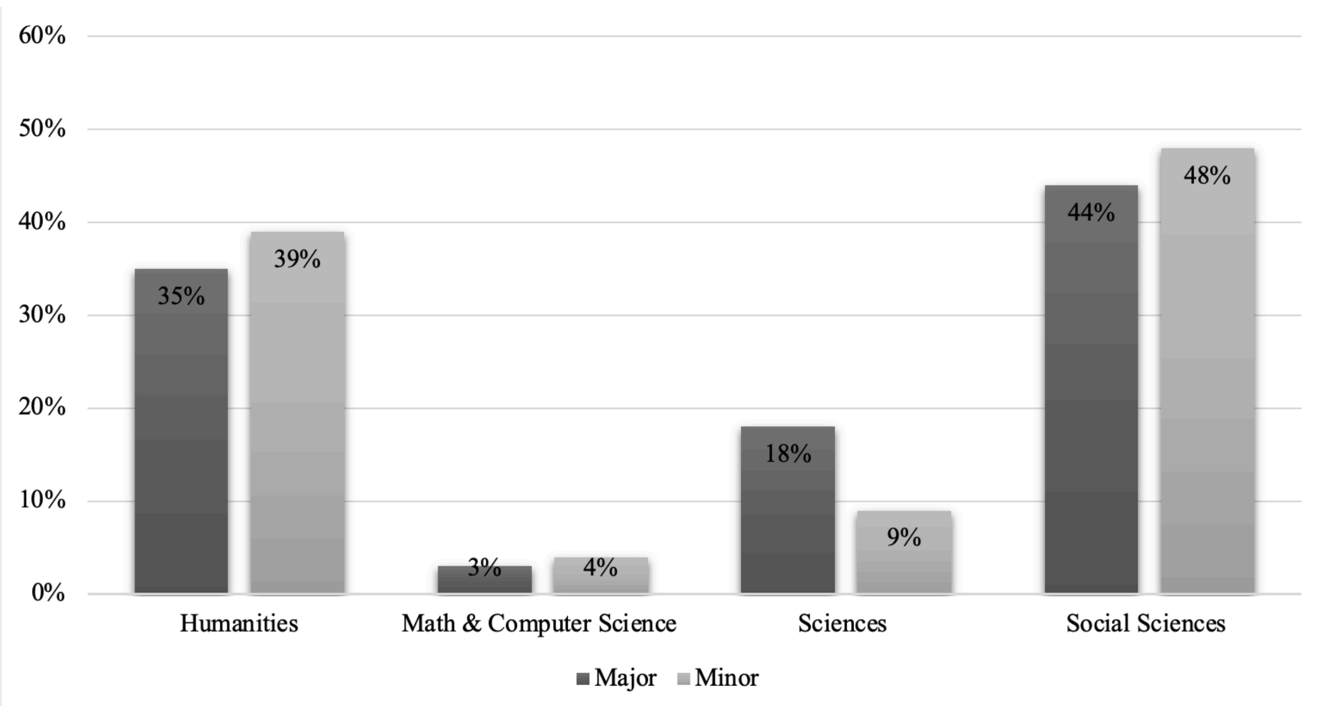

Figure 2. Major and Minor Areas of Specialization

Data Collection

Correspondents in the College of the Dean of the College sent an email to the general student body containing a link to the consent form and the online survey. Correspondents in the Office of Alumni Relations sent the same to a curated listserv of recent graduates. Neither current students nor recent alums were engaged in prior discussions pertaining to the topic of the study. Instead, the email they received briefly mentioned the general focus of the study: students' perceptions of their language-learning experiences in college. Willing participants were then asked to follow the included link in the email to complete a 15-minute, anonymous, electronic survey. Once within the survey, participants read the consent form and acknowledged their willingness to participate in the study. Participants were also informed that they could abandon the survey at any point if they no longer wished to participate.

The survey prepared for current students contained four sections. In the first section, participants answered questions related to their class standing, semesters of study at the Institution, major and minor areas of specialization, languages spoken at home, languages studied in high school, and language study already completed in college. In the second section, participants answered questions about their understanding of language study and its connection to the Institution's general education curriculum. The third section contained questions about participants' personal experiences with and perceptions of language study in college. The final section provided space for participants to reflect generally on their language study and provide constructive feedback for the Institution.

The survey prepared for recent graduates also contained four sections. Though this survey was similar to the one just described before, it was also modified significantly. In the first section, recent graduates reported their graduation year, major and minor areas of specialization, languages spoken at home, and language studied in high school. In the second section, similar to the germane section in the survey for current students, recent graduates were asked questions pertaining to their understanding of the Institution's general education curriculum and its relation to language study. In the third section, beyond soliciting information on personal experiences with language study while in college, recent alums were asked to speak about the same in the context of their current vocational or non-vocational activities after graduation. The final section provided space for recent alums to reflect generally on their language study and provide constructive feedback. In both versions of the survey, the final question also allowed participants to address any aspect of their language-learning experience that may not have been addressed in other survey questions.

From the pointed survey questions and the free-write section at the end, researchers were able to collect several pieces of data. For the purpose of this current study, the questions that follow yielded the most pertinent responses relative to the research questions listed previously.

1. You are having lunch with a prospective student who asks you to explain what cross-cultural comprehension means to you. What would you say?
2. Which three words would you use to describe your language learning experience at [the Institution]?
3. Beyond helping you to complete your general education requirements, do/did you see any additional benefit to your language studies? Please explain your answer.
4. If the Institution didn't have a language learning requirement, would you still have chosen to study a language? Please explain your answer.
5. In terms of your curricular experience at [the Institution], how important are/were your language studies? Please explain your answer.
6. Reflecting on your experiences in language studies, is there any constructive feedback that you could offer? Please write your feedback below.

Additionally, from the survey prepared for recent graduates, the following question was particularly useful:

7. In your current occupation, do you find that your language study proved to be beneficial. Please explain your answer.

Analyses

Though survey responses lent themselves to both quantitative and qualitative exploitation, the latter process was primarily used in this study. Following the sequencing suggested by Strauss & Corbin (1990), open coding was used to assign general descriptors to student responses to the seven questions listed before. Once satisfied with these general, lower-level categories, the process was repeated to create more specific categories. Next, the process of axial coding (Strauss & Corbin, 1990) was employed to organize the categories into specific and inter-related themes from which the thesis for the study was derived.

Results

Based on the results of qualitative analysis, student responses fell into three categories, moving from the empirical to the abstract: (a) perceptions of the value of language study in the context of composite undergraduate experiences, (b) perceptions of the value of cross-cultural understanding in the context of composite undergraduate experiences, and (c) perceptions of institutional changes that would enhance language study at the Institution. Though it is true that the three categories share significant commonality, this classification allows for iterative and nuanced readings of student responses that contributed to a deeper understanding of what students think.

Perceptions of the Value of Language study

When asked to choose three words to describe their language study in college, the vast majority of student responses fell into the following categories: (a) emotions (n = 154), classroom experiences (n = 65); content (n = 38); and benefit (n = 28). Regarding the largest category, emotions, words used such as *boring, exhausting, exciting, fun, good, humiliating, inspiring,* and *stressful* reflect the memory of how students felt and were made to feel in a language class. Regarding classroom experiences, students used words such as *immersive, thorough, comprehensive, virtual, repetitive, reading,* and *hands-on* to speak about aspects of the learning environment. Next, regarding content, students reflected on the information they received and engaged within language classes, using words such as *expansive, Eurocentric, elitist, cultural, artsy, analytical, insightful, important, eye-opening,* and *informative.* Finally, the following words reflected that there was or should be a benefit from having studied a language in college: *rewarding, enriching, worthwhile, valuable, fulfilling, unhelpful, unfulfilling, helpful, fruitful,* and *beneficial.* Surprisingly, only two responses to this question reflected words explicitly linked to the language requirement (*requirement, required*).

Requirements (n = 37) featured more prominently, however, when participants were asked about the importance of language study within their curricular experience. Besides requirements, the importance of language study was related to emotions (n = 37), knowledge and understanding of other cultures (n = 12), personal fulfillment as a college student (n = 16), cognitive development (n = 11), reward-based on time investment (n = 9), practical application (n = 8), and community building (n = 8). Overall, as shown in Figure 3, most participants (80%) ascribed at least moderate importance to language study within their curricular experience.

When asked if they thought there was additional benefit to their language study beyond fulfilling their language requirement to graduate, most students responded positively. Approximately 74% (39) of current students (CURR) and 86% (42) of recent graduates (ALUM) said that they perceived an additional benefit to their language studies. Only 2% (1) of CURR and 10% (5) of ALUM selected that they didn't see additional benefit to their language study beyond the language requirement. When asked to expand on their reasons for attributing or not attributing additional value to their language studies, among those who responded positively, the vast majority perceived certain benefits that were coded as relating to their future or current careers (n = 23), cognitive development (n = 31), knowledge and understanding of other cultures (n = 28), community building (n = 23), cognitive application to other classes (n = 13), and study abroad (n = 13). Additional benefits, although fewer in number, included the feeling of positive emotions (n = 3) and practical applicability to everyday life (n = 5).

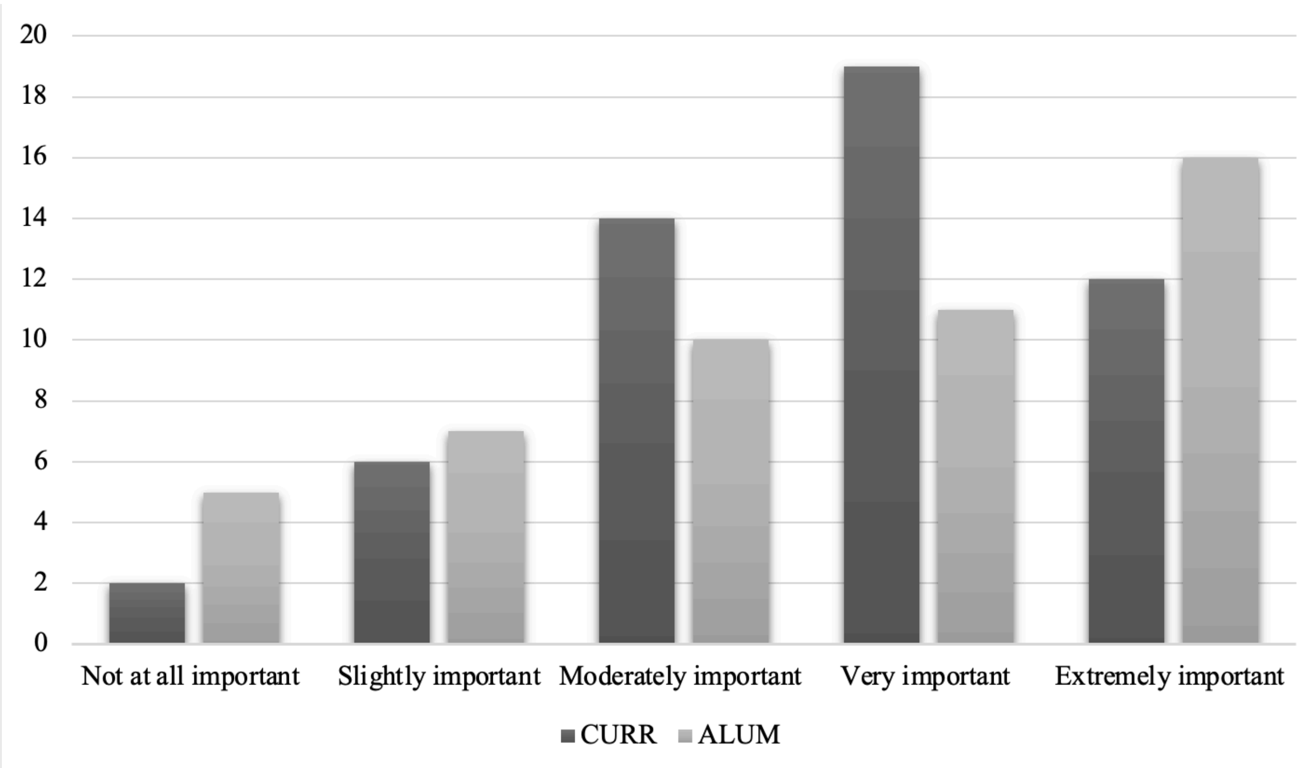

Figure 3. Importance of Language Study in the College Curriculum

For the six students who did not perceive any additional benefit to their language learning, their reasons included general lack of interest and the belief that their language study was only beneficial in completing graduation requirements. One of these six students stated, "No, however now I do see the benefits of language study and regret not putting more into my studies" (ALUM 49).

Related to the expression of regret in the last response mentioned before, recent graduates were asked a follow-up question pertaining to the perceived benefit of language study in their current occupation. We found that 44.9% (22) of participants gave a positive response and 34.7% (17) gave a negative response. The remaining 20.4% (10) were unsure if their language study proved beneficial in their current occupation. Among reasons for positive and negative responses, practical application of language study was most prominent (68%). However, reasons relating to intercultural competency (13%) and community building (9%) were not as prominent. One student who did not perceive any benefit to their language study in their current occupation noted:

> *I obtained a master's degree in [specific country where language is spoken], where my language skills were [...] useful. I had difficulty obtaining a permanent job there afterward and returned to the US to pursue a hopeful medical career. Every day I encounter the use of [specific language] professionally, and I often wish that I had been more practical with my language learning choices rather than following my intellectual curiosity* (Alum 24).

In analyzing these responses, it should be noted that student responses regarding the practical application of language study were mostly language-specific as opposed to metacognitive or metalinguistic.

The focus on specific languages was present when students were asked if they would have still chosen to study a language if language study wasn't required by the Institution. Among current students, 52.8% (28) said yes, 18.9% (10) said no, and 28.3% (15) said maybe. Among recent graduates, 63.3% (31) said yes, 14.3% (7) said no, and 22.4% (11) said maybe. Of note are the reasons given by those who were undecided about whether they would have decided to study a language. Their reasons center on several factors: (a) time constraints relative to not only completion of other major areas of specialization but time invested relative to professional and personal reward gained, (b) belief in aptitude and confidence as a language learner, and (c) the offering of and/or the placement in a specific language.

Perceptions of the Value of Cross-Cultural Understanding

When asked to provide a working definition for the term *cross-cultural comprehension*, a term used by the Institution to summarize the category to which language study falls within the general education curriculum, only 3% (2) of current students and 4% (2) of recent graduates said that they would not be able to define the term at all or defined it solely as a series of courses needed to graduate. Most responses, however, revealed an impressive understanding of cross-cultural comprehension that included the following general notions: appreciating others, understanding others, communicating respectfully with others, empathizing with others, broadening horizons, building community, knowledge of the global community, knowledge of others, and understanding our own selves. While some responses were succinct: "Understanding and finding value in other cultures and how they relate to our own" (CURR 3), others were more verbose:

> *At its core, I believe it is taking the time to learn about, recognize, and appreciate similarities and differences among differing cultures. Comprehension implies a holistic understanding, which requires time and effort to explore the complexities of unique cultures. I believe that learning to embrace and celebrate diversity, both through empirical experience and formal classroom instruction, is fundamental to achieving cross-cultural comprehension* (ALUM 8).

Regardless of the length of the responses, most students were able to demonstrate a base understanding of cross-cultural understanding in their own words.

Perception of Changes to Language study

The final section of the survey for both sets of participants asked for constructive feedback based on general reflection on language study at the Institution. Here, students were empowered to include information that they felt was important to them and information that was not housed elsewhere in the survey. Not surprisingly, some responses centered on changes to language placement and the language requirement itself:

> *I wish the requirement was only for a class. I stuck with a language that I studied in middle school and high school because that path led me to finishing the requirement in the most direct way. If I didn't feel that I was taking away time from other courses I wanted to explore at [the Institution]. I would have loved to try a completely new language that wasn't available to me in my prior years of schooling* [...] (ALUM 40).

However, most responses concerned a desire for more classes focused on the discovery of cultures where the target language is spoken as opposed to a focus on the exposure to grammatical structure:

> *A much stronger emphasis on the culture classes over the language classes, which actually teach foreign cultures and how they*

> *think about the world they live in, language classes do not do this at all; it's possible and common even for students to take years' worth of language classes and still know very little if anything about the culture and society to which that language belongs* (CURR 8).

> *I think [the Institution] could apply the functional model of community engagement to the languages* (CURR 37).

Along these same lines, some students mentioned the need to devote more of their language study to speaking and conversation:

> *I wish there was more opportunities to practice language orally. I feel like I'm prepared to read and write, but if I went to a country where my studied language is spoken, I think I'd have a lot of trouble communicating*. (CURR 36)

Finally, students expressed the essential need for the Institution to diversify its language offerings and challenge the traditional primacy of Europe within language study: "A less [European-centered] curriculum. Less colonizers please! More on Latin America and the Caribbean. And Indigenous folks [...]" (ALUM 17).

Though these responses do not reflect an understanding of the programmatic realities that affect the functioning of language departments at the Institution, these responses give an insight into what students perceive as essential within their language study. Additionally, the responses allow teacher-scholars to strengthen or rework existing theories relative to second language study and identify new areas of inquiry.

Discussion

Students' perceptions of second language learning experiences at an institution that has a language requirement provided interesting insight into what students value the most about language study. Researchers can use this insight to inform future research on pedagogical practices that aim to present second language learning in a context that fully resonates with today's students. With this in mind, based on their prominence in the students' responses, the following emerge as continued areas of interest for second language instructors and researchers: (a) practical application of a specific language to vocational activities and to everyday life, (b) representation of and engagement with the global cultures of the people whose languages (L2) students study, and (c) engagement with speech communities in which the second language (L2) is spoken with varying levels of proficiency. We will elaborate on these areas in the order just presented.

Practical Application of Language Study

From student responses, the importance or lack of importance of language study is primarily attributed to students' ability to use the language (L2) in practical ways in their vocational activities and in their daily lives. For current students and recent graduates, practicability in language study was mostly defined as opportunities to communicate orally with others who also speak the L2. With regard to recent graduates whose understanding of practicability included using L2 to complete vocational tasks, they also attributed great importance to using the language in their current employment. For most respondents, the fact that their current occupation did not require them to speak to clients in L2 rendered their language study of little value. It would seem, then, that the educational trends concerning the practical value of language study that vexed Kandel (1942) are in high demand among today's students. Also, the participants in this study did not report great value in the educational experience that Kandel (1942) attributed to Dr. John Dewey, who countered the notion of value and use by privileging studies that "ought to be appreciated on their own account – just as an enjoyable experience, in short'" (p. 23). However, the Communication standard that strives for students to "communicate effectively in more than one language in order to function in a variety of situations and for multiple purposes" (National Standards Collaborative Board, 2015) comes closer to affirming the greatest importance of language study as perceived by language learners today. However, what is emerging from student responses is the speed with which they want to be able to speak the language. This notion also corresponds with Weber & Keim (2020), who summarize research on Generation Z students:

> In particular, [researchers] suggested that Generation Z students have the urge to multitask, shorter attention spans, the drive for instant satisfaction, the desire for collaborative learning, a preference for professor-student interactions based on real relationships and learning that is practical and relevant to their future careers. (p. 10)

This notion of instant gratification is supported by students' concern that the Institution required more than one semester's worth of language study and that they perceived little reward for time they invested in language study. Though this concern is unique to this institution, it does ground itself in the idea that students desire to quickly see the benefit of their effort in practical ways.

From all of this, two conundrums arise that will require further study. First, research on second language acquisition informs us that formal classroom instruction, as opposed to study abroad programs or intensive immersion programs, is a less effective way of developing oral proficiency in the form of fluency (Freed, Segalowitz, & Dewey, 2004; Mora & Valls-Ferrer, 2012). Therefore, we see a generation of students who want to see quick progress and reward in an aspect of an academic discipline that has been proven to develop slower and less spectacularly. In other words, if students expect to experience significant gains in oral proficiency after a semester or even a year of formal instruction, their expectations will be unmet. Additionally, from responses given, students do not perceive the study of grammatical structures as a classroom experience that is essentially contributive to the development of their oral proficiency. Contrarily, several students expressed negative dispositions to this exercise and expressed more positive feelings to conversation. For these students, then, their experiences with formal classroom instruction are of little value. Furthermore, for those students who are unable to participate in study away language programs because of financial and programmatic obstacles, they may never experience the reward they had imagined receiving at the end of their language study. Second, seeing that it is unwise to pretend to perfectly predict the future, it is not sustainable practice to hinge the value of language study on the guarantee that the student will be required to speak the language (L2) regularly in their future career.

Engaging with Cultures

Speaking with others, as explained previously, is one practical product of language study that Generation Z learners value highly. Engaging with cultures where the language (L2) is spoken was also of great importance. Here, beyond communicating through speaking, the notion of engagement was seen in exposure to and an increased knowledge of different cultures with the aim of reflecting critically on one's own subjectivities and proclivities. It stands to reason, then, that language study framed by Byram's (1997) objectives pertaining to intercultural communicative competence and ACTFL's Cultures standard (National Standards Collaborative Board, 2015) is appreciated highly by today's learners.

We cannot ignore, however, two additional areas of concern related to students' perceptions of language study and cultural engagement. First, students' perceptions reveal the belief in a binary that creates an antagonistic relationship within itself: language study as learning grammar and vocabulary and language study as learning about other cultures. While language instructors understand the foundational role of grammar and vocabulary in developing language-learning competencies in traditional classroom settings, this understanding doesn't seem to be clear to learners. Additionally, many respondents saw learning about other cultures as a sort of reprieve from learning structural components of the language (L2), even where cultural engagement was the purported goal. While this notion might not fully recall Kandel's

(1942) notion of the desire for a "painless education" (p. 12), continued research is needed to show how to negotiate difficulty, complexity, and forms of cognitive dissonance when learning a language through instruction in college. Future research on navigating cognitive dissonance relating to language study and today's students might also lead to a reconsideration of the definition of the word *academic.* Second, some students considered the representation of culture within pedagogical materials to be hegemonic. As mentioned by some respondents, the focus on cultural objects belonging to European colonizers was highlighted as an aspect of language study to change. The fact that only five students mentioned this concern is extremely provocative. For some students, knowledge-based cultural engagement with a focus on European cultures is expected and valued highly. For others, this same approach to cultural engagement is seen as Eurocentric and an oppressive act of erasure that is ignorant of past and present atrocities. Contrarily, cultural engagement operationalized as community engagement with cultures belonging to territories outside of Europe may be seen as exploitative, patronizing, or even as an act of tokenism for some students. The point here is that language classrooms are populated by students whose perceptions of acceptable and fulfilling cultural engagement create a wide spectrum. To foster sustained investment in language study, future research will continue to explore ways of integrating cultural engagement into language learner identity discourse. In so doing, no member of the language-learning community should have negative dispositions toward the representation of culture in their classes. Ultimately, in support of research done on Generation Z students (Mohr & Mohr, 2017; Seemiller & Grace; 2017; Weber & Keim, 2021), this current study encourages further research on sustainable ways of adapting learning modalities to suit the needs of today's students. As mentioned previously, operationalizing cultural engagement in the study of language is of great importance to this study's participants.

Community Engagement

An additional form of desired engagement that emerged from this study was community engagement. Not only did respondents express a desire to speak with people in their immediate and extended residential area and those they met in their professional lives, one student suggested that language study should be reconceptualized using the frameworks of community engagement. These reports support the idea that the Communities standard that states that learners "communicate and interact with cultural competence in order to participate in multilingual communities at home and around the world" (National Standards Collaborative Board, 2015) is of extreme importance to students. Additionally, research that shows ways of reframing traditional pedagogical practices by a focus on community engagement, such as Randolph & Johnson (2017), will continue to be of great value to language instructors. Finally, a vast number of students expressed a desire to spend more time speaking with their classmates and their instructors in L2. Not only does this understanding support research about Generation Z learners and their desire to engage in more one-on-one interaction with instructors (Weber & Keim, 2021), but it also reminds us of an often-overlooked community: the classroom. From these responses, we are reminded that the language-learning classroom constitutes a multilingual community that students recognize, value highly, and in which they want to invest.

Conclusion

The qualitative analysis of responses on this preliminary study reveals that practicability, cultural engagement, and community engagement are products of language study that students value the most. As stated before, future research is needed to provide these language-learning products sustainably and ethically for today's learners.

Regarding practicability, students defined this as becoming quickly proficient in L2 to be able to speak the language in their daily lives and at work. Both definitions present challenges for language study as they ignore the nature of how oral proficiency is acquired through formal instruction and present a reductive and unbalanced approach to the relationship between vocation and language study. To address these concerns, future research within language awareness (LA) will be beneficial in several ways. First, research on language awareness (LA), such as presented by Scott, Dessein, Ledford, & Joseph-Gabriel (2013), should be employed to mitigate the hyper-focus on practicability relative to speaking ability. By focusing instead on the cognitive, social, and psychological gains of language study, students will not only no longer hinge the value of their language study on speaking ability but may also begin to see language study as contributing to several areas of their overall wellbeing in college and beyond. It should be highlighted, too, that difficulty and hardship are not inherently inimical to wellbeing. Second, collaborative LA studies and career development studies on the benefit of language study on career exploration, mobility, and evolution will help students to see greater applicability of language study beyond college and equip language instructors with ways of creating a "contemporary approach to learning" (Mohr & Mohr, 2017; p. 90). Finally, LA studies that provide a transparent and honest view of the authentic speech acts that students will be able to complete after each semester of classroom instruction will help learners to adjust their expectations and allow instructors to structure their objectives and assessments accordingly.

Regarding cultural engagement, besides continued research that seeks to acknowledge and empower the plural identities of language learners, language instructors will benefit from additional research on learner identities and how they affect expectations of cultural engagement within language study. Furthermore, more pointed studies might provide language instructors on how to engage their students with ongoing discussions on the implications of colonialism, imperialism, and racism on the universality of certain languages and the diminishing or eradication of others. This discursive approach to cultural engagement within language study will help to remove affective filters that hinder the investment of certain language learners in their language study.

Finally, regarding community engagement, language instructors should feel empowered to invest great time in identifying, celebrating, and promoting the classroom as a multilingual community of which they are a cherished part. Continued research that focuses on critical reflection and ways in which language instructors develop their own identities in their classroom will therefore be of great value. Such a focus on community building with people whose lives make up a vast amount of the communicative content of language study might, in turn, redefine the word *practical* and satisfy the desire for acceptable cultural and community engagement. Language instructors might also be able to remind students that cultural engagement and community engagement, which they name as essential products of language study, also belong to the realm of the practical.

Competing Interests

The authors declare that they have no competing interests.

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TRANSFORMING CURRICULUM

A Process for Implementing Problem-Based Learning in a College-Level Course

Morgan Robertson and Marla K. Robertson, Ph.D.

Abstract

Transforming curriculum by implementing Problem-Based Learning (PBL) in the college-level classroom helps students internalize the concepts of a course, improve their critical and reflective thinking skills, learn to problem-solve using questioning, and ultimately construct a better understanding of course concepts in a personally relevant way. This article introduces a process for implementing PBL in a college-level course. Each of the four main ideas in PBL, motivation, collaboration, reflection, and facilitation, are addressed with a particular focus on the role of the educator in designing and implementing PBL in the classroom. An example of how the process works in a specific college-level course is provided with explanations of the thinking that went into each of the steps in the process and the outcomes of the implementation, including examples of student assignments and the challenges and benefits of the implementation.

Keywords: problem-based learning, PBL, college coursework, concurrent enrollment, dual enrollment, teaching

Introduction

In some fields, college courses are primarily lecture-based. In some cases, students have issues with engagement in a lecture-based environment. A solution to this issue would be to incorporate ideas for more student engagement and creativity in assignments and the presentation of content. One well-documented educational model to accomplish this goal is problem-based learning (PBL). PBL has been implemented since the 1980s (Barrows & Tamblyn, 1980) starting in medical education and has an incredible amount of data supporting its efficacy in the subsequent decades (e.g., Gijbels et al., 2005; Kong et al., 2014). The goal of this article is to describe PBL and provide a simple process for college-level educators to follow to transform their curriculum by converting traditional assignments in a lecture-based course into PBL assignments. This process might help mitigate some of the challenges educators face with implementing PBL into their teaching.

Problem-Based Learning

PBL is a well-known type of student-centered instruction, originally implemented in medical education by Barrows and Tamblyn (1980). These researchers learned that students in small groups were better able to construct knowledge using medical case studies that required students to problem-solve based on supplied information to diagnose a patient. Often, case studies were missing some information, typical of medical issues, so small group discussions helped the students determine the next steps based on the information available. PBL has since become a common practice in the medical field and has been adopted by other fields as a common way to teach content, described in more detail below.

PBL is defined as "an active learning method based on the use of ill-structured problems as a stimulus for learning" (Hmelo-Silver & Barrows, 2006, p. 24). An ill-structured problem does not necessarily have a "correct" answer but forces students to explore alternate ideas or solutions and organically construct knowledge. Youngerman and Culver (2019) describe PBL in three ways. First, "learning is collaborative and self-directed" (p. 24), meaning that PBL incorporates group activities in varying formats and encourages student ownership of learning goals and outcomes rather than pre-determined goals. Second, educators take on the role of a facilitator, which puts the student as an "autonomous learner responsible for their own progress" (pp. 24-25). Finally, like Hmelo-Silver and Barrows (2006), Youngerman and Culver (2019) describe PBL as working with authentic and ill-structured problems. This promotes interdisciplinary thinking and problem-solving using synthesis and higher-order thinking skills on "real world" (Savery, 2015) problems.

According to Hmelo-Silver (2004) and Pecore and Bohan (2012), the four main components of PBL are motivation, collaboration, reflection, and facilitation. Motivation is described as "highlight[ing] the relevance of the problem to the learner" (Pecore & Bohan, 2012, p. 128), or establishing ways to help students engage in the learning goals. Helping students make personal connections and allowing students choices are ways to motivate students in learning in a PBL environment. The second component, collaboration, is described as "promoting shared knowledge construction and enhancing higher-order thinking and problem-solving skills" (Pecore & Bohan, 2012, p. 128). This involves students working and dialoguing with others through opportunities to discuss in class in formal or informal ways, participating in small group and partner work, and verbalizing and exchanging ideas with others. The reflection component of PBL helps "learners understand the relationship between their learning and problem-solving goals" (Hmelo-Silver, 2004, p. 247). This provides opportunities for student metacognition about their learning by allowing for ongoing reflection through student journals, reflective discussions, or other ways where they can relate new knowledge to prior knowledge and the reapplication of knowledge. The final component, facilitation, involves the teacher "emphasizing learning through problem-solving," "modeling good learning and thinking strategies," and helping "move students through problem-solving stages while monitoring progress for involvement in critical thinking" (Pecore & Bohan, 2012. p. 128). Facilitation involves teachers modeling learning and thinking strategies such as modeling the assignment and thinking aloud to model thought processes (Pecore & Bohan, 2012). It also includes teachers using mentor text (written examples), using open-ended questioning during formal and informal discussion (Hmelo-Silver & Barrows, 2006), and understanding that there is no "right" answer.

PBL is also a teaching methodology promoted in high school and college courses such as those that study real-world problems, engage with nonprofit partners, or involve mastery of discipline-specific practices (Youngerman & Culver, 2019). Research on PBL includes studies in various settings. For example, in high school, there are examples of courses implementing PBL in science (Ferreira & Trudel, 2012), chemistry (Tarhan & Acar-Sesen, 2013), biology (Pecore & Haeussler Bohan, 2012), technology (Hsu et al., 2012), engineering (Ruth et al., 2019), and mathematics (Widyatiningtyas et al., 2015). In many cases, PBL has been shown to provide positive effects on student achievement and other positive effects. Tarhan and Acar-Sesen (2013) conducted research in high school chemistry courses with a control group and a PBL group. Findings showed that PBL had positive effects on student achievement, aided students in "overcoming alternative conceptions" (p. 575), and helped students develop social skills. Widyatiningtyas et al. (2015) researched PBL with grade 10 senior high students and determined that this approach positively impacted students' mathematical abilities in critical thinking compared to students in a traditional learning environment. Ferreira and Trudel (2012) researched PBL with regular high school chemistry classes. Their research showed significant increases in "student attitudes toward science, problem-solving skills and positive view of the learning environment" (p. 23) in addition to increased feelings of community in the classroom.

Research on instructors implementing PBL has also shown benefits and factors to consider. Yukhymenko et al.

(2014), in their research of PBL used in social science classrooms, found that PBL requires a change in the mindset of the educator to a facilitator and exemplar of problem-solving skills for students, a curator of resources, and a coach to guide students in their decision-making. They also found that educators need to encourage a positive classroom environment, provide time for students to work in small groups, and encourage student independence. Pecore and Haeussler Bohan (2012) researched the teacher aspect of incorporating PBL in a secondary biology classroom. Findings from this study showed some factors account for differences in the effectiveness of PBL, including previous teaching experience, attention to classroom management, an inquiry-based classroom culture, and instructor beliefs about teaching and learning. With adult learners, PBL has been used in educator professional development (McConnell et al., 2013) as well as in its field of conception, medical education (Barrows, 2000). McConnell et al. (2013) studied the effects of using PBL to develop teacher content knowledge on self-chosen topics related to science where K-12 teachers attended summer professional development and worked in "facilitated groups of from five to nine participants to solve rich, ill-structured problems" (p. 216). Their research showed that teacher content knowledge improved through this PBL professional development approach, independent of other factors.

Ultimately, studies have shown PBL helps students develop many transferable skills such as reflective thinking skills (McConnell et al., 2013; Weshah, 2012) and "cognitive learning skills, critical thinking skills, and cooperative working skills" (Tarhan & Acar-Sesen, 2013. p. 575). Most importantly, PBL increases student responsibility for their learning and helps students understand both curriculum and its application more deeply than a teacher-centered approach (Bell, 2010; Hmelo-Silver, 2004; Hmelo-Silver & Barrows, 2006; McConnell et al., 2013; Yukhymenko et al., 2014).

Implementing PBL: Teacher Process

There are several items for a college-level educator to consider when implementing PBL in a traditional lecture-based course; first and foremost, what might that process look like in practice? A possible process to aid instructors in this endeavor is included in Appendix A with example questions an instructor might ask themselves throughout the steps of the process. Following is an example of what this PBL implementation process looks like in practice in a college-level course.

I (first author) teach several college-level courses, including a concurrent enrollment Adult Roles and Financial Literacy course. Concurrent enrollment courses, sometimes called dual enrollment, are college-level courses taught to high school students. These courses are expected to meet the standards of both a college course and a high school course, and students taking these courses are traditionally college-bound. The goal for students in concurrent enrollment courses is to show mastery of the learning objectives at a college level. The course under discussion, titled Family Relations at the affiliated college, fulfills either a college general education diversity requirement or a college general education social studies requirement. This course is traditionally taught in a lecture-based format with written assignments and multiple-choice exams.

Review Classes and Assignments

The first step in the process is to choose a class and a major assignment (or series of assignments) that would benefit from additional instructor modification to improve student learning outcomes. The traditional culminating assignment that counted as the final for the above course was called the Personal Family Awareness Paper and Cultural Genogram, described in more detail below. Instructors typically assigned the paper and gave students little or no class time or teacher support to complete the assignment. In the past, my students had an incredibly difficult time understanding the assignment directions and the rubric provided by the college. Students completed the paper grudgingly and were not motivated or engaged. Many of the end products did not fulfill the purpose of the assignment. The paper was difficult to grade and more than half of the students in my sections had to re-do the paper because of a lack of understanding of the purpose of the assignment or because of poor writing. Since students were not achieving the desired student outcomes and were not meeting the learning objectives, I decided to choose this assignment to consider as part of transforming my curriculum to PBL.

According to Hmelo-Silver (2004), it is important to begin this process with instructor goals. My goals were to (a) increase student engagement in the assignment, (b) provide opportunities for students to show an understanding of the personal and professional relevance of the content of the course through the assignment, (c) incorporate more social learning opportunities in a traditionally individual assignment, (d) break down a substantial final paper into more manageable pieces so as not to overwhelm students, (e) connect the assignment more explicitly to student learning outcomes, and (f) improve student learning outcomes.

Review Assignment Parameters

For this course and assignment, I first looked at the requirements from the college. Because this was a concurrent enrollment course, I had to obtain permission from the college supervisor to make changes to the assignment, including what I could change and what I was required to keep the same. This took some negotiation. I also had to keep in mind the state's strands and standards for the high school course curriculum. In addition, I considered how much class time could be allotted and what percent of the final grade could be attributed to this assignment.

Consider the Purpose of the Assignment

The purpose of this assignment, the Personal Family Awareness Paper and Cultural Genogram, was to place students in the mindset of a marriage and family therapist by analyzing their own family, looking for family dynamics and patterns across three generations. A major expectation of the assignment was to have students analyze and code their families based on previously learned concepts using the lexicon for the field of marriage and family therapy (Youngerman & Culver, 2019). This exercise allowed students to synthesize and apply the concepts they learned in the course in a context that was real-world and relevant to them. Ultimately, the assignment provided a way for students to show mastery of the course's content (Youngerman & Culver, 2019).

Break Down the Assignment

The Personal Family Awareness Paper and Cultural Genogram assignment was designed to assist students in understanding the cultural elements and extended family dynamics that influence their family in specific ways. This assignment contained four major parts: Part 1- the visual Cultural Genogram, and Parts 2A, 2B, and 2C – the written portion of the assignment. The Cultural Genogram was a visual representation that had to contain multiple points of analysis of three generations of students' families (e.g., family dynamics, emotional triangles, cutoff and enmeshment). Part 2 was broken down into three parts. Part 2A was an analysis of the family dynamics, processes, and patterns across the three generations, basically a written explanation of their visual representation. Part 2B was a comparative analysis and description of how the three generations varied in specific ways, (i) communication and conflict styles, (ii) parenting styles, and (iii) the levels of cohesion and flexibility in each generation. Part 2C was a summary and discussion of how understanding a family's culture and identity helped a person (in this case, the student) better understand other families and their cultures. For more detail, the rubric for Part 2 of the assignment is provided in Appendix B.

Identify Changes to Implement

In thinking about how to achieve a more desired outcome with this assignment, I considered the four aspects of PBL and how I might adjust. Over three years, I made multiple changes to this assignment. I describe the various changes I made below, with the rationale for each change.

In PBL methods, it is important to consider student motivation (Hmelo-Silver, 2004; Hmelo-Silver & Barrows, 2006; Pecore & Haeussler Bohan, 2012) and reflection (Weshah, 2012). Thus, I added a future family aspect to the assignment by adding a reflection piece for each of the comparative analysis sections (Part 2B, i, ii, and iii – see Appendix B). This required students to look at patterns of behavior across generations in conjunction with what they learned in the course and reflect on what they wanted to implement in their future families, whether it was from their current patterns or not. This additional aspect increased student motivation by making the information more personally relevant, and the reflection highlighted the power students have as agents of change in their current and future families and helped them see the relevance of the course curriculum to their lives.

Multiple components of PBL were incorporated in my next change, including motivation, collaboration, and facilitation (Hmelo-Silver, 2004; Pecor & Bohan, 2012). During this time frame, the affiliated college requirements changed for this assignment and so did the parameters needed to meet the learning objectives. The product for Part 1 changed from a single chart using standard genogram symbols to a tri-fold presentation with pictures and basic text requirements. In addition to this required change, I added a small group presentation for this portion of the assignment for multiple reasons. One reason was to prepare students for the next part of the assignment, specifically Part 2C, which required them to build on previous knowledge and make connections to foster greater understanding (McConnell et al., 2013). Adding this collaboration piece also made students' knowledge more flexible by providing opportunities to collaborate with students with different life experiences and backgrounds. This aided students in making connections and broadened their understanding more than in years past. Another benefit to the addition of a presentation was an increase in student choice (what information to include on the trifold, the format of the presentation, who to present to) to aid in student engagement. All these changes required facilitation on my part. For example, I changed the order in which I had students complete the assignment, which facilitated their knowledge construction process (doing Part 2B first helped them organize Part 1, Part 1 provided a concrete visual to reference while they wrote Part 2A, collaborating with students in the presentation process helped students write Part 2C). These changes also required an adjustment to the schedule, as discussed in more detail below.

An integral part of the facilitation of the PBL process is assisting students through the problem-solving stages through open-ended questioning and modeling (think aloud or demonstration) (Hmelo-Silver, 2004; Perore & Bohan, 2012). One of the major issues I had previously with section 2B was students were not using the correct terminology or were using the terminology incorrectly, which revealed a gap in their knowledge construction. To facilitate students through this process, I modeled the thought process they should use and the questions they should ask themselves as they were coding and analyzing their families in that section of the assignment. I used my own family as the example and verbalized how I would code my family and why, explaining anecdotally how I understood my coding was correct, while writing my outline for that section on the whiteboard. One semester, as I implemented this change, a student asked if I had a word bank that students could use as a reference to be sure that they were using the appropriate terminology required. Up to that point I had never provided my students with a word bank but created one at the student's request, an example of how educators may need to make adjustments along the way.

My next change was prompted by my participation in a writing professional development group. I learned that adding mentor texts is an excellent way to help students with their writing (Graham & Perin, 2007; Hillocks, 1986). Mentor texts, sometimes called anchor texts, are examples of writing or examples of a project. Research shows that having students study mentor texts allows students to "emulate the critical elements, patterns, and forms embodied in the models in their own writing" (Graham & Perin, 2007, p. 20). These mentor texts help students study the writing process and formatting required for an assignment with an example of what that looks like in practice rather than having to abstract that knowledge from the directions and rubric. I provided three very different visual examples for Part 1 that were given to me from the college and one student example (all student examples with permission) shown in Appendix C, and one student example for Part 2B shown in Appendix D. Previously, students were floundering with the writing portion of the assignment each time it was assigned, for various reasons. Students did not know where to start, what the final paper was supposed to look like, what formatting was required, and what APA was (first time with APA for many). For some students, it was their first college-level course. Providing mentor texts was a way to help facilitate student learning using teacher scaffolding.[1]

A big part of facilitation in PBL is moving students through the problem-solving stages (Hmelo-Silver, 2000; Pecore & Haeussler Bohan, 2012; Yukhymenko et al., 2014), planning how to do that, and deciding what the pacing should be. One of the adjustments I made to this assignment was to consider how much class time would be required when changing to a problem-based model. Previously I used a class period to introduce the assignment and then gave students two to three class periods in class to work on it. In making these changes to a PBL model, I introduced an overview of the assignment earlier in the semester, broke the assignment into pieces, and had students work on specific pieces rather than assign the whole assignment at once (specifically working on identifying and coding different aspects of their families as we went through those topics so that the terms were fresh). I changed my teaching to include more in-class work time, similar to a flipped classroom model where content learning is done outside of class and class time is used to work on assignments, so that students could ask questions of me or other students while working on the project. I modeled different sections at the beginning of the class (e.g., one class period model Part 2B, another class period Part 1), and the rest of the class, students worked on that section. In making this change, I found that the amount of class time I had allotted was not quite enough, but I was unable to use more class periods for it in my scope and sequence. So, with permission from the college, I removed one of the requirements for this assignment and integrated that part of the assignment with a different assignment I was doing to make this assignment slightly shorter.

Another aspect of facilitation that I integrated for this assignment was to allow students to make revisions based on instructor feedback (Johnson et al., 2019) as well as adjusting the time of year when I assigned the project. I, as the instructor, gave very detailed and specific feedback so that students could make changes if desired. Research shows that timely detailed electronic instructor feedback shows improvement in subsequent student drafts (Johnson et al., 2019) and electronic feedback also improves the quality of instructor feedback (Sopina & McNeill, 2014). Because of the level of detail required in providing comments on precisely why a student lost points and what they needed to do to fix each section, grading required more time. Rather than post grades, I waited to post the grade and comments so that students had access to them all at the same time, and I gave them one week to make their revisions. Any revisions were required to be noted in a different colored font. Allowing students to revise based on feedback is a way to show that the emphasis is on student learning. As far as schedule adjustment, since my class was taught across a full year in a high school setting, I considered when winter break was scheduled and began the assignment before the break so that students who got behind in class could work on part of the assignment over the break. I also allowed students to turn in drafts before the break

1. I was initially reluctant to provide a mentor text, worried that my students would just copy and paste from the example. To help mitigate that, I saved the example paper as a PDF. Even then I was a little leery. However, I was pleasantly surprised when I found that not a single student had copied anything from the example other than the format. For those thinking of using mentor texts as a scaffolding method and are worried about the temptation for plagiarism, I would recommend using a program like Turnitin to check for copying.

so that I could look them over and give them a preliminary grade according to the rubric. This allowed me to provide students with feedback they could use to adjust their work, which incentivized students to finish the assignment as much as possible before the break.

Implement Changes and Evaluate After Assignment Completion

When implementing a PBL model in teaching, it is important to keep the purpose of the assignment at the forefront, in this case, to improve student learning outcomes as well as reflect on the goals (Hmelo-Silver, 2004). Analyzing the changes made to the course, analyzing final student assignments, and asking questions are important parts of teacher reflection. Questions I ask myself might include: Did the changes work the way I thought they would? Did the adjustments help fulfill the main purpose of the assignment? What did not work? What additional adjustments may need to be incorporated? Do I need to revisit my goals? Table 1 includes the goals I set for my implementation and the changes I made to accomplish those goals.

Table 1. ***Instructor Goals and Changes to Assignment***

Instructor Goal	**Changes Implemented to Meet the Goal**
Increase student engagement in the assignment	Added a future family aspect; integrated a presentation; added discussions
Provide opportunities for students to show an understanding of the personal and professional relevance of the content of the course through the assignment	Modeled thought process; provided student examples; added more class time to work on and discuss the project
Incorporate more social learning opportunities in a traditionally individual assignment	Encouraged informal discussion; facilitated whole class discussion; added class time
Break down a substantial final paper into more manageable pieces so as not to overwhelm students	Adjusted time allotted across the semester for the assignment; adjusted the sequence of teaching and modeling; added content outside of class to allow for in-class working time; removed one section of the assignment
Connect the assignment more explicitly to student learning outcomes	Provided mentor texts; provided feedback to students on drafts; allowed students to revise and resubmit the assignment
Improve student learning outcomes	Final data supported that student outcomes improved

The changes I implemented for my first goal, increasing student engagement in the assignment, were met. Making the assignment more personally applicable through the future family aspect and integrating a presentation aspect to Part 1 helped students meet the learning outcomes for the assignment and be more involved and invested in the final product. I could see this engagement during our workshop time in class, in the discussions students had, in the questions students asked, and in their final papers.

I provided opportunities for students to show an understanding of the personal relevance of the content, my second goal. To accomplish this, I modeled my thought process using my own family as an example for the analysis section of Part 2B, provided the students with student examples, and provided more class time for students to work on and discuss the assignment.

Incorporating more social learning in an individual assignment, which was my third goal, was quite difficult. Adding class time, encouraging informal discussion, and facilitating class discussion did help with this, but I am going to keep working on this goal. I am considering adding a small group exercise for the students to practice doing the coding and analysis for Part 2B based on case studies. This might aid in incorporating more social construction of knowledge to meet this goal.

I met my fourth goal by breaking down the final paper to make it more manageable and less overwhelming for students. The changes all helped the students keep better track of what they were expected to be doing along the way, rather than being paralyzed thinking of the whole assignment. Adjustments were made to the time allotted to the assignment, the sequence of teaching and modeling for the assignment, the flipped style classroom (moving content-learning to outside of class so more class time is spent on working on assignments) with workshop days, and the assignment requirements regarding a section of the assignment that fit better elsewhere.

Connecting the assignment more explicitly to student learning outcomes was the ultimate goal and the reason for the majority of changes made to the assignment. The two changes that were the most beneficial in helping students meet the learning outcomes were providing mentor texts and giving feedback by allowing students to revise and resubmit. These changes allowed students to see that I was more interested in their mastery and understanding of the content than I was in a grade, although grading is an important aspect to consider for any educator looking to implement this process.

My final goal of improving learning outcomes was met, as evidenced by comparing my first year attempting changes to this assignment to my most current year. The first year, the only change I made was allowing students to revise and resubmit based on feedback. The most recent year, containing all the changes described above, showed a significant increase in students achieving the learning outcomes. For example, in fall semester of 2017, 27% of students did not satisfactorily meet the learning outcomes on the assignment[2] with 65% of students scoring 80% or higher[3]. For fall 2020, the most recent semester, only 12% of students did not meet the learning outcomes with 76% of students meeting the performance objective. This data constitutes a decrease of 56% in the number of students not meeting the learning objectives and an almost 17% increase in students meeting the objective. More work is required; however, this clearly shows the efficacy of the changes made in terms of learning outcomes.

I am considering a few additional changes. For example, I liked how modeling the thought process for Part 2B helped clarify the process for my students, but next year I am going to film myself while I am modeling. That way I can upload the video to my online course learning management system for students who were absent that day and have that as a resource for students to refer to while they are writing outside of class time. Also, I am planning on implementing small group case studies when teaching students how to code and analyze families to help them build knowledge together as a collaborative effort before them applying it to their own families.

Challenges and Benefits

One of the major challenges of modifying an assignment to consider PBL is the time investment. This assignment did not get to its current point immediately. I enacted the process and changed only one or two things with each iteration, resulting in the current assignment. This process took place over years with varying reasons for each change implemented, some of which were based on professional development or learning from professional conferences, and others from student input.

Another challenge was learning the role of a facilitator rather than a lecturer. The thought processes involved are much different than I believed going into this process. It takes reflexive thinking (Freire, 1998). I am no longer the font of

2. scored below 70% after revision
3. the college standard of meeting a performance objective

knowledge, but the questioner, and through my questioning and subtle guidance the students construct their learning. It takes practice and a paradigm shift, but the benefits I saw from these changes were worth it.

One benefit of incorporating PBL in my classroom, as promised by the research (Bell, 2010; Hmelo-Silver, 2004), was that students took responsibility for their learning. As the process proceeded, student questions changed. I could see the concepts were being internalized and the students' depth of understanding was reflected in the questions they asked. For example, rather than asking superficial questions like what vocabulary should be used, students asked questions related to analyzing their family conflict resolution styles. The further this process went, the more of a hands-off approach I was able to take as students required less and less facilitator support. The students also retained the material. For example, I referenced concepts that were used in this assignment later in the year, such as parenting styles, and students were able to have richer discussions on those topics than in previous semesters. Students had a deeper understanding of the concepts and remembered them from earlier in the semester.

Another benefit for my students was the collaborative aspect of PBL (Pecore & Bohan, 2012). As this was an individual assignment, I was not sure just how much collaboration I could incorporate. One of the ways I incorporated collaboration early in the learning process was to refer students to other students who had already talked to me about similar questions. Being given permission to talk with each other about their assignments led to excellent informal discussion during the work time in class. I was able to see, through my observations going around the room, that having these discussions or even just having a sounding board to clarify their thinking helped students construct the knowledge they needed (Pecore & Bohan, 2012) and helped them achieve the main purpose of the assignment while also incorporating the collaboration aspect of PBL.

As mentioned above, one of the challenges to consider is the time investment; however, this is where I saw a worthwhile benefit in how much time I saved overall. In fall semester of 2017, it took me between 30-90 minutes to grade an individual paper at the end of the course, depending on how well the student followed the rubric and assignment requirements as well as how much feedback the student required. By implementing all these changes with partial drafts turned in earlier in the process, I was able to grade all the papers in a quarter of the time while still giving the students robust feedback.

Conclusions

One focus of PBL is the usefulness of the concepts students are supposed to learn. Making knowledge functional helps students not only understand the concepts more effectively, but also helps them remember and internalize those same concepts (Bell, 2010; Hmelo-Silver, 2004; Hmelo-Silver & Barrows, 2006; McConnell et al., 2013; Yukhymenko et al., 2014). Various critical thinking skills like reflective thinking (McConnell et al., 2013) and cognitive and cooperative learning skills are both a function and benefit of PBL (Tarhan & Acar-Sesen, 2013). Using the facilitator educator as the model of effective learning and asking open-ended questions with no "right" answer forces students to think more deeply than simple definition-based questions (Hmelo-Silver, 2004). Open-ended discussions allow students to reflect on their thinking (Weshah, 2012), discuss together, and build off each other's knowledge to construct better understanding (Hmelo-Silver & Barrows, 2006). This process helps with transferable skills (Bell, 2010).

Implementing PBL into a college-level course is a significant process with many moving parts and requires thought, effort, and coordination on the part of the facilitator. Sometimes the changes do not work the way they are envisioned, or the changes may run counter to the purpose. What worked with one class may not work with another class. The instructor's administration may make changes to the course or the assignment requirements. However, there are still benefits of incorporating PBL. One of the most prominent benefits of PBL is that it instills in students personal responsibility for their learning (Hmelo-Silver, 2004), because students care about what they are learning and are willing to put in the effort to learn without being spoon-fed information from a "sage on the stage." The example above shows how this process can be implemented over some time in a college-level course in a straightforward way. PBL is a high-impact method to help students meet their learning objectives (Hmelo-Silver, 2004; Hmelo-Silver & Barrows, 2006; McConnell et al., 2013), a goal of all college-level instructors. If instructors can teach students the process of learning, regardless of the subject, students can become lifelong learners.

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Appendix A

Following is an explanation of a six-step process an instructor could go through to implement PBL in a college-level course (see Figure A1).

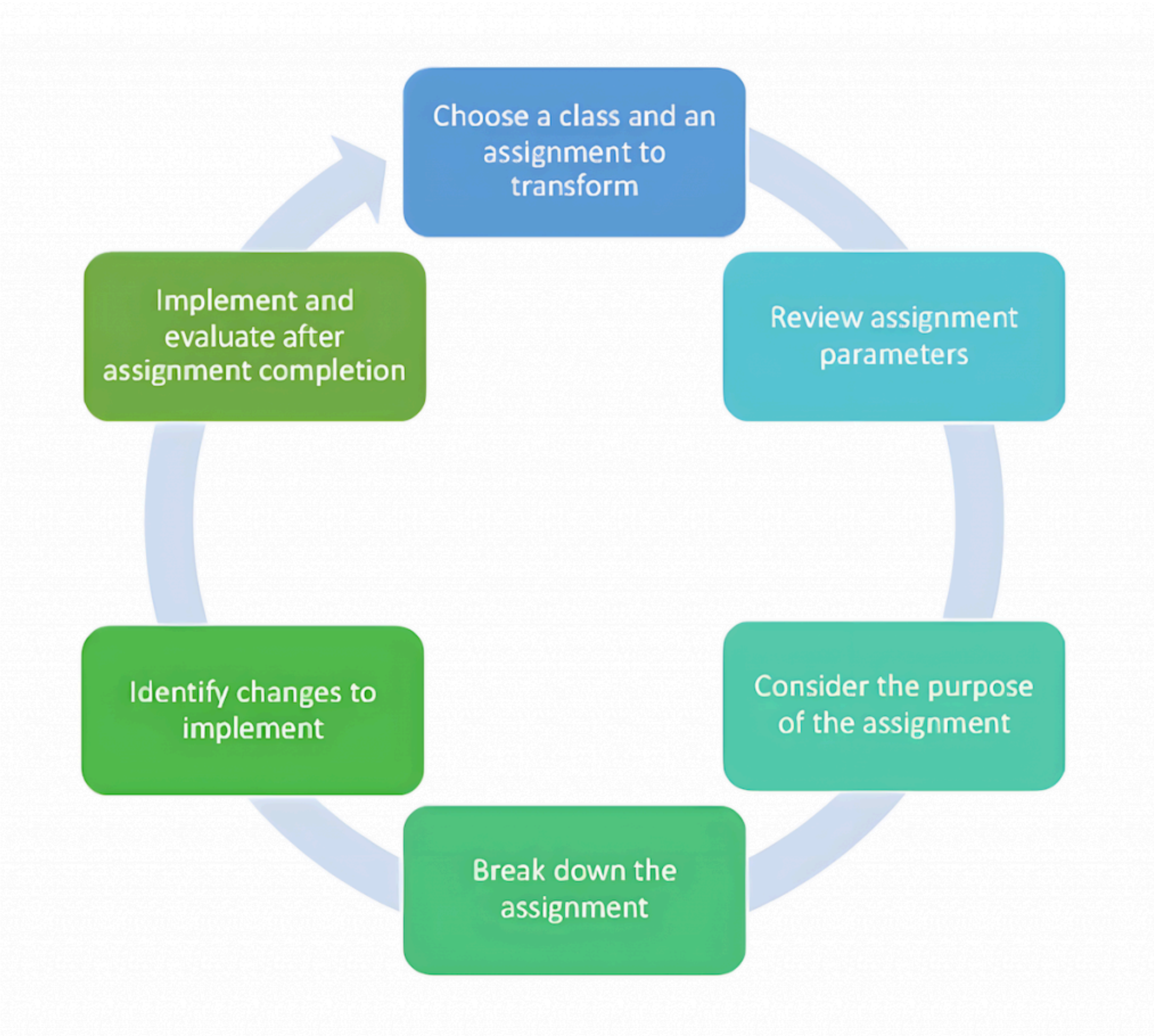

Figure A1: PBL Implementation Process

1. Review classes and assignments. Based on the complexity of assignments and a desire to improve student outcomes on learning objectives, choose a class and an assignment to modify. What assignment would benefit from PBL? What goals can be set for this modification? An example of this teacher process is provided below.
2. Review assignment parameters. What are the learning objectives, state requirements, college requirements and any other parameters that should be taken into consideration to improve student engagement and learning?

3. Consider the purpose of the assignment. What are the desired learning outcomes to reach mastery?
4. Break down the assignment. What aspects of PBL (motivation, facilitation, collaboration, reflection) can be implemented for this assignment? Can any parts of the assignment be adjusted or added in implementing it into a PBL assignment?
5. Identify changes to implement. As an instructor considers changing lecturing with little educator support to the hallmarks of PBL such as scaffolding, modeling, discussing, and questioning, how will these changes affect their role as a facilitator educator? As the instructor, what will be required to implement the proposed changes and where do they occur? Are the changes to the assignment (e.g., description, rubric) or scope and sequence? Or will the changes require more in-depth changes to teaching?
6. Implement and evaluate after assignment completion. Observe and evaluate along the way. Make changes if necessary. Is the modification resulting in the desired learning outcomes? What adjustments should be considered for the next semester/school year? Do the instructor goals need to be revisited?

Appendix B

Grading Criteria	Full Marks
2A-Family Dynamics and Processes	Introduces your 3-generation family, with the focus primarily on describing the family dynamics/patterns that define your family and how those dynamics/patterns make sense (both positive and negative dynamics)
2B (i)-Comparative Analysis Part One: Communication and Conflict across the three generations: • Father's Family of Origin • Mother's Family of Origin • Your Family of Origin • Your Future Family	All generations present, correct terminology used for both communication styles and conflict styles, and examples given for each term
2B (ii)-Comparative Analysis Part Two: Parenting Styles across the three generations: • Father's Family of Origin • Mother's Family of Origin • Your Family of Origin • Your Future Family	All generations present, correct terminology of parenting styles used and examples to justify the coding provided
2B (iii)-Comparative Analysis Part Three: Levels of Cohesion and Flexibility across the three generations: • Father's Family of Origin • Mother's Family of Origin • Your Family of Origin • Your Future Family	All generations present, used correct terminology and examples match coding used
2C-Summary and Cultural Awareness Summary of how understanding your own family cultural and identify helps you better understand other families and their cultures, discussion on the influence that culture has on family systems and an analysis, examples from the peer genogram presentations to illustrate how your unique cultural identities influence the way that you see others that are different, discuss specific ways that your peers' family is different from yours, and still makes sense.	All points present as described in the assignment requirements
Format, Spelling, Grammar, etc. Used APA format, minimal spelling and grammar errors, etc.	All conventions were followed with minimal mistakes

Appendix C

Mentor text for Part 1 (faces obscured for anonymity; used with permission).

Figure B1: Mentor Text for Part 1.

Appendix D

Mentor Text for Part 2B (used with student permission; names removed for anonymity)

Personal Family Awareness Paper

Section 2- Patterns of Behavior Across Three Generations

Communication and Conflict Styles:

My father's family of origin usually *avoids conflict.* With my dad and his siblings experiencing all that abuse for about the first ten years of their lives, they don't like the conflict. I feel like they feel like that if they are too involved into conflict they will end up like their dad, so they avoid it. However, the deconstructive and abusive communication my dad and his siblings witnessed as children did not rub off on them. They are all fairly good at using *positive communication* with others. Sometimes they will withdraw from people communication-wise, but I feel like that. is normal for most people to do.

My mother's family of origin definitely has a *hostile conflict style.* The abusive behaviors did not rub off on all of them (my uncle ___ being the exception). My mom tends to display constructive communication and a validating conflict style because she was a schoolteacher for seventeen years and is now a school counselor. However, if she gets *really* angry, all hell will break loose and so will hostile conflict. My uncle ___ can get pretty hostile towards his kids from what I have seen, but I do not know enough to make the claim that his conflict style is indeed hostile. My aunt ___ gets hostile with my uncle ___, her husband. My uncle is as sweet as can be, and she just gets super mad at him constantly. She has quite the short temper. She uses deconstructive communication with ___, too. I know she uses character assassination and blaming with him. I do not think she is necessarily abusive, hut it is getting there. I will not even get started on my uncle ___. He is a drug-addict and is way abusive towards his kids. I feel so bad for my cousins. but I cannot really do much because they live on the other side of the country. If I really think about it though, my mom and her siblings did not stand a real chance to break those behaviors they learned when they were growing up. To me, it hurts my heart.

In my family of origin, we mostly display a *validating conflict style or an avoiding conflict style.* As I mentioned before, my parents work very hard trying to raise us the best that they can, so we have a combination of my mom's conflict style and my dad's conflict style. Our communication is also a mix; *a mix of constructive communication and deconstructive communication.* Based on what I have learned in class and what I have experienced in my family, I would like my future family to have a *validating conflict style.* My own personal style is more conflict avoiding, but I would like to be more validating. I feel like validating conflict is what helps relationships with others. I feel it can help develop empathy and understanding and help learn how not to get too angry. Being angry is a natural thing that everybody experiences, but if I could teach my kids how to express it through *constructive communication* using “I” messages, having respect and clarity, and by avoiding intense anger, it will be beneficial for them. I only want the best for them.

Parenting Styles:

My father’s family had more of a *democratic parenting style* after my grandma divorced ___. She set clear rules and expectations, that were reasonable, for her kids and they followed them. My grandma was a schoolteacher, so she understood and acknowledged her kids’ frame of mind. Her parenting ended up producing happy, successful, and independent kids, despite the abuse they all had experienced. My grandma truly is a wonderful mother.

My mother’s family of origin had more of an *authoritarian parenting style.* As mentioned previously, my grandmother was abusive towards her children. In New England, it is proper for a child to be obedient. My grandma expected her kids to be on their best behavior all the time and she was extremely strict about it, too. I feel like my grandma’s parenting is the reason as to why my mom is susceptible to high stress levels. My mom thinks she always must do everything perfectly because that is what my grandma expected of her. It is a pity to see my mom stressed constantly. If I could give my grandma a piece of my mind about how she raised her kids I would, but sadly, it is not my place.

My family of origin has a *democratic parenting style.* My dad was raised like that and because my mom has worked in education for twenty-four years, she is a very reasonable person. My parents are stricter about some rules than they are of others, but not authoritarian strict. Their expectations are clear, and my siblings and I respect that.

For my future family, I would like to have a *democratic parenting style.* I would set expectations and make rules that are sensible and discuss them with my kids. I am glad my parents are not extremely strict, and I would like my kids to have a similar experience. I want my kids to be happy, hard-working, and honest. I want to raise them to be the best that they could be, and I feel I could do that best using a democratic parenting style.

Cohesion and Flexibility:

In my father’s family, they are a good mix of *connected and cohesive,* and they are a *flexible* family. They are balanced in their togetherness and their separateness. They call and text each other to talk frequently, but not so much that it seems clingy. They are also good at adapting to change. When my mom married into the family, they were totally accepting of her and of me and my sisters. They treated us as if we had been part of the family for years, which just to goes to show how great my dad’s family truly is.

My mom’s family is enmeshed cohesively and very rigid. As my mom grew up, her family spent a great deal of time together. Most of the time was spent being abused, but I feel like it was a sort of “bonding time” for my grandmother. My grandma also did not respond well to change. She was strictly set in everything she did. My mom moving out here to Utah was not a good combination for my grandma. My mom was not close anymore, and my mom was converting to the Church of Jesus Christ of Latter-Day Saints. It was too much for my grandma to handle, and things in my mom's family were shaky from then on out.

In my family, we have a good mix of both connected and cohesive, and of structured and flexible. My mom is more of a structured and connected person. She loves being with us, but she also wants us to learn independence. My dad is a cohesive and flexible person. He wants us to spend time together because we are always going to be family and he wants us to be able to adapt in life. They are both very good at teaching us life skills, and I am thankful that they get to raise me to be an independent, loving, and flexible person. I would like to have the same cohesion and flexibility in my future family as I do in my family now. For me, all the things my parents are teaching me now are important for kids to learn. I like the way parents are making it happen, and I would like to be just like that. Now all I have to do is hope that my future husband will be the same way.

BOOK REVIEW OF COSTA, K. (2020). 99 TIPS FOR CREATING SIMPLE AND SUSTAINABLE EDUCATIONAL VIDEOS. STYLUS PUBLISHING.

Jason Olsen, Ph.D.

Abstract

Book review of Costa, K. (2020). *99 Tips for Creating Simple and Sustainable Educational Videos*. Stylus Publishing. This article discusses Costa's book from the perspective of both experienced asynchronous instructors and those thrust into different delivery methods due to education challenges created by the pandemic.

Keywords: teaching, videos, asynchronous, review, flipped

"Pandemic" and "COVID-19" are two terms that do not appear in Karen Costa's *99 Tips for Creating Simple and Sustainable Educational Videos,* and for good reason—Costa's book was released in March 2020, right as the pandemic was in the early stages of changing so many aspects of life, including higher education. It is not mentioned because, as Costa was writing the book, it had not yet happened. However, it is difficult to read the book without thinking of how the pandemic has forced higher education instructors to relearn—or newly learn—so many aspects of teaching. This new world could include asynchronous learning where classes are not "live" but instead taught with prerecorded videos or tasks assigned on learning management software (LMSs) like Canvas. While this book will benefit instructors by teaching how best to create instructional videos, students will also benefit, many of whom will be new to LMSs and asynchronous teaching. This practical and theory-driven book is a valuable resource for those new to creating video components for courses (whether for asynchronous, hybrid, or flipped courses). It also provides excellent advice and guidance for those with more experience.

As promised in the title, the book is structured into 99 tips for teaching through videos, and she discusses the merits of using videos in land-based, online, hybrid, and flipped courses. The tips themselves are further split into twelve sections in which each tip within a given section relates to a main theme. These sections include why videos work, how videos can align with course objectives, and tips for presentation, among others. The tips range from the practical (Tip 54 is "Keep the Camera Lens Level with your Face") to the more theoretical (Tip #29: "Apply Aesthetic Usability Effect"). While the tips always tie back to effective video creation, much of this information would be valuable for teachers of all delivery methods, including the five tips that make up section eight, "Using PowerPoint in your Videos." While the word "videos" is specified, the advice here applies to a wide range of teaching and conference-presenting. For example, Tip 70 within this section is entitled, "Use Your Slides to Present Ideas, Not as Speaker Notes." Costa explains that PowerPoint slides "are meant to grab the audience's attention and to illustrate (which means to visually display) critical content. Then, you, as the speaker, add in additional information in spoken form" (p. 111). She then follows this with practical advice on how to embed notes in PowerPoint's presentation mode.

As a guide through online teaching and videos, Costa is trustworthy and reliable. Her decade and a half in education and online instruction are evident not only through the advice provided but also through myriad examples that verify the effectiveness of these tips. Prior to this book, she published several articles on how best to adapt to current technologies to assist students, including how to teach digital notetaking to college students ("The Nuance of Notetaking") and how online education specifically benefits introverted students ("Quiet Power"). While this is her first book, her experience in video-based teaching (and online education in general) is conveyed via her attention to detail and her grounded perspective. The tips presented are supported consistently by research—a third of the tips contain specific academic references and those that do not are supported by her teaching experience (as shown through examples in the text). The book builds from her experiences, research, and dedication to her students' needs. Her personal and accessible writing style helps acquaint the reader with her teaching style. For example, in Tip #3, she speaks about her teaching priorities:

> While a lot of other factors go into forming how and why I teach (challenge and support, validation, fun, brain-based teaching), all of it rests on my understanding that by getting to know my students, and letting them get to know me, our teaching and learning journey together will be more fruitful and enjoyable. (p. 28)

This early statement of purpose effectively conveys her priorities to the reader. By acknowledging both apprehensions instructors have about teaching through videos because of a perceived difficulty in relationship-building with students in asynchronous environments and illustrating her dedication to relationship-building, the reader realizes that finding ways to "know" students (and for them to "know" the instructor) are achievable. She provides both this statement of purpose and other examples to prove the credibility of her philosophy.

Like the rest of the book, those examples are presented with conversational academic vernacular, and the book is engaging tonally. Considering one of Costa's core beliefs in teaching is the importance of providing an authentic self to students, it is valuable to show that philosophy within the book's prose. The book is welcoming. In addition to an inviting academic-casual tone, she includes personable narratives to establish and justify the book's tips. She also incorporates several QR codes throughout the book that link to YouTube videos in which she further explains concepts introduced in the tip with which the code was linked. While this could be perceived as gimmicky, these QR codes are used effectively in execution. These embedded videos show real-world examples of the concepts she describes, making her advice relatable and achievable. Considering the book frequently discusses the merits of creating a relatable persona for students, it also makes the relationship between reader and writer more accessible—compared to most book authors, the reader connects to Costa because of these videos and has greater trust for her methods.

While practical, the book is also firmly grounded in theory. While the first two sections establish the value inherent in using videos in higher education teaching, the third shows the theoretical framework for her suggestions, providing multiple theories to discuss the philosophies shared in the book, starting with an introduction and application of the community of inquiry model in Tip 24. The tips themselves are short but consequential. They pack a lot of content in their brief bursts, including relevant teaching/personal anecdotes and necessary supplementary material. These theory-driven tips and well-connected to the rest of the book and convincingly researched.

This book effectively builds off recent research in higher education, but its narrow focus on video creation allows for a more comprehensive look at that aspect of asynchronous, blended, or flipped teaching than anything else available. For example, Kathryn E. Linder's *The Blended Course Workbook: A Practical Guide* (2017) contains guidance on video creation in a section entitled "Best Practice for Creating Multimedia Resources" (p. 118). *Small Teaching Online: Apply Learning Science in Online Classes* (2019) by Flower Darby with James Lang discusses the unique challenges of online learning and how to make connections in the online environment. Both of these books are valuable but possess comprehensive intentionality. While both of these books discuss strategies for video creation, Costa's focus on the topic (while still providing general advice on online teaching using video creation as a starting point) helps it stand apart and encourages teaching scholars to follow Costa's path. Perhaps this book will inspire more narrowly focused practical guides to online teaching, perhaps ones concentrated on working within LMS constructs or crafting a personal presence in online teaching.

The book's clever format consistently delivers short pieces of advice and, for most of this advice, that brevity is appreciated. This is especially true of practical tips like avoiding wearing eyeglasses to prevent glare from the screen and using the earbuds that came with your smartphone as a microphone. Both are great pieces of advice that do not require much elaboration (and I have already integrated both into my personal video-making strategies). But there are times when the short sections leave the reader wanting more. Specifically, the fourth section discusses different video presentation options, such as the benefits of recording "talking head videos" and the merits of recording on a webcam or a phone. This section is valuable in this text because an instructor who approaches educational video creation with trepidation needs the practical guidance offered within these tips. While the book explains these topics well, these were subjects where I found myself wanting to know more about her perspective. She explains the merits of these various methods, but using more experience-based anecdotes would have been worthwhile. The aforementioned section on theory (Section Three) provided good introductions to the theories presented, but even a little more information could have done more to promote effective application.

Of course, this book is so effective, simply wanting more of what it provides is hardly a criticism. It is a book that embraces practicality, shown through most of the tips and emphasized through a final section entitled "Practical Exercises," in which she provides an effective range of hands-on exercises. Like the expert teacher she clearly is, Costa effectively leaves the reader with an important lesson to end the book: to speak honestly to your students by letting your heart guide the way. Ultimately, the main message I took from the book is that teachers best teach through their hearts and their heads, and video creation should not be seen as an obstacle but instead as an opportunity to connect even more effectively with our students.

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