

## The Effect of Creative Thinking Challenges on Learning and Engagement

**Kristy Doss**

Western Carolina University  
kkdoss@wcu.edu

**Lisa Bloom**

Western Carolina University  
bloom@wcu.edu

**Jasmin Poor**

Western Carolina University  
jpoor@wcu.edu

*Abstract: The purpose of this study was to examine the effect of creative thinking challenges on teacher education students' perceptions of learning, engagement with the course, and their creative attitudes and values. Researchers provided creative thinking challenges that promoted divergent thinking, metaphorical thinking, and creative problem-solving. Participants completed a post-only survey with Likert-style questions and open-ended responses to determine if the creative challenges enhanced student perceptions of learning, motivation, and engagement with the topics studied. Thematic analysis was used to determine student perception of the creative activities, their influence on personal creative abilities, and how the participants would promote creativity in their own classrooms. In addition, participants completed a pre- and post-assessment, the Creative Attitudes and Values (CA&V) which is a 25-item self-report that is part of the Runco Creativity Assessment Battery (rCAB). Results indicate that the challenges enhanced learning and engagement. Additionally, results of the CA&V indicated a statistically significant difference in scores from pre to post indicating the creativity challenges increased the participants' creative attitudes and values.*

*Keywords: Creativity, higher education, divergent thinking, teacher education, creative attitudes*

21st Century Skills necessary for future success include critical thinking, creativity, collaboration, and communication (Trilling & Fadel, 2009). Educational reformers worldwide have called for transformations in teaching and learning that put creative and critical thinking at the forefront (Couros, 2015; Robinson, 2011, Zhao, 2012). Creativity is an important resource for human development, education, adaptation, and in both occupational and social contexts (Valverde, 2020). On an individual level and an organizational level, creativity is highly valued by employers (van Laar et al., 2020). In

addition, critical thinking, problem-solving, and creativity have become important goals of international education standards and reform efforts (Ritchhart, 2015; Zhao, 2009).

While this article focuses on students enrolled in a teacher education program, the techniques discussed have wide applicability across various higher education settings as creativity is not confined to a single discipline. Creativity is at play in all areas of life and is valued by virtually every discipline including business and industry (Pfeffer, & Thompson, 2013; Wagner, 2008). Creative thinking skills are essential for innovating, addressing challenges, and problem-solving in fields such as business, healthcare, STEM, and the arts. Subsequently, the skills and habits should be nurtured in all areas of schooling (Robinson, 2015). By embedding creativity into pedagogy, educators across disciplines in higher education can prepare students to have the tools to be adaptable, inventive, and resourceful.

Pedagogical changes in higher education courses that allow for inquiry, problem-based learning, and exploring curiosity can provide avenues for students to engage in creative endeavors that build skills in creativity, cooperation, self-awareness, commitment, and self-esteem (Tell & Hoveskog, 2022). Students may benefit from creative pedagogy through building soft-skills, in risk-taking, by engaging in course material, growth in creativity development, with problem-solving and communication skills, being actively engaged in class, with student writing success, and in imagination (Arnab et al., 2019; Güneyli, 2020; Gyurova, 2020; Hsia et al., 2021; Lin & Wu, 2016; Marsono, 2016; Shieh et al., 2016; Zalutskayaa et al., 2016). Explicit instruction can enable these individuals to use creative thinking strategies at appropriate times (Cano-Moreno et al., 2022; Epstein & Phan, 2012).

Opportunities for learning creative thinking strategies specifically in teacher preparation programs and with in-service professional development are rare (Anderson et al., 2022; Bereczki & Kárpáti, 2018; Kimhi, & Geronik, 2020). Teachers' understanding and beliefs about creativity are foundational to their development as creative teachers and to their classroom implementation of creative activities and practices so that future generations can use these skills to problem-solve, innovate, design, and create (Anderson et al., 2022). Thus, this study sought to extend the pedagogical literature about creativity in higher education by exploring how implementing creative thinking challenges in teacher preparation courses would influence how future educators assessed their creative abilities and attitudes, how the experiences impacted their learning and engagement, and how they would use the strategies with students.

## **Review of Literature**

### **Creative Pedagogy in Higher Education**

Experts agree that creativity involves not only having novel ideas but also using critical thinking processes to develop ideas that are effective, useful, or in some way have value (Runco & Jaegar, 2012). Csikszentmihalyi (1996) defined creativity as an act, idea, or product that changes an existing domain of knowledge or transforms an existing domain into a new one. This process occurs as part of a system that involves not only the individual but the context or system in which it was developed. He argued that

originality and creative thinking should be a focus in education to ensure that students are original, as well as competent (Csikszentmihalyi, 1996). Guilford's model of creativity (Guilford, 1950) proposed that creative thinking involves a combination of both divergent and convergent thinking and the ability to combine and transform ideas in novel and useful ways, and proposed four components of divergent thinking: fluency, flexibility, originality, and elaboration. Wallas (1929) described the creative process as evolving through four stages: preparation, incubation, illumination, and verification. Similarly, creative problem-solving involves brainstorming issues related to a problem, generating ideas, evaluating ideas, implementing unique solutions, elaborating, modifying, and assessing results (Wynn & Okie, 2017). As a malleable trait, creativity can be nurtured through practice, through the application of strategies, and through the enhancement of thinking skills (Cano-Moreno et al., 2022; Epstein & Phan, 2012).

In order to clarify the definition of creativity in higher education courses, Jahnke et al. (2017) researched the teacher perspective of creativity and created a 6-Facet-Model in which teachers identified creativity in students through self-reflections, independent decision-making, curiosity and motivation, by producing something, through exploring multiperspectives, and when students develop new ideas. They noted that creativity is subjective, depending on the position of the observer, and understanding this allows instructors to build creativity into their courses in ways that fit the desired learning outcomes for their students (Jahnke et al., 2017). Creativity differs across domains and is a process that is shaped by the sociocultural context in which it appears (Georgiou et al., 2022). Marquis & Vajoczki, (2012) found disciplines described creativity in unique terms that aligned with processes within their fields of study with business using terms such as "novel ideas or outcomes", engineering with "the generation of multiple ideas", health sciences with "innovation and flexibility", the humanities "challenging assumptions or conventions, the generation of detailed elaborated ideas, and expressiveness", science with "challenging assumptions or conventions, generating novel ideas or outcomes, and examination of phenomena from multiple points of view", and the social sciences with "challenging assumptions or conventions".

As the demand for creativity grows, institutes in higher education have started to require more creativity from their students and instructors (Anderson, 2022). Instructional methods that involve design thinking (DT) and project-based learning (PjBL) can improve student motivation and creativity (Kuo et al., 2022). During problem-based learning (PBL) activities, creativity can be targeted during the problem-solution process where students generate solutions/decisions, deliberate to select the most appropriate one, compare it to the actual historical decision(s) or outcome(s), and then evaluate its consequences (Wynn & Okie, 2017). Researchers across the fields of education and the medical field have assessed the impacts of PBL on student engagement and learning outcomes (Kolmos, 2010; Rooks & Holliman, 2018; Wynn & Okie, 2017).

Creative teaching involves innovative instruction, while teaching for creativity focuses on improving creative thinking of the students (Han & Abdrahim, 2023). Knowlton & Sharp (2015) found that students described the benefits of completing creative thinking activities over the course of a semester with growth in creative abilities, in taking more risks and being vulnerable, as well as describing the course as more

immersive than a typical graduate-level course. In addition, researchers have examined specific instructional tools that promote creative thinking such as digital mind-mapping and the use of metaphors to develop fluency, flexibility, originality, and elaboration (Bai, 2013; Burton, 2008; & Knowlton & Sharp, 2015). Strategies used by instructors include collaborative projects, discussing exemplars of creativity, challenging students to find new answers to existing problems, and allowing students to present ideas in non-traditional formats (Marquis & Vajoczki, 2012). In addition, researchers have used creative teaching to engage students and to develop personal creative abilities (Han & Abdrahim, 2023).

### **Creativity in Teacher Preparation Programs**

Creative practices in teacher training programs benefit pre-service teachers in numerous ways such as developing creative abilities in mathematics, awareness and perceptions towards creativity-directed tasks, their mindset in mathematics, and their beliefs about mathematics as a creative field (Bicer et al., 2022). Wynn and Oak (2017) found that explicitly teaching the PBL process in candidate preparation courses resulted in 12 teacher candidates implementing 54 PBL lessons with their own students. These candidates reported benefits in relationships with students, achieving specific student outcomes, and understanding the goals of social studies education. Catalana (2020) found that creativity influenced the reflective abilities of teachers during internship experiences allowing individuals to be able to confront misconceptions about teaching practices. Creative thinking training provided through models such as the Incubation Model of Teaching (IMT) can be used to support reflective practices (Catalana, 2020).

Although there is widespread interest and extensive research in creativity, teachers do not receive sufficient support to be able to implement these practices in their classrooms (Patson et al., 2021). Many teachers do not fully understand creativity or how to identify creative behaviors based on their affect toward creativity and their implicit beliefs of creativity such as correlating creativity to the arts and that creativity is innate versus malleable (Anderson et al., 2022; Bereczki & Kárpáti, 2018; Gralewski & Karwowski, 2018; Katz-Buonincontro et al., 2020). Developing a deeper understanding of creativity, personal reflection, and creative practices can improve self-efficacy and mindsets (Anderson et al., 2022). Teachers' beliefs about creativity indirectly and directly influence their students' pursuits of creative endeavors and creative growth (Paek & Sumners, 2017). These beliefs should be addressed in teacher preparation programs (Paek & Sumners, 2017).

Paston et al. (2021) examined teacher education curricula from 12 countries around the world and found the curricula lacks explicit details about how teachers can implement creativity-supported practices in their area of expertise. Hence, while there is a substantial body of research regarding the importance of creativity across disciplines and in teacher education, there is a gap in understanding the practical application of creative strategies and their effect on learning, engagement, and attitudes toward creativity for future teachers. The current emphasis on the need for fostering creativity underscores the importance of ensuring that teachers are equipped not just with knowledge of creative pedagogies but with the confidence and capability to implement them in their classrooms.

## Purpose of the Study

The purpose of this study was to determine the effect of creative thinking challenges in teacher preparation courses. Researchers sought to understand the impact on student learning and engagement, on personal attitudes and values of creativity, and on potential implementation in the teachers' classrooms.

### Research Questions

1. What is the impact of implementing creative thinking activities on student learning and engagement in teacher preparation courses?
2. What is the impact of completing creative thinking activities on participants' creative attitudes and values about creativity?
3. What is the impact of completing creative thinking activities on participants' intentions or plans to implement these techniques in their current or future classrooms?

## Method

### Participants

Participants included students enrolled in six courses in a teacher education program in the southeastern United States pursuing a Master of Arts in Education (MAED) in Gifted and Creative Education or Special Education, a Master of Art in Teaching (MAT) in Special Education, seeking initial teaching licensure, enrolled in the class as part of a minor in Special Education, or taking the class as an elective. Those enrolled in the courses outside of teacher education were pursuing degrees in Psychology, Communication Sciences, or Social Work. These courses included *Methods and Models in Gifted and Creative Instruction* Graduate Level (n=3) and Undergraduate Level (n=9), *Using Technology to Personalize Instruction* (n=18), *Research Methods in Education* (n=19), *Social and Emotional Issues of Exceptional and Gifted Learners* (n=23), and *Education in a Diverse Society* (n=5).

The courses were taught by instructors with experience in higher education, ranging from 6 to 30 years. Their professional backgrounds included gifted and creative education, special education, and curriculum and instruction. These three instructors taught the six courses involved in this study. Five of these courses were composed entirely of graduate students, with one course for undergraduate students.

Of the 77 students enrolled in the courses, 54 completed the end-of-course survey focusing on engagement and learning. The 54 participants were enrolled in the courses as part of their MAT program, MAED program, for initial teaching licensure or as an elective (see Table 1). All of the 54 survey responses were included in the Likert survey scores and the divergent bar chart. 49 participants provided answers to the open-ended questions about their experiences, and all responses were included in the qualitative analysis. 34 participants completed both the pre- and post-surveys measuring creative attitudes and values.

**Table 1. Participants' Program of Study.**

Program of Study	Number of Participants
Elective Graduate Level	5
MAT in Special Education	13
MAED in Gifted Education or Special Education	34
Special Education Minors Undergraduate Level	2

## Procedures

Institutional Review Board approval was obtained for this study. All students completed the creative thinking activities, though completing the surveys was optional. Participants received an invitation at the beginning of the semester to complete the pre survey and at the end of the semester to complete the post survey about creative attitudes and values. In addition, participants received an invitation to complete the questionnaire with Likert Scale and Open-ended questions about their experiences in the course. The invitations included links to the surveys on Qualtrics. No identifying factors were collected for the end of course survey. Participants recorded the last four digits of their phone number in order to match the pre and post creative attitudes and values survey.

The courses used the STAR (Software Technology for Action and Reflection) Legacy Model which consists of six phases of the learning cycle which include The Challenge, Generate Ideas, Multiple Perspectives, Research and Revise, Test your Mettle, and Go Public. Modules include initial thoughts (private journal), required reading of textbooks and articles, websites, podcasts, or videos, reflection and discussion with peers, and a project and responses to peers. Modules typically last two weeks in length.

Instructors collaborated with each other to create five to six Creativity Challenges for each course, one challenge for each module. The creative challenges consisted of tasks that involved divergent thinking skills (fluency, flexibility, originality, or elaboration), self-expression, Synectics (creating analogies), and creative problem-solving strategies. The challenges were similar in nature for each course.

Example of Challenges:

1. Create an analogy (in writing or drawing) from something in the reading.  
Example- Bloom's Taxonomy is like a mountain. The lower levels of the mountain are easily accomplished and typically quick. However, as you head to the summit, it gets harder and requires more effort. If you decide to draw a picture, please describe the analogy in the text.
2. Think about the topics for this module - Exceptionality and Language. Use SCAMPER to address a problem regarding exceptionality or language at your school, in your practice, in the community, or for a family. Describe the problem. Think of the components that contribute to the problem. Use the list of questions below to think about changes that could be made to solve the problem. You will not be able to use all of the questions but try to use one from each category to brainstorm ideas.

SCAMPER is a divergent thinking technique that uses the following steps to explore different perspectives:

**Substitute:** Replace part of the process, product, or problem with something else.

Example: What materials, ingredients, or people can be swapped out?

**Combine:** Merge two or more elements to create something new.

Example: Can you integrate different products or ideas to enhance functionality?

**Adapt:** Adjust something that already exists to serve a different purpose.

Example: How can an existing solution from another context be modified for your problem?

**Modify/Magnify:** Change size, shape, or other attributes; increase impact or scope.

Example: What happens if you make a feature larger, louder, or more intense?

**Put to another use:** Find new applications for an existing product or process.

Example: How else can this tool or resource be utilized?

**Eliminate:** Remove components to simplify or enhance efficiency.

Example: What elements are unnecessary and can be discarded?

**Reverse/Rearrange:** Reorganize or invert the sequence of operations.

Example: What happens if you do things in a different order or direction?

3. Based on this module's topics (Age & Multicultural Education), create 5-7 new compound words. To complete this, switch one of the words in the compound word to create a new one. Example - Sunflower becomes Moonflower. A list of words can be found on the Enchanted Learning website under Compound Words Vocabulary Word List.
4. Think about a current issue impacting the social and emotional well-being of students. Consider five different perspectives people might have about the topic or who are involved in some aspect. Briefly describe the five different perspectives.
5. Here are some squares with little figures drawn inside of them. On a piece of paper or using your paint App, create your own version of the boxes with the same little figures inside the boxes. Next, add to the figures. Try to make the figures into something related to the topic you chose to explore for your literature review. You can create whatever you want with these. You can draw outside of the lines, as well. You can add words. You can use more than one at a time – whatever you want. Share your final product.

## Data Sources

### ***Runco Creativity Assessment Battery (rCAB) - CA&V***

The rCAB is a comprehensive battery for measuring creativity (Runco, 2021). It focuses on creative potential and creative performance and has specific subtests for each. Norms have been obtained from every geographic & economic group. It covers the entire lifespan and specific domains, with subtests for both realms. While components

of the battery address individual measurements (self-reports, divergent thinking tasks, activity checklists, and idea preferences), there are also assessments that parents, teachers, or supervisors can complete, allowing for triangulation and increased objectivity (Runco, 2021).

The Creative Attitudes and Values Scale (CA&V) is a questionnaire that is part of the rCAB (Runco, 2021). The questionnaire consists of 25 items on a 5-point Likert Scale with 125 points total. Participants assess how they value certain ideas or behaviors related to creativity. A higher score implies that the individual possesses attitudes and values that make creative behavior more likely. Sample items include how participants viewed brainstorming and the problem-solving process, the benefits of multiple perspectives, working with others, and taking a playful approach to work (Acar & Runco, 2015). The CA&V showed good inter-item reliability (Acar & Runco, 2015) and was correlated with other measures of creative potential, suggesting convergent validity (Acar & Runco, 2015). Additional support for the reliability and validity of the CA&V was reported by Runco et al. (2022).

### ***Likert Survey with Open-ended Questions about Engagement and Learning***

The authors of this study designed a Likert Survey to assess participants' perceptions of how the creativity challenges influenced their learning and engagement. The Likert Survey included eight questions with the following directions: Move the bar to express your thoughts about the Creativity Challenges with 1 being none at all and 10 being a great deal:

1. Improved your understanding of topics studied in class
2. Helped you apply what you were learning to current students or clients
3. Helped you make personal connections with the information
4. Increased your interest in what you were studying
5. Motivated you to learn more about specific topics
6. Helped you explore the topic in new and different ways than you normally would have
7. Enhanced your ability to be creative
8. Were Enjoyable

In addition, the survey included three open-ended questions:

1. Can you describe an experience with the creativity challenges that was meaningful for you with regard to what you were learning in class?
2. Did completing the creativity challenges influence how you feel about your personal creative abilities? Please explain.
3. Would you use similar creative thinking activities with your current or future students or clients? Please explain.

## Data Analysis

### ***Creative Attitudes and Values Pre and Post-Assessment***

Researchers conducted a paired t-test in Excel to assess the pre and post-scores on the rCAB CA&V survey. They used the total score of the test. Four students completed the survey who were enrolled in two of the courses. Their first submission for the pre and post test was included in data analysis, and their second submission was excluded. All submissions that were not aligned with both a pre and a post-test were not used.

### ***Likert Survey with Open-ended Questions about Engagement and Learning***

Likert scores were averaged to find the mean. Researchers designed a divergent bar chart to analyze the results of the end-of-course survey about student learning and engagement. The researchers employed thematic analysis to examine the open-ended survey responses. This process allowed them to identify patterns and themes. Each researcher began by thoroughly reading and re-reading the responses to become familiar with the content. This step helped them gain an initial understanding of the participants' perspectives and experiences. Researchers independently generated initial codes by labeling specific segments of the text that reflected key ideas or concepts. For example, phrases like "*thinking outside the box with the topic*" and "*dive a little deeper than I would have without the challenges*" were coded as relevant to themes about *ways to explore topics in-depth*. The researchers grouped similar codes together to form broader themes. For instance, codes such as "*overcoming negative self-labeling*" and "*overcoming self-doubt*" were grouped under the theme of *influence on personal creative abilities*.

After identifying potential themes, the researchers convened to discuss their findings. They compared and refined the themes, resolving discrepancies through discussion. This collaborative process ensured that the themes accurately represented the data and were not biased by any single researcher's perspective. Once the themes were agreed upon, the researchers refined them to ensure clarity and distinctiveness. They defined three themes or categories with clear direct quotes from participants. For each overarching theme, they identified 4-5 subthemes. For example, under the theme *Student Perception of Creative Activities and Learning*, subthemes included *enjoyment and engagement*, *making connections*, *exploring topics in-depth*, and *thinking about materials in a new way*. These subthemes provided nuanced insights into specific aspects of participants' experiences.

The researchers used the themes to complement and elaborate on the quantitative findings. This integration helped explain how participants' qualitative experiences aligned with their responses on the Likert survey and the CA&V Scale. To enhance the trustworthiness of their analysis, the researchers followed best practices in qualitative research by cross-checking codes and themes to ensure accurate representation of the data, by providing detailed description of participants' responses with the aim to make findings applicable to similar educational contexts, and by reflecting on personal biases to prevent influencing their analysis.

## Quantitative Results

### Creative Attitudes and Values (CA&V) Pre and Post-Assessment

Researchers completed a dependent-samples t-test to determine if creative attitudes and values increased after completing the creative thinking challenges over the course of the semester. The results showed that the scores on the creative attitudes and values scale ( $M = 97.38$ ,  $SD = 7.35$ ) increased from pre to post-assessment ( $M = 99.5$ ,  $SD = 9.01$ ), ( $t(33) = 2.11$ ,  $p = .042$ ).

### Likert Survey with Open-ended Questions about Engagement and Learning

Results of the Likert Survey indicated the highest scores in helping participants explore topics in new and different ways than they normally would have, allowing them to make personal connections with the information, applying the information to current students or clients, enhancing their ability to be creative, and improving their understanding of topics studied in class (see Table 2 and Figure 1).

**Table 2. Likert Scale Results of Student Engagement and Learning.**

Impact of the Creativity Challenges	Mean
Improved your understanding of topics studied in class	8.06
Helped you apply what you were learning to current students or clients	8.09
Helped you make personal connections with the information	8.30
Increased your interest in what you were studying	7.50
Motivated you to learn more about specific topics	7.68
Helped you explore the topic in new and different ways than you normally would have	8.40
Enhanced your ability to be creative	8.08
Were Enjoyable	7.84

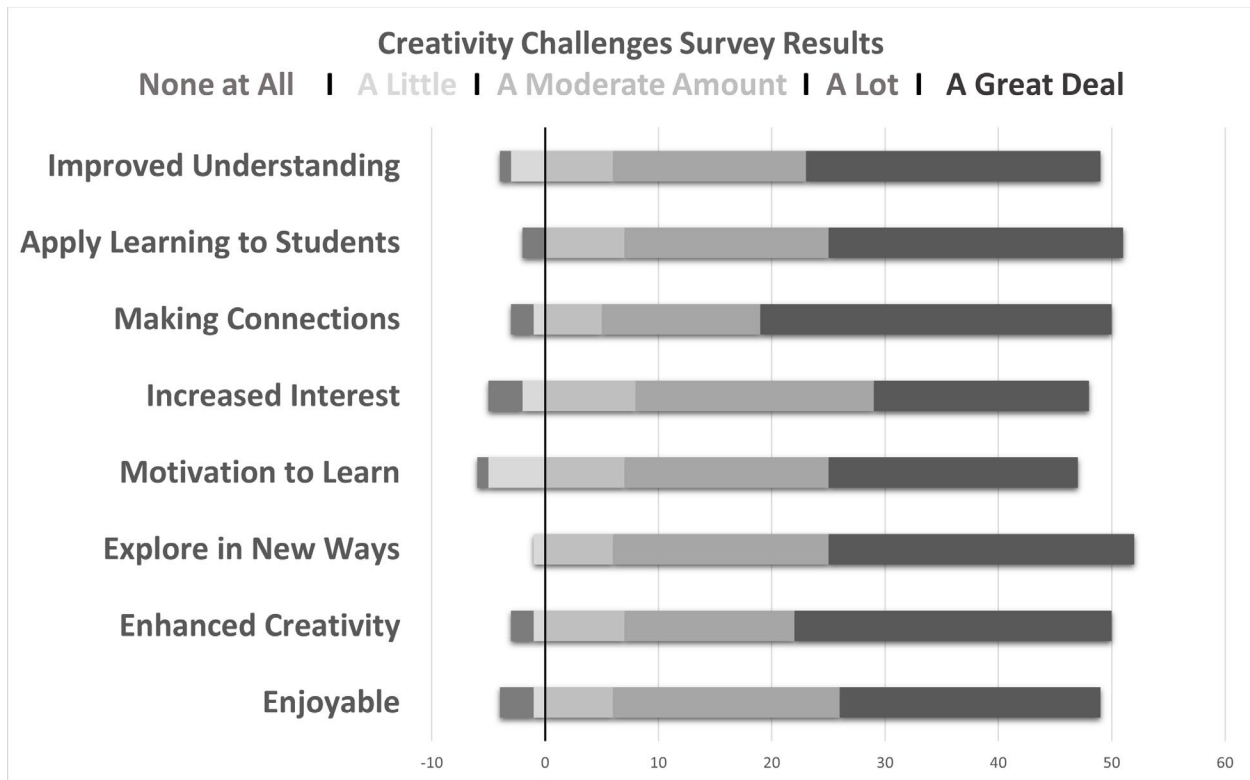


Figure 1. Likert Scale Divergent Bar Chart.

### Open-Ended Question Results

Thematic analysis was used to determine student perception of the creative activities (enjoyment and engagement, making connections, exploring topics in-depth, and thinking about materials in a new way), their influence on personal creative abilities (gaining confidence, overcoming negative self-labeling or labeling by others, learning to be a risk-taker), and how the participants would use creativity in their own classrooms (specific tools, promoting general creative thinking skills, meeting students' learning preferences or needs, promoting critical thinking, understanding different perspectives, deeper thinking, demonstrating understanding, and obstacles to implementing creative activities).

#### Category One: Meaningful Experiences

Participants described meaningful experiences from completing the creativity challenges due to enjoyment and engagement, as a way to make connections with the concepts in class, to investigate ideas on a deeper level, and as an avenue for thinking about the material in a new way.

#### *Enjoyment and Engagement*

Participants described specific tasks or techniques they enjoyed. These included using body movements to explain concepts, using math to represent ideas, writing a free

verse poem, using a universal theme to analyze a topic, a picture completion activity based on a research interest, digital organizers, writing short stories, bend-break-blend technique, and a timed doodle activity. One stated, "It was a very different and creative approach from other courses. It was very engaging and thought-provoking." One participant shared:

I really enjoyed the Bend, Break, or Blend, and Pi-ku creativity challenges. The most meaningful creativity challenge in regard to what I was learning in class was the create five different perspectives people might have about the public services topic or who are involved in some aspect.

### ***Making Connections***

Participants described how different activities helped them to make connections to their personal and professional lives and to the materials they were studying in class. One explained, "I really liked being able to take what I was learning and connect it to different aspects of my life and within teaching." In addition, participants described how they were able to make physical connections. One shared, "I liked the challenges where we had to use images to make the content our own. It really helped me connect the reading with something more physical." Another said, "I enjoyed the poetry challenge. It helped me connect ideas." Another explained, "Connecting the material to real-world things and to our future careers helped create a deeper meaning." One noted that the creative aspect made it easier to make personal connections compared to other assignments: "I was able to understand the models more because of the activities. I was able to connect it to my life easier than I would with other assignments." One shared:

I really enjoyed developing the compound words based on topics learned in the weekly readings. It allowed me to retain the information that was read. It also allowed me to use out-of-the-box thinking to make connections with the text which made learning more meaningful.

### ***Creativity as a Way to Explore Topics In-depth***

Participants described how the creativity challenges gave them the opportunity to explore topics more in-depth. One said, "The creativity challenge helped me to have a better understanding of the different topics we learned." Another described how the challenges encouraged them to learn more about the topic: "I liked completing the challenges, these gave me the opportunity to explore the topics more in-depth and to learn more about them." One commented on how they had to explore the topics on a deeper level in order to complete the challenge:

I really enjoyed relating the creativity challenges to the topic I was working on for my literature review. The challenges made me think outside the box with the topic and dive a little deeper than I would have without the challenges.

### ***Thinking about the Material in a New Way***

Participants described how the creative thinking challenges allowed them to explore the topic or understand the topic in a new way. This involved manipulating the information in a unique way, applying their knowledge through a different avenue, understanding other perspectives, expressing their personal point-of-view, and the role of metacognition during the process. One shared, “The creativity challenges encouraged me to organize and display data that I learned or wanted to share with others.” Another said, “The creativity challenges helped me increase my understanding of the topics that we were discussing in the modules. These gave me the opportunity to provide my own point-of-view about the topic.” Another stated, “It allowed me to think more critically about the information I have obtained and made me apply my knowledge in a different way (instead of writing a typical summary or quick assignment).” The creativity challenges included exploring perspectives in order to build flexibility. One participant described the importance of this activity:

For our module 6 creativity challenge, we had to look at our public awareness campaign topic from 5 perspectives. This allowed me to think about the topic in a deeper way and challenge myself to see this from other viewpoints. It really made me think about why it was viewed so differently from other perspectives.

One participant explained the metacognitive process involved with using creativity:

The activities helped me to understand that creativity can be instilled in the students, and I am able to teach myself how to be more creative. For every challenge, I was not searching information on the Internet. I wanted to think about my thinking.

### **Category Two: Personal Creative Abilities**

Practicing creativity showed growth in feeling more creative, overcoming negative self-labeling or labeling by others, and learning to be a risk-taker.

#### ***Gaining Confidence***

Participants described gaining confidence in their creative abilities. One said, “Yes, I do not consider myself a creative person, but I feel I became more creative throughout the semester.” Another shared, “Yes! Prior to this class, I did not feel like I could express myself creatively but now I have gained some confidence in my abilities.” One described feeling hesitant at the beginning of the semester. They shared, “At first I was hesitant, as it is difficult for me to think outside of the box, but now I feel confident in my creative abilities.” Another explained how they felt they could talk about creativity with other people. Others shared:

I have never felt very creative, nor tried to really express any creativity since finishing high school. These challenges made me dive back into what it means to be creative and think differently than I'm used to. I loved these activities.

Five participants stated that they did not gain confidence because they already considered themselves highly creative. One participant described the process of letting go of perfectionistic tendencies by the end of the semester. They shared:

There are so many experiences that I had with the creativity challenges that were meaningful for me in regard to what I learned in class, especially the Sketchnotes, that I was not brave enough to try, I would always use the computer/graphics but for Module 6, I told myself that I was going to do it whether it was perfect or not. I did and I was so excited! It may not be perfect, but to me, it is because the pressure that I put myself through to express my ideas on paper through sketches made me realize that creativity does not need to be perfect, I just need to get my thinking juices flowing and let my fingers do the rest.

### ***Overcoming Negative Self-Labeling or Labeling by Others***

Participants described how they were able to investigate labels they placed on themselves concerning creativity or labels others had placed on them. One shared, "Yes. I don't consider myself a creative person, so the challenges pushed me to be more creative." One shared:

I am not someone who thinks of myself as inherently creative, yet I enjoyed these challenges. These challenges helped remind me that there are many ways to think creatively or create something that do not necessarily involve fine art skills! I think my insecurity about my skills in painting and drawing is what has led me to cast myself as a "not creative" person, when in fact I am quite capable of creativity in many ways.

### ***Learning to Be a Risk-Taker***

Participants described how they grew more comfortable with taking risks. One shared, "With some activities I felt very creative, but with others, I felt like I floundered a bit. I still muddled through, and I think it was good for me to be pushed to work outside of my comfort zone." Another said, "Sometimes out of my comfort zone, so it's good to push that sometimes!" Another explained, "I did not realize how much I enjoyed making comics/cartoons! These challenges made me think and come up with different ways to complete the challenge (a lot of trial and error)." One described how she appreciated that there was not one correct answer:

Completing these creativity challenges reminded me that I do enjoy being creative. I also felt like I could take more risks when presenting my information. I

knew there was not just ONE right answer. But I also felt like I could defend/explain my answer in a way that proved I understood the topic.

### **Category Three: Applying the Techniques in Their Own Classrooms or with Clients**

Participants described specific tools or activities they would use with students, how they would promote general creative thinking strategies, and how they could use creative approaches to address different learning preferences or needs. In addition, they described creativity as an avenue to promote critical thinking, understand different perspectives, and demonstrate deeper thinking or comprehension. Participants also described issues that would impede them from implementing creative practices.

#### ***Specific Tools or Activities Teachers Would Use***

Participants described different approaches or techniques they would use in their own classroom. These included the poetry challenge, the body movements to match concepts covered in class, sketch notes, pictochart, bend-break-blend, pi-ku, letter to self to address misconceptions, using SCAMPER to create a product that could help someone, mind-mapping, and writing poetry. Several teachers described how they had already started implementing creativity as a result of working on the creativity challenges. One shared:

Absolutely! As the semester went on, I started taking this lens while completing the creativity challenges, thinking about how I could apply them in my own classroom for my students. I used some the creativity challenges to practice my skills with curriculum design, planning activities for my own students!

Other participants described how they planned to use the creative thinking activities in the future. One participant explained, "Yes, it gives them the chance to think outside the box and relate more to their life while still focusing on class material." Another stated:

Oh yes! Most definitely because just as how I tapped into my inner fear and brought my thoughts out on paper, I should allow my students to engage in creative thinking activities and let them talk about them. Because my students' primary language is Spanish, and they need to orally express themselves, creative thinking activities will get them talking because they would be doing activities that they chose.

#### ***Creativity Challenges to Promote General Creative Thinking***

Participants described how including these activities in their classes would be beneficial for promoting general creative thinking skills that cross domains. One said, "I would. I think it gives students the ability to show their creativity while learning. I think it is an important part of learning." Another explained, "Yes, I would start using some kind of

creative challenges with my kindergarten children to promote creative thinking.” Another shared:

I would love to use these challenges with my future students! I don't always feel creative but working on these assignments made me tap into the creativity I didn't know I had. This could be true for my students as well.

### ***Creativity to Meet the Students' Learning Preferences or Needs***

Participants described how using the creative thinking activities could help them meet their students' learning preferences and needs. One said, “Yes, I feel like the creativity challenges are part of the Autonomous Learning Model, I am a big fan of the specific model because it gives students the freedom to learn in a way that best suits them.” Another shared, “Yes, I like the idea of thinking creatively. As students ourselves, many times we learn the material in different ways. I think it's a great way to use our knowledge.” Another stated, “Yes, definitely. These creativity challenges can help a teacher or provider to understand their student or client better and in a more personal level.” Another described how the activities could be beneficial as a form of formative assessment. They shared, “I think that it would be a fun exit slip every day that can help them better understand the material like I did in this course.”

### ***Creativity Challenge as Critical Thinking, Understanding Different Perspectives, Demonstrating Deeper Thinking, and to Demonstrate Their Understanding***

Participants described how the activities could promote critical thinking. They described how these tasks could be beneficial for understanding different perspectives. One participant explained, “Yes. It allows students to look at the same material from a different perspective.” Others described how they could provide the opportunity for deeper thinking. They shared, “I would definitely use these types of activities in the future. It allows for a deeper thinking of the topics. Additionally, it provides a broader opportunity for learners to demonstrate their learning.” Others said that they would be a good tool for demonstrating their understanding of the information taught in class.

### ***Obstacles to Implementing Creative Activities***

Three participants explained that they had hesitations about implementing creativity into their classroom due to their student population, trouble fitting creativity into the curriculum, and difficulty with designing creativity challenges. They explained:

I might use something similar but the students I work with would need something more structured to follow in order to be successful. Creativity often assumes a certain level of prior knowledge and when it is lacking it takes so much time to build that there is little time left to focus on whatever the final project needs to be.

I would like to figure out a way to implement some of the models discussed into my classroom, but I am still on the fence about the effectiveness in low SES students and classrooms. I like giving projects and letting students be creative, but they are not all interested and willing to give their best effort.

I would love to, but I find it hard to find time to fit them into the curriculum (at least for the classes I currently teach- I can see it working in others). I also think it is hard to come up with creativity challenge ideas.

## Discussion

By completing the activities over the course of the semester, participants described how they had gained more confidence in their creative abilities and in understanding what creativity entails (Han & Abdrahim, 2023). This was also supported by the results of the pre and post-assessment with the Creative Attitudes and Values scale (Acar & Runco, 2015). Several described how they understood creativity in a new way, beyond thinking of it in terms of “arts and crafts”, an important aspect for educators to understand in order to implement creativity into their classrooms (Gralewski & Karwowski, 2018; Katz-Buonincontro et al., 2020). It can be important for teachers to engage in creative activities themselves in order to understand creativity or redefine creativity if their understanding is skewed (Anderson et al., 2022).

The exercises were framed with the terminology of being a “challenge”. Participants noted that these activities encouraged them to think outside of the box, to work outside of their comfort zone, and to grow as a risk-taker. They described how they overcame labels they had assigned themselves or that were given to them by others. Shifts in these paradigms can be important for enabling educators to understand creativity (Anderson et al., 2022). Teachers who value creativity tend to implement creative thinking activities in their own classes (Bereczki & Kárpáti, 2018).

The creativity challenges offered the participants an avenue for experimenting with the content in new and unique ways and to make connections with the content covered in each module, to personal experiences, and with other sources. They described different aspects of creativity as engaging and improving their understanding of topics studied in class including divergent thinking, problem-solving, and self-expression (Knowlton & Sharp, 2015). Cognitive and emotional engagement during the learning process can improve learning performance (Xin, 2022). Participants described their appreciation for experimenting with *flexibility*, a component of divergent thinking, when they noted two of the tasks as the most meaningful: investigating different perspectives and with exploring a universal topic. They described the benefit of creative problem-solving with the SCAMPER activity and the Bend Break or Blend activity. Others described creative self-expression as an effective tool with the poetry, artistic, and musical prompts.

Participants described how the creativity challenges allowed them to apply what they were learning to their students and clients. When describing if and how they could implement these practices into their current or future classroom, they described the benefits for their students with comprehension, exploring content in more depth, with making connections, and as a form of critical thinking. They also described how these

types of activities could be beneficial for formative assessments and for meeting the needs of different learners. Reasons for not implementing creativity included that designing creative activities was too challenging. This could change with better teacher preparation in creative thinking and creative problem-solving. Others described that the population of students they currently served would struggle with creative activities. This supports the need to help educators understand creative potential and creative malleability (Paek & Sumners, 2017).

Explicit instruction of creative thinking activities embedded within content areas provides an avenue for teachers to promote engagement and student learning while equipping students with the skills to become effective problem-solvers (Cano-Moreno et al., 2022, Hargrove & Nietfeld, 2015). As the world encounters increasingly complex and multi-dimensional problems such as political divide, economic disparity, a rise in mental health issues, and climate change, we need to arm our children and youth who inherit these problems with the brain power that will generate innovative solutions (Couros, 2015; Robinson, 2011, Zhao, 2012). In addition to world problems, technology and the way we do business continue to change at a rapid pace. Jobs once occupied by middle-class workers are easily replaced by automation. To be competitive in the job market, our future workers will be required to do work where answers and procedures are fluid and ambiguous and where innovation and creativity will be highly sought (Pfieffer, & Thompson, 2013; Wagner, 2008).

To ensure that graduates across disciplines have the skills to be creative and innovative, colleges and universities must provide opportunities for students to develop creative habits and creative thinking. Creative teaching involves using tools such as digital mind-mapping and metaphors to develop students' fluency, flexibility, originality, and elaboration (Bai, 2013; Burton, 2008; & Knowlton & Sharp, 2015). Design thinking (DT), project-based learning (PjBL), and problem-based learning (PBL) are methods used to enhance creative problem-solving skills (Kuo et al., 2022; Wynn & Okie, 2017). Instructors can also encourage creativity through the use of specific techniques such as collaborative projects, non-traditional presentations, reflective practices, and creativity challenges, which help students build confidence in their creative abilities (Han & Abdrahim, 2023; Knowlton & Sharp, 2015; Marquis & Vajoczki, 2012). By embedding creativity into pedagogy, educators can prepare students to thrive in complex, dynamic environments.

### **Limitations and Future Research**

There are limitations to this study. The use of a control group would make this study stronger where researchers could compare the experiences of students who received the creativity challenges versus those who did not. This would allow for a clear understanding that creativity offered the avenue to explore the topics in more detail as opposed to another aspect such as personal experience with the topic. In addition, increasing the number of participants in the study would be beneficial. Having multiple classes across universities and programs would provide information about experiences in different disciplines. Individuals in teacher education programs might have prior experiences with using different modes of learning and might have an appreciation for these opportunities to investigate material through different methods.

The study relied on student perception of learning and engagement which relies upon self-assessment. Future studies should consider more direct measures of learning and engagement. Understanding how creative thinking influences comprehension and retention of information would be beneficial. In addition, future research could provide further insights into how participants in teacher preparation courses implement creative thinking strategies in their classrooms through qualitative interviews and the collection of artifacts. This would provide insights into the transferability of creative practices in higher education coursework to application with students in a school setting.

### Conclusion

This research is important to consider as part of the 21<sup>st</sup> Century Learning Skills that are encouraged in our educational system – critical thinking, creative thinking, collaboration, and communication (Trilling & Fadel, 2009). Although outcomes are expected in each of these realms, standardized testing often leaves teachers focusing on tests designed for convergent answers. Providing creative thinking activities in teacher preparation courses provides the opportunity for current and future teachers to explore creativity on a personal level. It provides the opportunity for growth in creative confidence. These experiences can enhance the creative attitudes and values of participants. As a result, teachers have the experiences and foundation for implementing creative thinking activities into their current or future classes (Anderson et al., 2022).

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