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Original Article

Exploring Creativity Beliefs and Biases of University Education Students

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Abstract
Teachers' beliefs about creativity are an important precursor to their intent to engage in creative pedagogy. The present study explored how education students' beliefs about teaching for creativity relate to potential misunderstandings about creativity (i.e. creativity bias). Two hundred and nine education students were recruited from a large state university. Participants were given a creativity bias scale and the Beliefs about Teaching for Creativity Scale (BATCS). We conducted four multiple regressions predicting overall creativity bias, arts bias, psychopathology bias, and big-C bias from the subscales of the BATCS. First, we found low rates of creativity bias endorsement indicated by only 4.8% of participants scoring rating biases above the midpoint. Second, we found that a fixed creative mindset predicted the Arts, Big-C, and psychopathology bias. Third, creative teaching self-efficacy negatively predicted the arts bias. These findings inform the instruction in creative pedagogy in teacher education programs to help educators develop accurate beliefs about creativity and creative pedagogy.

Keywords: creativity, creativity bias; teacher's beliefs, mindsets, beliefs bias

Introduction

Including creativity in the curriculum and instruction programs of schools has been widely advocated by educational researchers (Beghetto, 2013; Craft, 2010; Kettler et al. 2018a; Shahen, 2010; Starko, 2014), as creativity is generally accepted as a beneficial skill to be acquired regardless of students' career pathways (Beghetto & Kaufman, 2009; Conner et al., 2016). Moreover, creativity is a set of skills and dispositions that can be developed through appropriate educational environments (Beghetto & Kaufman, 2014; Hennessey, 2004; Renzulli, 2017; Scott et al., 2004; Sternberg, 2015). Though creativity has matured as a field of study in the six decades following Guildford's (1950) seminal address calling for the scientific study of creativity, there still exists in the general population limited understanding or misunderstandings about its definition, prevalence, or its relationship to other phenomena, which are called creativity biases. These biases go against the scientific literature on creativity. Some research indicates that creativity biases are held by K–12 educators themselves (Andiliou & Murphy, 2010; Bereczki & Kárpáti, 2018; Kettler et al., 2018b; Mullet et al., 2016). This is problematic as creativity biases of educators about creativity can potentially lead to the stifling of students' creativity (Beghetto, 2006, 2013). The purpose of this study was to explore the creativity beliefs and potential creative biases of university students enrolled in the education program at the undergraduate and graduate level.

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Although definitions of creativity vary widely, two key components typically included in these definitions are originality and appropriateness (Runco & Jaeger, 2012). In this study, we defined creativity as production of original and contextually appropriate ideas, actions, or outcomes. Based on this definition, creativity can be found across all domains of skill and knowledge. For example, a teacher may be creative when s/he generates a new metaphor to explain a concept to her students.

Theoretical Framework and Literature Review

Creativity biases

Despite the prevalence of evidence that creativity is expressed across domains, there is a tendency for people to relegate creativity to the arts, known as the arts bias (Andiliou & Murphy, 2010; Bereczki & Kárpáti, 2018; Mullet et al., 2016; Runco, 2007). This is a misunderstanding of the definition of creativity, which is not domain specific. Glăveanu (2014) found that when people were asked which domains require creativity, they tended to not only assign higher importance of creativity for artistic endeavors compared to scientific endeavors but also responded faster indicating that they had a stronger association between creativity and the arts compared to creativity and science. Educators are also susceptible to endorsing the arts bias (Patston et al., 2018), which is problematic as this may lead to educators neglecting the development of students' creativity in other domains (e.g., math, science). However, creativity can be found across all domains, such as math (Bicer et al., 2020; Mann, 2006), science (Hollingsworth, 2012; Raj et al., 2016), and even sports (Santos & Monteiro, 2020).

Furthermore, there is a tendency for people to believe there is a strong relationship between creativity and mental illness despite research indicating that creativity is frequently related to well-being. This bias is called the psychopathology bias (Benedek et al., 2021; Kaufman et al., 2006). This is a misunderstanding of how creativity relates to other phenomenon. Past research has indicated that the relationship between creativity and mental illness is complex and minor. Kaufman (2001) looked at the rates of mental illness among writers. He found that only female poets showed higher rates of mental illness compared to male writers and female fiction writers. He dubbed this the Sylvia Plath effect. A recent meta-analysis has shown that certain types of mental illness (e.g., bipolar disorder) positively correlated to creativity whereas other types of mental illness (e.g., anxiety) negatively correlated to creativity (Baas et al., 2016). Although there is a small relationship between mental illness and creativity, there is a larger relationship between creativity and mental well-being. Acar et al. (2020) conducted a meta-analysis of 26 studies and found an average correlation of $r = .14$ between creativity and well-being and an average correlation of $r = .22$ between creative behavior/activity and well-being. Currently, it is unknown whether educators endorse the psychopathology bias.

The Big-C bias posits that only large-scale, historically significant creative acts are creative (Baas et al., 2015). In other words, the Big-C bias is the misunderstanding that only large-scale creative products are creative, while small, everyday creative products are not. This is unfounded in the literature as creative behaviors have been defined and documented at four levels of creativity: mini-c, little-c, pro-c, and Big-C (Kaufman & Beghetto, 2009). For instance, little-c, or everyday creativity, is "a phenomenon in which a person habitually responds to daily tasks in an original and meaningful way" (Villanova & Cunha, 2021, p. 691) such as modifying an existing recipe. Benedek et al. (2020) found that people self-report that they enjoy their everyday creative pursuits, which in turn sustains their engagement in everyday creativity. Karwowski et al. (2017) found that being at work (rather than home) or working (as opposed to resting) both predicted everyday creative actions. The Big-C bias is a misunderstanding of the prevalence of creativity, since it views it as extremely rare, as well as the definition of creativity, which does not stipulate magnitude of the contribution. Although these three biases are not exhaustive of all creativity biases (Benedek et al., 2021), their prevalence is well established in the literature and provides a launching point for investigating potential factors that predict these biases among educators.

These biases are problematic for educators to hold because they may be dissuaded from promoting creativity in their classrooms. For example, a math teacher who believed creativity was only found in the arts may not promote mathematical creativity in his students. Another educator who thought creativity could lead to psychopathology may be hesitant to promote creativity amongst his students. Lastly, a teacher who believed only large-scale endeavors are creative, may fail to recognize the everyday creative endeavors of his students and thus fail to encourage such behaviors.

Educators' beliefs and biases about creativity

We suspect that creativity biases may impede educators from fostering creativity across domains; thus, it is important to understand predictors of biases so that appropriate interventions in the teacher education process can be created. One set of potential predictors are educators' beliefs about creativity. Investigating creativity beliefs can reveal whether educators' knowledge about creativity is built upon scientific evidence or myths (Benedek et al., 2021; Puryear & Lamb, 2024).

One measure of educators' beliefs about creativity is *the Beliefs about Teaching for Creativity Scale* (BATCS; Katz-Buonincontro et al., 2020). Consisting of multiple subscales, this scale measures: (a) educators' beliefs about how desirable creativity is to their teaching career, (b) educators' value of developing creativity in their students, and (c) educators' self-efficacy for teaching for creativity. Additionally, the BATCS measures the degree to which educators have a fixed or growth mindset about their students' ability to grow and develop in creativity. To our knowledge these beliefs about creativity have not been studied in relation to creativity bias. Thus, this research is exploratory in nature. However, previous work has found that fixed mindsets are related to other creativity beliefs, such as creative self-concept (Karwowski et al., 2014) and teacher's perceptions of student's creative potential (Paek & Sumners, 201).

Theoretical framework

The Dynamic Creative Pedagogy Model (DCPM) describes the complex relationship between educators' creativity knowledge and creativity beliefs in relation to implementing creative teaching that leads to students' creative outcomes (see Figure 1; Kettler, 2023). Beliefs are deeply held psychological understandings that an individual believes to be a true and accurate representation of the world (Fives & Buehl, 2012; Richardson, 2003). In this model, educator beliefs refer to suppositions, commitments, and ideologies whereas educator knowledge refers to factual propositions and understandings (Kettler, 2023).

As educators learn and practice their profession, they gain knowledge of pedagogical propositions; however, their beliefs continue to serve as a filter that evaluates the accuracy or viability of that new knowledge (Calderhead, 1996; Ertmer, 2005). Sometimes their prior experiences or internalized narratives continue to favor deeply held beliefs over newly acquired knowledge (Mama & Hennessy, 2013; Nespor, 1987). In other words, deeply held commitments to educators' beliefs can be a powerful influence in educators' creative pedagogy practices even as they acquire new knowledge and skills through training and development.

The DCPM (Kettler, 2023) illustrates the process of how educators develop intentions to behave relative to creativity in their instructional environment (i.e., creativity intentions). Those intentions are influenced by both knowledge of creative pedagogy and beliefs about creativity and creative people (Fang, 1996). The dual directional arrow indicates the dynamic interaction between creativity knowledge and creativity beliefs. In other words, knowledge can inform beliefs, and beliefs can inform how new information is stored (or disregarded) as knowledge (Rokeach, 1968). Educators' creativity intentions precede their creativity behaviors (i.e., teaching for creativity, teaching creatively, modelling creativity; Bandura, 1986; Kettler, 2023). This process may be influenced by the educators' personal

factors (creative personality, creative skills, etc.) or environmental factors such as the school environment and the relative importance of creativity in that learning community.

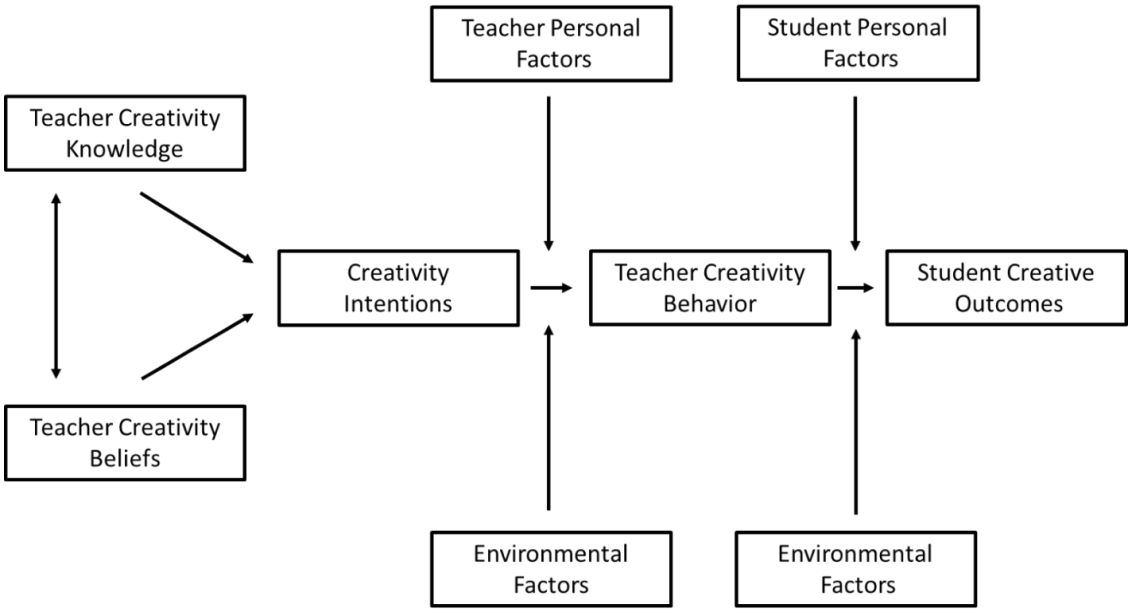

Figure 1. Dynamic Creative Pedagogy Model

Note. This model shows that both teachers' knowledge about creativity and teachers' beliefs about creativity influence each other, and they collectively influence the creative intentions of the teacher. Whether or how a teacher's creative intentions manifest in actual creative teaching behaviors is influenced by the endogenous variables of the teacher and the exogenous variables associated with the environment. The endogenous and exogenous variables can either enhance or inhibit the transition from creative intentions to actual creative teaching. In the final phase of the model, the teacher's creative teaching behaviors will influence the students' creative outcomes. However, the endogenous variables of individual students will influence the process of creative outcomes, and the exogenous variables of the environment will also influence the process of developing students' creative outcomes.

The present study

This cross-sectional study focused on education students' creativity beliefs (creative mindsets, self-efficacy for teaching for creativity, desirability of teaching for creativity, desirability for developing student creativity, and creativity bias). Theoretically, those beliefs exist in a dynamic relationship with educators' knowledge about creativity and predict educators' creativity intentions in the areas of curriculum, instruction, and assessment (Kettler, 2023). This study is part of ongoing research to understand educators' behaviors relative to creativity and creative pedagogy, with the primary goal of understanding educators' beliefs and behaviors relative to creative pedagogy so that we can improve educator education and provide ongoing training to support educators who desire to move along the continuum toward fostering students' creative capacities. While this will take several studies to do, the present study has a smaller aim. The primary aim of the present study was to assess whether educators' beliefs about creativity predicted creativity biases. The research questions are as follows:

Endorsement of beliefs

1. Do education students endorse the importance of teaching creativity?
2. Do education students demonstrate self-efficacy for teaching for creativity?
3. Do education students endorse the importance of developing students' creativity?

4. Do education students endorse fixed creative mindsets or growth creative mindsets?
5. Do education students endorse beliefs that reflect creativity biases?

Predicting creativity bias

6. To what extent are education students' general creativity biases predicted by their: self-efficacy for teaching for creativity, importance of teaching creatively, importance of developing students' creativity, fixed creative mindset, and growth creative mindset?
7. To what extent are education students' specific creativity biases predicted by their: self-efficacy for teaching for creativity, importance of teaching creatively, importance of developing students' creativity, fixed creative mindset, and growth creative mindset?

Methodology

Participants

We recruited 209 participants enrolled in the College of Education at a large state university in the United States. The participants were studying to be educators, were currently teachers, or were formerly teachers but now in leadership roles in educational organizations. Students were recruited via email and all students in the education program were invited to participate. Participants (77% female) were enrolled in Bachelor's (40.2%), Master's (25.8%), Ed.D. (4.3%), and Ph.D. (29.2%) programs. Participants were both full-time (66.5%) and part-time (33.5%) students. In terms of ethnicity, participants were White (64.6%), Hispanic (15.3%), Asian (8.6%), Black (6.7%), and other (4.8%). The mean age of the participants was 29.9 years (SD=10.7).

Measures

Creativity bias scale

The Creativity Bias Scale was developed by Tang (2016). It is a 10-item measure of creativity bias answered on a 6-point fully anchored scale (1 = very strongly disagree; 2 = strongly disagree; 3 = somewhat disagree; 4 = somewhat agree; 5 = strongly agree; 6 = very strongly agree). The creativity bias scale has three subscales: arts bias (3-items; α = .65), Big-C bias (4-items; α = .66), and psychopathology bias (3-items; α = .75). The arts bias subscale captures how strongly participants view the arts as synonymous with creativity. The Big-C bias subscale measures how strongly participants view creativity as synonymous with large-scale, historically significant innovations. Psychopathology bias measures how strongly participants believe creativity is related to mental illness, either causing it or resulting from it. Full scale reliability estimate for the Creativity Bias Scale with our data was α = .74.

Beliefs about teaching for creativity scale (BATCS)

The BATCS, developed by Katz-Buonincontro and colleagues (2020), is a 17-item measure using a 7-point Likert scale to measure five types of beliefs about creativity. The BATCS uses three items to measure educators' desirability of teaching for creativity for their own teaching practice (α = .90), three items to measure how strongly educators value developing creativity in students (α = .82), and three items to measure educators' self-efficacy in teaching for creativity (α = .84). This last scale measures the self-belief of being able to teach creatively. Thus, we will refer to this subscale as self-efficacy for teaching for creativity. The BATCS also uses four items to measure fixed mindset about students' creative abilities (α = .80) and four items to measure growth mindset about students' creative abilities (α = .69).

Analytic strategy

Missing data

The five subscales of the BATCS had some missing data, which consisted of 0.3% of the data set. The test for missing completely at random (MCAR) was not significant (p = .434), indicating that the missing data was missing randomly with no relationships to any of the variables. Since the missing data was less than 1% and determined to be MCAR, we used listwise deletion for each analysis. Listwise deletion was chosen to keep the sample size across analysis the same.

Power and sample size

Based on previous studies (Hass et al., 2018; Katz-Buonincontro et al., 2017), self-efficacy for teaching for creativity, desirability of creativity, value of creativity, and mindset should have small to medium (r = 0.1 to 0.5) correlations to creativity bias. To ensure we could detect those effects, we conducted a simulation power analysis by assuming each predictor had a (r = .3) correlation to the dependent variable of creativity bias to estimate the number of participants needed (Cohen, 1988). The sample size was analysed from 50 to 250 by 10 each time for 200 datasets. The results indicated that to achieve power around .8, a sample size of approximately 100 was sufficient. Our sample (n=209) was more than adequate for the study.

Findings

We calculated descriptive data for all variables and present them in Table 1. We then derived bivariate correlations for each variable and present them in Table 2. In the first five research questions we estimated descriptions of educators' beliefs across each of the variables in the study. For the sixth and seventh research questions, we answered with inferential statistics using multiple regression analyses.

Table 1.

Descriptive Statistics for Constructed Variables (n = 209)

Variable	Mean	*SD*	Min	Max	Skewness	Kurtosis
Desirability of Teaching for Creativity	6.35	.88	1	7	-2.09	6.66
Self-Efficacy for Teaching for Creativity	5.59	.96	1	7	-1.14	2.90
Desirability for Students to Develop Creativity	5.17	1.20	1	7	-1.62	5.28
Fixed Mindset for Student Creativity	3.22	1.16	1	6	.32	-.25
Growth Mindset for Student Creativity	5.40	.93	4	28	-.79	1.58
Creativity Bias	2.46	.67	1	4	.00	-.24
Big C Bias	2.19	.67	1	4	.25	-.48
Arts Bias	3.06	1.05	1	6	.02	-.25
Psychopathology Bias	2.23	.93	1	5	.43	-.57

Note: We reported means and standard deviations on item-levels for interpretation. On the first five variables, 1 = strongly disagree and 7 = strongly agree. The midpoint is represented by 4.0 On the last four variables (creativity bias variables), 1 = very strongly disagree and 6 = very strongly agree. The midpoint is represented by 3.5. The descriptive statistics indicate that there are moderate to high endorsement of positive creativity beliefs and generally low endorsements of creativity bias from educators.

Table 2.
Bivariate Correlation (Pearson) Matrix between Constructed Variables (n =209)

	1	2	3	4	5	6	7	8
1. Desirability of Teaching for Creatively	1							
2. Self-Efficacy for Teaching for Creativity	.30**	1						
3. Desirability for Students to Develop Creativity	.47**	.27**	1					
4. Fixed Mindset for Student Creativity	-.03	-.08	-.07	1				
5. Growth Mindset for Student Creativity	.34**	.14*	.33**	-.17*	1			
6. Creativity Bias	.04	-.15*	.03	.47**	-.03	1		
7. Arts Bias	.11	-.20**	.08	.28**	.07	.73**	1	
8. Psychopathology Bias	.05	.04	.08	.29**	-.01	.69**	.20**	1
9. Big-C Bias	-.11	-.15*	-.13	.45**	-.15*	.73**	.29**	.31**

Note. *$p < .05$, **$p < .01$, Creativity bias is the aggregated score of arts bias, psychopathology bias, and big-C bias. Four of the five creativity beliefs were correlated to each other. Only fixed creative mindset for student creativity was not correlated to the other creativity beliefs. The three bias subscales were correlated to each other. Fixed creative mindset for student creativity was the most consistent correlate of creativity bias.

Desirability of teaching for creativity

Participants in the study generally agree or strongly agree that teaching creatively is desirable (M = 6.35; SD = .88). Interpreting the BATCS items, they believe that teaching creatively helps them succeed as educators and gives them an edge with their students. These results also suggest that they believe that teaching creatively will generally help them in their career trajectories. We found no differences in these beliefs based on educators' sex ($t(200) = .67$, $p = .65$) or race/ethnicity ($F(4, 201) = 1.46$, $p = .22$). Similarly, we found this strong endorsement for the importance of teaching creatively did not vary across educational levels (undergraduate, masters, or doctoral; $F(2, 202) = 1.78$, $p = .17$). We did find a significant relationship between participants' age and how they rated the desirability of teaching creatively ($r = -.18$, $p = .01$). Younger participants tended to be more in agreement on the desirability of teaching creatively.

Self-efficacy for teaching for creativity

Participants reported above-average self-efficacy for teaching creatively (M = 5.59; SD = .96), meaning that they generally have confidence in their ability to teach in ways that are creative. The observed mean should be interpreted between somewhat agree and agree. Educators believe that they are good at helping students develop their ideas and good at coming up with novel ways to teach and solve problems. We found no evidence of sex ($t(199) = 1.53$, $p = .13$) or race/ethnicity differences ($F(4,$

200) = 1.49, p = .21) in our sample. There were significant differences in self-efficacy for teaching creativity based on educational level. Educators enrolled in graduate programs had higher self-efficacy for teaching creatively than those enrolled in undergraduate programs ($F(2, 201) = 5.87$, $p < .01$, $\eta^2 = .06$ indicating a medium effect size. We also found a significant relationship between participants' age and their self-efficacy for teaching for creativity ($r = .21$, $p < .01$). Older participants seemed to have higher self-efficacy for teaching for creativity.

Valuing developing creativity in students

We asked participants how desirable it is for students to develop creativity to help them succeed in their educational program. The responses indicated that participants somewhat agree that developing student creativity is important ($M = 5.17$; $SD = 1.20$) which indicates that these educators somewhat, but not strongly, endorse the belief that creativity is important for growth and learning and for general academic success and future career preparation. This moderate endorsement of the value of developing students' creativity was consistent across participants' sex ($t(197) = 1.03$, $p = .37$), race/ethnicity ($F(4, 198) = 1.49$, $p = .24$), and education level ($F(2, 199) = 1.42$, $p = .24$).

Fixed creative mindset for students

Participants generally did not endorse fixed creative mindsets ($M = 3.22$; $SD = 1.16$). In other words, participants slightly disagreed that students are either creative or they are not (and that creativity cannot be changed). In other words, the educators in this study somewhat rejected the fixed creative mindset belief for students, and that was consistent across participants' sex ($t(200) = .14$, $p = .89$), race/ethnicity ($F(4, 201) = .68$, $p = .61$), and level of education ($F(2, 202) = .83$, $p = .44$).

Growth creative mindset for students

The participants somewhat agreed with the principles of growth creative mindset for students ($M = 5.40$; $SD = .93$). These educators somewhat believed that perseverance and working hard are ways that students develop creative skills and capacities. However, there were significant differences based on participants' education level ($F(2, 201) = 7.60$, $p < .01$, $\eta^2 = .07$ (medium effect size). Specifically, those participants enrolled in the doctoral education programs espoused lower support for growth creative mindsets for students compared to both masters' level participants, and undergraduate participants. We found an inverse relationship between participants' age and their endorsement of growth creative mindsets for students ($r = -.15$, $p = .04$). Younger participants were more in agreement with a growth mindset for students.

Overall creativity bias beliefs

The Creativity Bias Scale we used measured three specific creativity bias beliefs, and we refer to overall creativity bias as the collective measure of those three specific biases. We calculated the average (mean) for educators' overall creativity bias as well as each of the three biases individually. On average, educators disagreed or somewhat disagreed with creativity bias statements indicating a low overall creativity bias ($M = 2.46$; $SD = .67$). In other words, there was minimal evidence these educators endorsed creativity biases overall. Another way of answering this research question was to determine what proportion of the educator sample endorsed creativity bias as indicated by a total score above 3.50 (the midpoint) on the scale of disagreement to agreement. Only 10 out of 209 (4.83%) respondents scored above 3.50 to endorse overall creative bias beliefs. Thus, we found that these participants generally do not endorse overall creativity bias beliefs. There were no differences in overall creativity bias responses across sex ($t(199) = .34$, $p = .74$) or race/ethnicity ($F(4, 200) = .49$, $p = .75$). There was a significant difference based on education level ($F(2, 201) = 4.38$, $p = .01$) with undergraduate students reporting a slightly higher creativity bias than masters' and doctoral students on the overall bias scale

(η^2 = .40, small effect). We found that participants' age was related to overall creativity bias (r = -.19, p < .01). Younger participants tended to hold slightly higher levels of bias than older participants.

Specific creativity bias beliefs

We wanted to drill down deeper into each of the three specific creativity biases– Big-C bias, arts bias, and psychopathology bias. Examining responses on all three specific biases, the data indicated that these educators really did not endorse any of the three bias beliefs, where endorsement is defined as a score above the midpoint (3.50) on the disagreement to agreement scale. Arts bias was the highest bias reported (M = 3.06; SD = 1.05) followed by the psychopathology bias (M = 2.23; SD = .93) and Big-C bias (M = 2.19; SD = .67; See Table 1). No differences in any of the three specific biases were observed based on sex (Big-C, $t(199) = .36$, $p = .72$; Psychopathology, $t(200) = 1.55$, $p = .12$; Arts, $t(200) = 1.03$, $p = .30$), or race/ethnicity (Big-C, $F(4, 200) = .62$, $p = .65$; Psychopathology, $F(4, 201) = .25$, $p = .91$; Arts, $F(4, 201) = 1.17$, $p = .33$). There was one significant difference (arts bias) based on the participants' education level (Big-C, $F(2, 201) = 1.18$, $p = .31$; psychopathology, $F(2, 202) = 1.35$, $p = .26$; arts, $F(2,202) = 5.72$, $p < .01$, $\eta^2 = .05$, (small effect). Undergraduate students reported slightly higher levels of bias than masters' and doctoral students on the arts bias subscale.

We also considered the proportion of the participants who endorsed one or more of the three specific creativity bias beliefs. Again, with a 6-point scale, we defined agreement as a score higher than the scale mid-point of 3.50. As mentioned previously, only 4.83% of respondents endorsed the overall creativity bias. Considering each bias individually, Big-C creativity bias was only endorsed by one respondent totalling only .48% of the sample. Psychopathology creativity bias was endorsed by 10.14% of the educator sample. The most endorsed specific creativity bias was arts bias at 33.33%. One-third of respondents endorsed the arts bias. We also found age related to participants' tendency to endorse arts bias (r = -.25, p < .001). Younger participants, typically those in teacher education programs, were more likely to endorse the arts bias, which also coincided with our finding that undergraduate students in the teacher education program were more likely than graduate students to endorse the arts bias.

Table 3.
Multiple Regression Table for Predicting Overall Creativity Bias (n = 209)

Predictor	*B*	*SE B*	*β*	Partial r^2	*p*
Intercept	1.78	.38			<.001
Desirability of Teaching for Creativity	0.40	.05	.06	.00	.44
Self-Efficacy for Teaching for Creativity	-.11	.04	-.17	.03	.01
Desirability for Students to Develop Creativity	.03	.04	.07	.01	.37
Growth Creative Mindset for Students	.02	.05	.03	.00	.69
Fixed Creative Mindset for Students	.24	.03	.45	.21	<.001

Note. R^2 = .239, Adjusted R^2 = .220. Dependent Variable: Overall Creativity Bias.

Predicting overall creativity bias

For research questions six, we investigated whether creativity beliefs predicted creativity bias overall. We conducted a multiple regression analysis to determine the predictors of educators' overall creativity bias. Our model indicated that Self-Efficacy for Teaching for Creativity (β = -.11, p = .01) and fixed creative mindset (β = .24, p < .001) predicted overall creativity bias, $F(5, 194) = 12.19$, $p < .001$, $R^2 = .24$ (see Table 3).

Predicting specific creativity bias

Arts bias

With the seventh research question, we asked to what extent creativity beliefs predicted the three specific biases. Our model was predictive of the arts bias ($F(5, 195) = 7.33$, $R^2 = .16$, $p < .001$). Two variables primarily accounted for that prediction: fixed creative mindset for students (β = .27, p < .001) and self-efficacy for teaching for creativity (β = -.27, p < .001). Self-efficacy for teaching for creativity was negatively predicting arts bias. In other words, the higher their self-efficacy for teaching for creativity, the less they endorsed arts bias. (see Table 4).

Table 4.

Multiple Regression Table for Predicting Overall Arts Bias (n = 209)

Predictor	*B*	*SE B*	*β*	Partial r^2	*p*
Intercept	2.08	.67			<.01
Desirability of Teaching for Creativity	.15	.09	.13	.01	.10
Self-Efficacy for Teaching for Creativity	-.29	.08	-.27	.07	<.001
Desirability for Students to Develop Creativity	.08	.07	.09	.01	.22
Growth Creative Mindset for Students	.08	.08	.07	.01	.31
Fixed Creative Mindset for Students	.242	.06	.27	.08	<.001

Note. $R^2 = .158$, Adjusted $R^2 = .137$. Dependent Variable: Arts Bias

Psychopathology bias

Our model predicted psychopathology bias ($F(5, 195) = 3.87$, $R^2 = .09$, $p < .01$) explaining a small portion of the variance. The only variable predicting the psychopathology bias was fixed creative mindset for students with a β = .29 (p < .001). The more participants endorsed a fixed creative mindset, the stronger their psychopathology bias was. None of the four protective factors made a meaningful contribution to the model (see Table 5)

Table 5.
Multiple Regression Table for Predicting Overall Psychopathology Bias (N = 209)

Predictor	*B*	*SE B*	*β*	Partial r^2	*p*
Intercept	.87	.62			.16
Desirability of Teaching for Creativity	.00	.09	.00	.00	.98
Self-Efficacy for Teaching for Creativity	.03	.07	.03	.00	.71
Desirability for Students to Develop Creativity	.08	.06	.10	.01	.23
Growth Creative Mindset for Students	.01	.08	.01	.00	.87
Fixed Creative Mindset for Students	.23	.06	.29	.08	<.001

Note. R^2 = .090, Adjusted R^2 = .067. Dependent Variable: Psychopathology Bias

Big-C bias

Our model predicted Big-C bias ($F(5, 194) = 11.09$, $R^2 = .22$, $p < .001$). Again, the only variable predicting the Big-C bias was fixed creative mindset for students with a $\beta = .43$ ($p < .001$). Students endorsing higher levels of fixed creative mindset demonstrated higher levels of Big-C bias. None of the four protective factors made a meaningful contribution to the model (see Table 6).

Table 6.
Multiple Regression Table for Predicting Overall Big-C Bias (N = 209)

Predictor	*B*	*SE B*	*β*	Partial r^2	*p*
Intercept	2.23	.41			<.001
Desirability of Teaching for Creativity	-.02	.06	-.02	.00	.79
Self-Efficacy for Teaching for Creativity	-.08	.05	-.11	.01	.11
Desirability for Students to Develop Creativity	-.03	.04	-.06	.00	.42
Growth Creative Mindset for Students	-.02	.05	-.03	.00	.66
Fixed Creative Mindset for Students	.24	.04	.43	.18	<.001

Note. R^2 = .222, Adjusted R^2 = .202. Dependent Variable: Big-C Bias

Discussion

In this study, we utilized the Dynamic Creative Pedagogy Model (DCPM) (Kettler, 2023), which postulates that there is a dynamic interchange between teachers' knowledge about creativity and teachers' beliefs about creativity and both influence their intentions to enact creative pedagogy. Teacher beliefs tend to have stronger affective and evaluative components than teacher knowledge (Nespor, 1987). Therefore, beliefs may be more influential than acquired knowledge when teachers are forming pedagogical intentions (Pajares, 1992). The present study concentrated on *teacher creativity beliefs* to investigate how one set of educators' beliefs (about creativity) predicted another set of beliefs (creativity biases). Specifically, whether educators' beliefs about teaching for creativity predicted their creativity biases. We obtained three major findings: (a) creativity biases were slightly, but not strongly endorsed, (b) fixed creative mindset predicted all biases, and (c) self-efficacy for teaching for creativity was protective against the arts bias. Bandura's social cognitive theory (1997) emphasizes triadic reciprocal causation. Personal factors (including beliefs) interact with behaviors and environmental influences dynamically. In this case, the personal factor of higher self-efficacy for teaching for creativity makes teachers less likely to cling to fixed mindsets or biases about creativity as their lived experiences affirm creative's malleability and broad applicability. Moreover, there is evidence that creative self-efficacy is malleable and can be increased through targeted interventions (Mathisen & Brønnick (2009). Thus, specific interventions to increase teachers' self-efficacy for teaching for creativity theoretically should reduce the prevalence of fixed-creative mindsets in the educator population as observed in the present sample.

In the DCPM, all three categories of beliefs, creativity bias, creative mindsets, and self-efficacy for teaching for creativity are located in the Teacher Creativity Beliefs box on the DCPM. In this study, we were only testing the relationships between those three belief categories. Future studies should further explore how both teacher creativity knowledge and teacher creativity beliefs predict creative pedagogy intentions.

First, education students largely did not endorse an overall creativity bias. All in all, this is good news and points to recent findings in which samples consisting of general populations (Benedek et al., 2021) and practicing educators (Puryear & Lamb, 2024) were more likely to endorse creativity facts than creativity myths. Our sample included graduate students in education which may also be a nod to Puryear & Lamb (2024) findings related to postgraduate education and higher endorsement of creativity facts.

In our study, endorsement of the three specific biases ranged from less than 1% (Big-C) to 33.33% (arts bias). This aligned with Patston et al. (2018) who found that although educators did endorse the arts bias, their endorsement was relatively low. Puryear & Lamb (2024) found that educators were less likely to endorse the arts bias than the general population sample used in Benedek and colleagues' (2021) study. Endorsement of the arts bias may be related to lingering misconceptions of creativity (Benedek et al., 2021; Mullet et al., 2016), and though some studies have yielded promising results, the misconception of associating creativity with the arts is still present. The persistence of the arts bias may be due to how science and mathematics are taught in American K-12 education, which impresses on students that there is only one way to solve each problem (DeHaan, 2011). In contrast to the arts, which is seen as a form of self-expression and inherently creative (Zimmerman, 2009). Consequently, students may perceive math and science as the opposite to the arts. These students then grow up to be teachers themselves and continue to hold this arts bias. For instance, Kapoor et al. (2024) found that artistic occupations were endorsed as more creative than other occupations (e.g., business, science). Puryear & Lamb (2024) found that holding an "arts-centric view" of creativity was the most prevalent reason participants either saw themselves as creative or not creative (p. 4). However, professional development and intentional training may provide one potential avenue for change (Anderson et al., 2022; Cropley et al., 2019; Puryear & Lamb, 2024).

Second, we found that fixed creative mindset predicted all biases; thus, indicating a fixed creative mindset as a potential risk factor for the endorsement of creativity bias overall and specific creativity biases. Holding a fixed creative mindset or fixed creative ability beliefs has been linked to creative mortification, defined as "the loss of one's willingness to pursue a particular creative aspiration following a negative performance outcome" (Beghetto, 2014, p. 266) and suppressed creative problem-solving (Karwowski, 2014). Karwowski described a mindset-as-trait approach where mindsets shap how individuals approach creative challenges, including the challenge of implementing creative pedagogy. In contrast, holding a growth creative mindset has been associated with positive outcomes such as a stronger creative personal identity (Puente-Díaz & Cavazos-Arroyo, 2017) and creative achievement (Li et al., 2020).

In the present study doctoral students had a lower endorsement of growth mindset compared to master's and undergraduate students. It is possible that including doctoral students attenuated the relationship between growth mindset and creativity bias. However, the inclusion of graduate and undergraduate students within the same analysis did provide greater statistical power and more variance providing a more accurate understanding of the relationship between growth mindset and creativity bias. In the context of our study, this relationship is concerning because the belief that creativity is unchangeable may deter educators from engaging in creative pedagogy (Paek & Summers, 2017). We believe that the relationship between fixed creative mindset and creativity bias, might be explained by participants holding limited or inaccurate views of creativity. For instance, the arts bias views creativity as limited to the arts. The psychopathology bias views creativity as limited to those with mental illness. The Big-C bias views creativity as limited to eminent creators. Thus, it may be a limited view of creativity that is driving the relationship between a fixed creative mindset and each specific creativity bias. Perhaps a future latent variable analysis can test whether having a limited view of creativity predicts a fixed creative mindset.

Third, self-efficacy for teaching for creativity was the only belief that protected against creativity biases (overall creativity bias and the arts bias specifically). Otherwise stated, participants who had higher levels of self-efficacy for teaching for creativity were less likely to endorse any of the creativity biases. This could be related to education students' creativity knowledge. For instance, Puryear & Lamb (2024) found that "postgraduate education and getting information from more authoritative sources (e.g., scientific journals) was positively related to creativity knowledge, or less creativity myth endorsement and higher endorsement of creativity facts" (p. 10). This suggests that targeted interventions during teacher education or in professional development that seek to increase educators' self-efficacy for teaching for creativity and use scientific evidence to build creativity knowledge (Puryear & Lamb, 2024) may reduce or eliminate biases. Creativity training has led to increased overall creative self-efficacy and creative production (Byrge & Tang, 2015; Mathisen & Bronnick, 2009). Additionally, Anderson et al. (2022) found that educators' creative mindset and self-efficacy for teaching creativity improved after a blended professional development course on creativity in the classroom. Although Anderson and colleagues did not see creativity biases decrease, increasing creative self-efficacy may help to reduce creativity biases amongst educators.

We also had some minor findings related to how beliefs differ across participants' age and educational levels. Younger participants were more likely to agree that teaching for creativity was desirable for their teaching practice, but they also were more likely to agree with creativity bias overall compared to older participants. This may indicate that younger educators want to teach for creativity but do not have the necessary knowledge about creativity. This observation is supported by Levanon (2021), who found that over the course of a teaching practicum year, pre-service teachers shifted their perspective from believing that schools inhibit creative teaching to recognizing that schools can actually enable it. This was further supported by our undergraduate participants (teacher education students)

scoring higher than graduate students in the arts bias which may be associated with graduate students' increased level of education and a decrease in creativity bias.

Furthermore, education students in a doctoral program had higher self-efficacy for teaching creatively compared to education students in the undergraduate, teacher education program in this study. This suggests that creative teaching ability may be linked to graduate education, or at the very least, it points to the relationship between additional education or training and creativity knowledge (Puryear & Lamb, 2024). However, doctoral students also had a significantly lower endorsement of creative growth mindset compared to undergraduate and master students. This may be related to academic stress associated with doctoral education which could be negatively related to growth mindset (Mosanya, 2021). Lastly, older education students tended to have higher self-efficacy for teaching for creativity than younger education students in this study which may be related to their years of experience in teaching. Years of teaching experience is typically associated with an increase in teaching self-efficacy (Rubenstein et al., 2018). The relationship between creativity beliefs and educators' age and level of education merits further investigation.

Limitations and future directions

A limitation to the present study is the reliance on one sample of educators from one geographical area. It is reasonable to suspect that geography may influence creativity bias as comprehension and professional application of creativity do not seem to be equally distributed across geographic regions or cultures (Florida, 2014; Shao, 2019). Thus, this limits generalizability to different cultures. Our sample included educators with a broad range of experience and years of service in educational work, and deeply held beliefs may become more firmly held over time. Regarding future studies, we encourage researchers to collect data from specific groups including those who are still in more malleable positions, such as pre-service teachers or early career teachers. Additionally, a limitation of this study was the lack of explanatory analyses. Given our data limitations, we were not able to explain why these relationships between creativity biases and educators' beliefs exist. Adopting a mixed-method approach could better explain why these relationships develop or how they might be modified through training and intervention.

Another limitation is that although many creativity biases exist, we limited our exploration to three creativity biases, thus, providing a snapshot of this area of research. Since creativity is a term used both in common public communication as well as in technical scientific discourse, biases and misunderstandings are not surprising. Future studies may consider using qualitative research designs to garner deeper, more organic evidence of creativity biases. For example, researchers can use a phenomenological study design to conduct interviews for focus groups with educators to explore the underlying reasons for their creativity beliefs, when they developed these beliefs, and how these beliefs relate to creativity biases. A qualitative approach would expand and improve our understanding of the ethology and impact of each of creativity bias on teaching pedagogy.

A third limitation is the lack of a social desirability bias measure. The low scores on this measure may be due to participants giving responses they think are desired rather than their true opinion. However, since these were confidential online surveys, students may have felt less pressure to respond in a socially desirable manner. A fourth limitation is that there were several similar statistical analyses conducted, but familywise error rates were not accounted for. However, correcting for the type I error rate can lead to an increase in type II errors (Akobeng, 2016). Instead, it is recommended to focus on effect sizes instead of significance testing (Akobeng, 2016; Feise, 2002). The present study has a small effect size. However, this only tests a small portion of the theoretical framework. There may be larger effect sizes in other aspects of this model. While the present study has small effect sizes, replication studies will approximate the true effect size better. Additionally, future replication studies can use other measures of creativity, which may have higher levels of reliability. The present study had two subscales

that were slightly below the commonly recommended threshold for alpha of .70 (Nunnally, 1978). Thus, caution should be used when interpreting the findings.

As stated above, the Dynamic Creative Pedagogy Model (Kettler, 2023) highlights how educators' beliefs can influence their intention to engage in creative pedagogy. Training and supporting educators for the implementation of creative pedagogy should include examination and potential modification of beliefs or biases in addition to developing their knowledge and skills. An area for future research is to use an experimental intervention to assess if decreasing fixed creative mindset, which was the only predictor of all biases, will reduce or eliminate endorsement of these biases. If this type of causal link between fixed creative mindset and creativity biases were established, we might strengthen our confidence that teacher training at both pre-service and in-service stages can reduce perceptions that are counter-productive to creative pedagogy and creative talent development in students. Furthermore, this study focused on how one set of beliefs (i.e., beliefs about creativity) can predict another set of beliefs (i.e., creativity biases). Subsequent studies may more deeply explore the dynamic relationship between the development of creative knowledge and skills and educators' intentions to engage in creative pedagogy.

Lastly, we analyzed relationships using overall creativity bias as a single construct, and we analyzed relationships with each of the three underlying types of bias (arts, psychopathology, Big-C). Future theoretical and empirical investigations should address the best way to conceive of creativity bias as a single construct with multiple dimensions or as a broad construct with distinct and unique factors requiring latent analyses. Furthermore, future research should aim to conduct longitudinal studies to assess whether educators' beliefs about creativity or creativity bias developed first. In conclusion, replication studies, which use a one-directional hypothesis, should be conducted to assess the stability of these findings (i.e., fixed creative mindset acted as a risk factor to endorsing creativity beliefs while self-efficacy for teaching for creativity was a protective factor).

Conclusion

This study further illuminates the relationship of educators' beliefs about creativity and their potential creativity biases. We anticipate that fixed creative mindsets and creativity biases inhibit the use of creative pedagogies. Teacher education is a complex interplay between developing both accurate teacher beliefs and scientific pedagogy knowledge. This study may encourage other researchers to pick up the mantel of investigating how beliefs impact intention and how intentions impact teacher behavior. Although the field of educators' beliefs is rich and well-established (Fives & Gill, 2015), the specific understanding of how educators' beliefs about creativity impact their implementation of creative pedagogy is still a fledgling research area. With the increasing automation of simple jobs, the creative economy will continue to grow. Thus, developing students' creativity will likely benefit students' career trajectories, especially in dynamic innovation economies.

There is power in language, and the academic study of creativity bias (e.g., Mueller et al., 2012; Patston et al., 2018) connotes creativity bias as beliefs that are in need of revision as they tend to distort the recognition, encouragement, or development of creativity. Other approaches may consider these beliefs as pedagogical stances informed by context, values, and institutional priorities. Educators' beliefs about creativity may reflect legitimate concerns such as a pedagogical balance between creativity and domain expertise. Thus, it is possible that what we call bias beliefs others may see as complex positions embedded in teachers' broader ecologies. In other words, we admit our potential bias about bias and note that other legitimate positions exist and should be considered. More importantly, we suggest further research on which educator beliefs either constrain or enrich opportunities for creative expression. This research can also investigate the impact of various educational settings (i.e., elementary math vs. secondary math) influences educators' creativity emphases.

Applied recommendations

- We should not assume that students in teacher education programs have accurate, scientific understandings about the nature of creativity and its potential for development.
- Preparing teacher education students for the use of creative pedagogies involves teaching and learning in both teachers' beliefs about creativity as well as teachers' knowledge and skills related to creativity.
- Effective preparation for developing teachers' creative pedagogies involves critically examining teachers' belief and systematic reduction of creative biases, including fixed creative mindsets.

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