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DESIGN THINKING IN TEACHER EDUCATION: DEVELOPING STUDENT CREATIVITY AND EMPATHY

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Abstract. This study investigates the role of design-thinking activities in developing creativity and empathy among preservice teachers, highlighting the potential of this approach for modern teacher education programs. A mixed-methods design was employed, combining quantitative data from a Likert-scale questionnaire with qualitative insights from open-ended questions. Twenty-eight undergraduate students enrolled in a pedagogical program participated in a series of design-thinking tasks throughout one academic semester. These activities included empathy-building exercises, problem-definition workshops, ideation sessions, lesson prototyping, and peer-feedback exercises. Quantitative analysis indicated that participants perceived significant improvements in both creativity (mean = 4.3) and empathy (mean = 4.1), as well as increased confidence in applying design-thinking strategies in their future teaching practice. Qualitative responses further highlighted the value of iterative and learner-centered problem-solving, emphasizing how the activities helped students understand learners' perspectives, experiment with instructional strategies, and develop reflective thinking skills. Some participants noted challenges, such as difficulties in defining precise problems and managing time during prototyping, which were generally considered constructive experiences that fostered resilience and adaptability. The findings suggest that design-thinking methodologies not only enhance individual competencies but also promote an integrated mindset combining creativity, empathy, and reflective practice, essential for future teachers navigating complex educational environments. Based on these results, practical recommendations for integrating design thinking into teacher preparation programs are provided, including structured guidance, hands-on exercises, reflective practice, and opportunities for long-term application.

Keywords: design thinking, teacher education, creativity, empathy, preservice teachers, innovative pedagogy, students, reflection

Introduction

In recent years, teacher education systems worldwide have undergone a significant transformation driven by rapid technological advancement, changes in student learning needs, and growing expectations for teachers' creative and human-centered problem-solving skills. As contemporary classrooms become more diverse and complex, future teachers are increasingly required not only to master subject knowledge but also to demonstrate empathy, flexibility, and innovative thinking in designing learning experiences. These demands highlight

the need for pedagogical approaches that foster both creativity and a deep understanding of learners' perspectives.

Recent international studies emphasize that future teachers require not only subject-specific competencies but also creative problem-solving abilities, empathy, collaboration, and adaptability in digitally transformed educational environments. Research conducted in teacher education programs demonstrates that design thinking contributes to learner-centered pedagogical practices, reflective thinking, and the development of innovative instructional strategies. In this context, design thinking is increasingly recognized as an effective approach for preparing teachers capable of responding to the challenges of contemporary education.

Design thinking, originally developed in the fields of engineering and product innovation, has emerged as a powerful educational methodology capable of addressing these challenges. Characterized by its iterative, learner-centered process-empathizing, defining problems, ideating, prototyping, and testing-design thinking encourages preservice teachers to approach educational problems with curiosity, openness, and a willingness to experiment. Research shows that design-thinking-based approaches enhance students' ability to generate original ideas, collaborate effectively, and develop solutions grounded in real learner needs. Such qualities are essential for future teachers who must navigate unpredictable classroom situations and design inclusive, engaging learning environments.

In teacher education, design thinking holds particular promise for cultivating two critical competencies: creativity and empathy. Creativity enables preservice teachers to design innovative instructional strategies and adapt to diverse student learning styles. Empathy, in turn, helps them understand learners' experiences, motivations, and challenges, making instruction more responsive and supportive. Together, these competencies form the foundation of human-centered teaching.

Despite its potential, the integration of design thinking into teacher preparation programs remains an emerging field. Many studies highlight its relevance, yet limited research has examined how design-thinking-based activities specifically contribute to the development of creativity and empathy among preservice teachers. Addressing this gap is particularly important for modernizing teacher education practices and aligning them with 21st-century educational expectations.

Therefore, this study explores the role of design thinking in teacher education with a focus on how it supports the development of student creativity and empathy. By analyzing theoretical foundations and presenting small-scale qualitative findings, the paper aims to provide insights into effective pedagogical strategies for preparing future teachers capable of designing meaningful, learner-centered educational experiences.

Existing studies have examined the implementation of design thinking in higher education, interdisciplinary learning, and teacher preparation. International researchers highlight that design-thinking-based learning environments foster creativity, collaboration, and human-centered approaches to educational problem solving. At the same time, domestic studies mainly focus

on innovation in pedagogy and digital transformation, while the role of design thinking in developing empathy and creativity among preservice teachers remains insufficiently explored. Therefore, further research in this area is necessary.

Materials and methods

This study employed a mixed-methods approach combining a small-scale survey with elements of qualitative analysis in order to examine how design-thinking-based learning activities contribute to the development of creativity and empathy among preservice teachers. Mixed methodology was selected because the competencies under investigation creative ideation, empathic awareness, and reflective thinking are multidimensional and cannot be fully captured through quantitative measures alone, a rationale supported in contemporary educational research [1].

The research was conducted at a Kazakhstani university and involved 28 preservice teachers enrolled in third- and fourth-year teacher preparation programs. All participants had prior exposure to design-thinking principles through coursework, and their participation was voluntary. Data were collected using a student questionnaire developed for this study, which consisted of ten Likert-scale items and five open-ended questions. The Likert-scale items were rated on a 5-point scale (1 = Strongly Disagree, 5 = Strongly Agree) and measured perceived development in creativity, empathy, and the applicability of design-thinking activities in future teaching. Sample items included statements such as: "Design-thinking activities helped me generate more original ideas," "Empathy-based tasks helped me better understand learners' needs," and "I feel confident applying design thinking in my future teaching."

To ensure content validity, the questionnaire items were developed based on existing studies related to creativity, empathy, and design thinking in education and were reviewed by two experts in педагогical research and teacher education. A pilot administration with a small group of students (n=8) was conducted to clarify wording and improve item consistency. Internal consistency reliability of the Likert-scale items demonstrated acceptable results (Cronbach's alpha = 0.81).

The open-ended questions prompted students to describe the most helpful design-thinking activities, how these activities influenced their understanding of learners, challenges encountered during the tasks, and how they plan to use design thinking in their future teaching. Presenting the full version of the questionnaire in the text ensures transparency and allows replication of the study.

During one academic semester, students engaged in a sequence of design-thinking activities integrated into a methods course. These activities followed the widely used five-stage model-empathizing, defining, ideating, prototyping, and testing [2]. Students conducted empathy-based tasks such as interviews and observations, formulated learner-centered problem statements, participated in ideation workshops, created prototypes of lesson plans or instructional materials, and tested these prototypes through peer feedback. At the end of the course, they completed the questionnaire reflecting on their experiences.

Quantitative data obtained from the Likert-scale questions were summarized using descriptive statistics to identify general trends in students' self-assessments of creative and empathic development. Qualitative responses were analyzed using thematic coding following the guidelines of Braun and Clarke [3]. Initial codes were generated independently from the data and later clustered into broader categories reflecting students' perceptions of creative growth, empathy development, challenges encountered during design-thinking tasks, and the perceived relevance of design thinking for future teaching. The integration of quantitative and qualitative findings allowed for triangulation, thereby strengthening the credibility of the results in line with recommendations for mixed-methods educational research [4-7].

Results

To quantify the students' responses on the Likert scale, the following formula was used to calculate the mean score for each item:

$$X = \frac{\sum_{i=1}^{n} x^1}{n}$$

where X represents the mean score for a given item, x^i is the score assigned by the *i-th* respondent, and n is the total number of respondents. This formula allowed us to obtain a general measure of perceived growth in creativity, empathy, and the applicability of design-thinking activities for future teaching.

Analysis of the Likert-scale items indicated that design-thinking activities had a positive impact on the development of both creativity and empathy among preservice teachers. The mean score for creativity-related items was 4.3 out of 5, suggesting that most students felt more confident in generating original ideas, designing innovative solutions, and thinking beyond traditional teaching methods. The quantitative findings are summarized in Table 1.

Table 1. Mean scores of students' perceptions of design-thinking activities

Variable	Mean score
Creativity development	4.3
Empathy development	4.1
Usefulness for future teaching	4.2
Confidence in applying design thinking	4.0

Empathy-related items received a mean score of 4.1, reflecting an increased awareness of learners' needs, emotions, and challenges. The perceived usefulness of design-thinking activities for future teaching scored 4.2, and confidence in applying the design-thinking model in real pedagogical practice averaged 4.0.

Qualitative analysis of the open-ended responses further confirmed these findings. Students frequently noted that empathy-building tasks, such as interviews and classroom observations, helped them better understand learners' perspectives. One student remarked, "Design-thinking exercises made me think deeply about students' feelings and motivations, which I rarely considered

before." Another wrote, "Creating lesson prototypes allowed me to experiment and test my ideas without fear, which boosted my creative confidence."

Some participants reported challenges during the process, including difficulty in defining precise problem statements and time constraints during prototyping. However, these challenges were generally perceived as constructive, contributing to the development of problem-solving resilience and iterative thinking skills.

Overall, the combination of quantitative and qualitative data indicated that the majority of participants perceived significant gains in both creative and empathic competencies. Most students also expressed the intention to apply design-thinking approaches in their future teaching, demonstrating the practical relevance and potential of these methods in teacher education.

Discussion

The results of this study indicate that integrating design-thinking activities into teacher education programs has a positive effect on developing both creativity and empathy among preservice teachers. The quantitative findings, with mean Likert-scale scores of 4.3 for creativity and 4.1 for empathy, suggest that students perceived a notable increase in their ability to generate innovative solutions and understand learners' perspectives. These results align with previous research highlighting design thinking as an effective method for enhancing creative confidence and learner-centered thinking in educational contexts.

Qualitative responses further supported these conclusions, revealing that students valued empathy-building exercises such as peer interviews, classroom observations, and problem-definition tasks. Many participants reported that these activities helped them better recognize the needs, motivations, and challenges of learners, which is consistent with the literature emphasizing empathy as a core competency in 21st-century teaching.

Although some students encountered challenges, such as difficulty formulating precise problem statements and managing time during prototyping, these were largely viewed as constructive elements of the learning process. The iterative nature of design thinking encourages reflection and resilience, enabling future teachers to adapt to complex classroom situations and develop flexible problem-solving strategies.

The findings of this study are consistent with previous international research demonstrating that design thinking supports creative confidence, reflective practice, and learner-centered pedagogical thinking among preservice teachers. Similar results were reported in studies emphasizing the role of empathy-driven instructional design and collaborative problem solving in teacher education contexts. This consistency suggests that design thinking may serve as a universal pedagogical framework applicable across diverse educational systems.

Importantly, the study suggests that design-thinking activities do not only enhance isolated skills but also cultivate an integrated mindset combining creativity, empathy, and reflective thinking. This holistic development is critical for preservice teachers, who must navigate increasingly diverse and dynamic

educational environments. Moreover, the high levels of student intention to apply design thinking in their future teaching indicate the practical relevance and sustainability of these approaches in teacher education programs.

In conclusion, the findings highlight the value of incorporating design-thinking methodologies into teacher preparation curricula. By promoting both creativity and empathy, such approaches prepare future teachers to design more engaging, inclusive, and learner-centered educational experiences. Despite the positive findings, this study has several limitations. The sample size was relatively small and limited to one university context, which restricts the generalizability of the results. In addition, the study relied primarily on self-reported perceptions rather than objective measurements of creativity and empathy development. Therefore, the findings should be interpreted with caution. Future research could expand on this study by examining larger and more diverse student populations, assessing long-term impacts, and exploring the integration of digital tools within the design-thinking framework to further enhance preservice teachers' competencies.

Conclusion

This study examined the role of design-thinking activities in developing creativity and empathy among preservice teachers. The findings indicate that engaging students in structured design-thinking tasks-such as empathy-building exercises, problem-definition workshops, ideation sessions, and lesson prototyping-can significantly enhance both their creative and empathic competencies. Quantitative data from the Likert-scale questionnaire revealed high perceived gains in these areas, while qualitative responses highlighted the practical and reflective benefits of the approach.

Challenges encountered during the activities, including defining precise problem statements and managing time during prototyping, were generally perceived as constructive, fostering resilience, iterative thinking, and problem-solving skills. Importantly, students reported strong intentions to apply design-thinking methods in their future teaching, suggesting that such experiences have lasting relevance for professional practice.

Overall, this study supports the integration of design-thinking methodologies into teacher education programs as an effective means of preparing future teachers to design learner-centered, inclusive, and innovative educational experiences. By fostering creativity, empathy, and reflective thinking, design-thinking-based approaches contribute to the development of well-rounded, adaptable educators capable of addressing the complex demands of contemporary classrooms.

Based on the findings, the following practical recommendations are proposed for teacher education programs:

1. Integrate design-thinking modules across pedagogical courses to provide consistent exposure to creativity- and empathy-building activities.

2. Incorporate hands-on, iterative tasks such as lesson prototyping and peer-feedback exercises to strengthen students' problem-solving and reflective skills.

3. Provide structured guidance on problem-definition to help students formulate clear and actionable educational challenges.

4. Allocate sufficient time for prototyping and ideation, ensuring students can explore ideas fully without excessive time pressure.

5. Encourage reflective practice by combining quantitative self-assessment (e.g., Likert-scale surveys) with qualitative reflection on the learning process.

6. Promote long-term application by supporting students in transferring design-thinking skills to real classroom situations during teaching practice or internships.

Future research could examine the long-term effects of integrating design thinking, explore larger and more diverse student populations, and investigate the use of digital tools to further enhance creativity and empathy in teacher preparation programs.

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ПЕДАГОГТАРДЫ ДАЯРЛАУ ЖҮЙЕСІНДЕ ОЙЛАУ ДИЗАЙНЫ: СТУДЕНТТІК КРЕАТИВТІЛІК ПЕН ЭМПАТИЯНЫ ДАМЫТУ

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Аңдатпа. Бұл зерттеу болашақ педагогтардың креативтілігі мен эмпатиясын дамытуда ойлау дизайнының рөлін қарастырады және бұл

тәсілдің қазіргі заманғы мұғалімдерді даярлау бағдарламалары үшін потенциалын көрсетеді. Зерттеуде сандық және сапалық әдістердің комбинациясы қолданылды: Лайкерт шкаласы бойынша сауалнама және ашық сұрақтар арқылы алынған деректер талданды. Зерттеуге педагогикалық бағыттағы 28 студент қатысты, олар бір оқу семестрі ішінде ойлау дизайнына негізделген тапсырмаларды орындады. Бұл тапсырмалар эмпатияны дамыту жаттығулары, педагогикалық мәселелерді анықтау семинарлары, идея генерациясы сессиялары, сабақ прототиптерін жасау және әріптестермен кері байланыс алуды қамтыды. Сауалнама нәтижелеріне сәйкес, қатысушылар креативтіліктің (орташа балл = 4,3) және эмпатияның (орташа балл = 4,1) айтарлықтай өскенін, сондай-ақ ойлау дизайны әдістерін болашақ педагогикалық тәжірибеде қолдануға сенімділіктің артқанын атап өтті. Ашық сұрақтарға алынған жауаптар студенттердің оқушылардың қажеттіліктерін, эмоцияларын түсіну, сабақ жүргізудің түрлі әдістерін тәжірибелеу және рефлексия дағдыларын дамыту тұрғысынан тәжірибенің маңызды екенін көрсетті. Кейбір қатысушылар нақты проблемаларды анықтауда және прототип жасау кезінде уақыт тапшылығына байланысты қиындықтарды атап өтті, бірақ бұл қиындықтар конструктивті тәжірибе ретінде қабылданды, өйткені олар төзімділік пен икемді ойлауды дамытуға ықпал етті. Зерттеу нәтижелері ойлау дизайны әдістерінің тек жеке компетенцияларды дамытуға ғана емес, сонымен қатар креативтілік, эмпатия және рефлексивтік дағдыларды біріктіретін интегративті ойлау қалыптастыруға мүмкіндік беретінін көрсетті. Бұл қасиеттер болашақ педагогтарға күрделі білім беру жағдайында тиімді жұмыс істеуге көмектеседі. Алынған деректерге сүйене отырып, студенттердің практикалық дағдыларын дамыту үшін ойлау дизайнын педагогикалық бағдарламаларға енгізуге арналған ұсынымдар берілді, соның ішінде құрылымдық нұсқаулық, практикалық тапсырмалар, рефлексивтік әрекеттер және ұзақ мерзімді қолдану мүмкіндіктері.

Тірек сөздер: ойлау дизайны, педагогтарды даярлау, креативтілік, эмпатия, болашақ педагогтар, инновациялық оқыту әдістері, студенттер, рефлексия

ДИЗАЙН-МЫШЛЕНИЕ В ПЕДАГОГИЧЕСКОМ ОБРАЗОВАНИИ: РАЗВИТИЕ КРЕАТИВНОСТИ И ЭМПАТИИ СТУДЕНТОВ

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Аннотация. Данное исследование посвящено изучению роли дизайн-мышления в развитии креативности и эмпатии у будущих педагогов и подчеркивает потенциал этого подхода для современных программ подготовки учителей. В исследовании применялась смешанная методология, включающая количественный анализ данных с помощью анкеты по шкале Лайкерта и качественный анализ открытых вопросов. В исследовании

приняли участие 28 студентов педагогического направления, которые на протяжении одного учебного семестра выполняли ряд заданий, основанных на принципах дизайн-мышления. Эти задания включали упражнения по развитию эмпатии, семинары по формулированию педагогических проблем, сессии генерации идей, прототипирование уроков и взаимное обсуждение результатов среди студентов. Количественный анализ показал, что участники исследования отметили значительное улучшение как креативности (средний балл = 4,3), так и эмпатии (средний балл = 4,1), а также повышение уверенности в применении методов дизайн-мышления в будущей педагогической практике. Качественные данные подчеркнули ценность итеративного и ориентированного на ученика подхода, показывая, как задания помогали студентам понимать потребности и эмоции обучающихся, экспериментировать с методиками преподавания и развивать навыки рефлексии. Некоторые участники отметили трудности, связанные с формулированием точных проблем и ограничениями по времени при прототипировании, которые, тем не менее, воспринимались как конструктивный опыт, способствующий развитию устойчивости и гибкости мышления. Результаты исследования свидетельствуют о том, что методы дизайн-мышления способствуют не только развитию отдельных компетенций, но и формированию интегрированного мышления, сочетающего креативность, эмпатию и рефлексивные навыки необходимых качеств для будущих педагогов, работающих в сложной образовательной среде.

Ключевые слова: дизайн-мышление, подготовка педагогов, креативность, эмпатия, будущие педагоги, инновационные методы обучения, студенты, рефлексия

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