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Assessing the impact of a business-oriented educational course on the development of entrepreneurial thinking in pre-service primary school teacher

Nurzhaugan Balginbayeva[1], Aktoty Akzholova[1], Zhuldyzai Baimaganbetova[2], Abay Duisenbayev[3], Saule Yerkebayeva[4], Alua Smanova[5], Elmira Aitenova[6]

[1]Department of Primary Education, Faculty of Pedagogy and Psychology, Abai Kazakh National Pedagogical University, Almaty, Kazakhstan
[2]Institute of Pedagogy and Traditional Arts, Korkyt Ata Kyzylorda University, Kyzylorda, Kazakhstan
[3]Department of Pedagogy and Educational Management, Faculty of Philosophy and Political Science, Al-Farabi Kazakh National University, Almaty, Kazakhstan
[4]Department of Preschool Education and Social Pedagogy, Faculty of Pedagogy and Psychology, Abai Kazakh National Pedagogical University, Almaty, Kazakhstan
[5]Department of Preschool and Primary Education, Faculty of Pedagogy and Social Sciences, M.Kh. Dulaty Taraz University, Taraz, Kazakhstan
[6]Department of Pedagogy, Faculty of Pedagogy and Psychology, Abai Kazakh National Pedagogical University, Almaty, Kazakhstan

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ABSTRACT

This study aimed to assess the impact of a business-oriented educational course on the development of key components of entrepreneurial thinking among pre-service primary school teachers. The research involved 220 students from M. Dulati Taraz University. A pre-test/post-test design was used with an author-developed questionnaire. Entrepreneurial thinking was assessed both before and immediately after the course. Statistical analysis revealed a significant increase in the overall level of entrepreneurial thinking and its key components, including initiative, creativity, risk-taking, result orientation, and persistence. The course featured innovative teaching methods such as project-based learning, case studies, and business games, and was offered as an elective module on an experimental educational platform. The findings are consistent with international research, highlighting the importance of integrating entrepreneurial thinking into teacher training to enhance professional preparedness. These findings can help shape modern educational programs in Kazakhstan and the countries of the Commonwealth of Independent States, in line with global trends and the challenges of the 21st century.

Corresponding Author:

Aktoty Akzholova
Department of Primary Education, Faculty of Pedagogy and Psychology
Abai Kazakh National Pedagogical University
Dostyk ave., 13, Almaty, Kazakhstan
Email: aktoty_72@mail.ru

1. INTRODUCTION

In the context of rapid advances in digital technologies, globalization, and labor market transformation, modern education systems must prepare graduates with both subject expertise and essential soft skills such as critical thinking, creativity, initiative, and an entrepreneurial mindset. Entrepreneurial thinking has become a crucial 21st-century competency, relevant across professions including teaching [1]. It is important to clarify the distinction between entrepreneurial skills and entrepreneurial thinking. While

entrepreneurial skills refer to specific practical abilities like business planning or financial management, entrepreneurial thinking represents a broader mindset that includes creativity, initiative, risk-taking, and persistence. This mindset underpins the capacity to recognize opportunities and innovate, which is fundamental for adapting to the rapidly changing educational environment. Today's primary school teachers not only impart knowledge but also serve as facilitators, mentors, and catalysts for change [2]. Therefore, developing entrepreneurial thinking in future teachers is especially important as it fosters active engagement, self-development, innovative problem-solving within inclusive and science, technology, engineering, arts, and mathematics (STEAM)-focused education, and adaptability to evolving educational conditions [3]. Despite increasing global attention to entrepreneurship education, Kazakhstan lacks a systematic approach to integrating business innovation methods in teacher training. Current pedagogical programs, including primary school teacher training, address business skills in a fragmented manner, creating a gap between the fast-evolving demands of education and the professional readiness of graduates [4], [5].

The scientific novelty of this study lies in the development and testing of a specialized business-oriented educational course tailored for future primary school teachers in Kazakhstan, alongside a quantitative assessment of its impact on entrepreneurial thinking. While international pedagogical practice actively discusses entrepreneurial skills development in future teachers [6]–[10], empirical evidence from developing countries like Kazakhstan remains limited. This study fills this gap by providing data from M. Dulati Taraz University, which may inform both national reforms and international discourse on entrepreneurial teacher education in post-Soviet and transition economies. To provide a stronger conceptual basis for this study, a structured theoretical framework has been introduced. This framework identifies the core components of entrepreneurial thinking—initiative, creativity, risk-taking, result orientation, and persistence—as central competencies to be fostered in pedagogical education. These constructs are grounded in the established models of the entrepreneurial mindset profile (EMP) and entrepreneurial attitude orientation (EAO), which inform both the design of the educational intervention and the assessment tools used in the study. The framework clarifies the theoretical background, ensures alignment between research objectives and methodology, and facilitates a more focused interpretation of the empirical findings regarding the course's impact on students' entrepreneurial development.

Recent studies confirm the effectiveness of business-oriented courses in fostering leadership, creativity, and perseverance in future teachers [11]–[17]. However, systematic empirical data on such initiatives in Kazakhstan, particularly with regard to primary school teachers, are scarce. This study aims to assess how participation in a business-oriented course influences the development of entrepreneurial thinking in this target group. To address the identified gap, the study posed the following research question: To what extent does participation in a business-oriented educational course contribute to the development of entrepreneurial thinking among pre-service primary school teachers? The objective of the study was to assess the impact of such a course on the development of key components of entrepreneurial thinking in this target group. Based on the theoretical framework and previous empirical findings, the following hypothesis was formulated: participation in the course significantly increases the level of entrepreneurial thinking among pre-service primary school teachers. This hypothesis guided the research design and data analysis, aiming to empirically validate the effectiveness of entrepreneurial education in the context of teacher training.

2. METHOD

2.1. Study design

This study used a pre-post design. Entrepreneurial thinking was measured twice: one week before the course and one week after it ended [18], [19]. The choice of a pre-post design without a control group was due to organizational and ethical reasons, as well as the specific nature of the educational process, in which all students in the Primary Education program took this course as part of their curriculum [20]. This design allows for tracking changes within the same participants [21]. To reduce potential bias, standardized and validated tools were used to assess entrepreneurial thinking [22], along with consistent conditions for administering the surveys at both time points. Questionnaires were completed in a controlled environment that ensured responses remained confidential and anonymous, reducing the likelihood of socially desirable answers. All participants provided informed consent to take part in the study. The protocol was reviewed and approved by the Ethics Committee of M. Dulati Taraz University, ensuring compliance with ethical standards and the rights of participants.

2.2. Participants

A total of 220 3rd-4th year students from M. Dulati Taraz University, Taraz, Kazakhstan, participated in the study. Participation was voluntary, and all participants gave informed consent. The sample included students who regularly attended classes in the chosen course, without restrictions on gender,

ethnicity, or socioeconomic status. Inclusion criteria were: 3rd or 4th year students majoring in primary education, voluntary consent, and attendance of at least 80% of the course classes. Students who did not complete the course or were absent from the final testing were excluded. Table 1 presents the characteristics of the participants, reflecting their academic and social profiles.

Table 1. Demographic and academic characteristics of participants

Characteristic	Categories/indicators	N	%/mean (SD)
Gender	Female	170	77.3
	Male	50	22.7
Year of study	3rd year	120	54.5
	4th year	100	45.5
Age (years)	-	-	M=20.8, SD=1.2
Grade point average (GPA)	-	-	M=3.6, SD=0.4
Previous entrepreneurial experience	Yes	40	18.2
	No	180	81.8

2.3. Procedure

The course was delivered in a face-to-face format over one academic semester (16 weeks), totaling 48 academic hours (3 hours per week). The main goal was to foster an entrepreneurial mindset in future educators by combining theoretical knowledge with practical assignments and project-based learning. Classes were held in person, with a workload of 3 hours per week. Each session included a lecture and a practical component, allowing for an effective blend of theoretical understanding and direct application. The content and structure of the course were developed based on the core components of entrepreneurial thinking identified in the EMP and EAO models—initiative, creativity, risk-taking, and achievement orientation—to ensure alignment between course activities and the targeted learning outcomes [23]. To help participants succeed, they received study guides and methodological recommendations in both printed and electronic formats, making it convenient to study outside the classroom. Modern equipment was actively used during the training: multimedia projectors and interactive boards for presentations, as well as computers with Internet access and specialized software for group assignments, creating presentations, and developing business plans [24]. Additionally, participants had access to extra resources such as flip charts, markers, handouts, and prototyping kits, which supported creative thinking and idea visualization. Attendance and completion of intermediate assignments were monitored by the instructor, enabling timely progress tracking and, if necessary, adjustments to the learning plan. Special emphasis was placed on feedback: regular consultations and individual recommendations provided ongoing support throughout the training, fostering deeper understanding of the material and personal growth for each participant.

A detailed weekly course plan is provided in Table 2, outlining the topics, objectives, teaching methods and resources used throughout the 16-week program. This structured approach ensures a balanced combination of theoretical instruction and practical activities aimed at developing an entrepreneurial mindset in future educators. Each week focuses on specific competencies, supported by appropriate facilities and learning materials to enhance student engagement and skill acquisition.

Table 2. Weekly course plan

Week	Topics and objectives	Methods and activities	Facilities and resources
1	Introduction to entrepreneurship and course goals	Lecture; group discussion	Classroom; multimedia projector
2	Fundamentals of entrepreneurial mindset	Lecture; case studies	Handouts; interactive whiteboard
3	Creative thinking (methods and techniques)	Brainstorming; creative exercises	Flipchart and markers
4	Business idea analysis and opportunity evaluation	Group discussion; business games	Computers with internet; presentation software
5	Basics of financial literacy for entrepreneurs	Lecture; practical tasks	Handouts; calculators
6	Designing and planning a business idea	Group project work	Computers; business plan templates
7	Marketing and promotion (basic concepts)	Lecture; case studies	Interactive whiteboard; presentation slides
8	Legal foundations of entrepreneurship	Lecture; Q&A	Handouts
9	Developing a product/service prototype	Group work; hands-on activities	Workshop space; prototyping materials
10	Teamwork and project management	Business games; role play	Classroom; group work area
11	Problem-solving and decision-making in business	Simulations; case studies	Computers; simulation software
12	Developing a business project presentation	Practical session	Computers; projector; presentation software
13	Communication and negotiation skills	Role play; communication training	Classroom; video recording equipment
14	Ethics and social responsibility of an entrepreneur	Lecture; group discussion	Handouts
15	Final project preparation	Consultations; project refinement	Computers; presentation materials
16	Project presentations and course wrap-up	Presentations; feedback	Multimedia-equipped classroom

The development and implementation of a business-oriented educational course were carried out as part of an internal innovation project at M. Dulati Taraz University. The course was piloted as an innovative module within the faculty of pedagogy's experimental site to update the training content for future teachers, aligning it with current socio-economic challenges. An interdepartmental working group developed the module with support from university management and coordination with the educational and methodological department. The course was offered as part of the elective component of the educational program, providing academic flexibility and preventing student overload. Due to its experimental nature, the course incorporated modern pedagogical technologies such as project work, business games, and case analysis. The educational process emphasized cultivating practical skills and fostering entrepreneurial thinking among future primary school teachers. The results of the pilot phase provide a foundation for expanding this approach to other programs and faculties within the university.

2.4. Instrument and measures

To assess entrepreneurial thinking, we used an author-developed questionnaire based on adapted scales from the EMP and EAO. Translation into Kazakh and Russian and statement adaptation were carried out using the double translation method, followed by expert calibration. The questionnaire, as seen in Table 3, includes statements rated on a Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). Content validity was confirmed through expert evaluation (n=5), which included two pedagogy teachers, two entrepreneurship instructors, and one business coach. Each expert assessed the alignment of statements with the targeted constructs (initiative, creativity, and risk propensity) and their relevance to the student audience. The translation of the EMP and EAO scales from English employed the double translation and back-translation method, involving independent linguists and educators in the review process. The questionnaire was piloted on a separate sample of 30 students, resulting in clarification of the wording for two statements. Internal consistency, measured by Cronbach's alpha, was α=0.85, indicating high reliability of the instrument.

The choice of the EMP as a basis for the instrument is justified by its comprehensive structure, which captures key dimensions of entrepreneurial thinking such as initiative, creativity, risk-taking, and persistence—competencies that are highly relevant to the teaching profession in the 21st century. The EMP has been widely used in both business and educational contexts, demonstrating its versatility and adaptability across domains. Its application in this study enables the assessment of not only general entrepreneurial traits but also those particularly valuable in pedagogical practice, such as proactive behavior, innovative thinking, and goal orientation. This makes the EMP a suitable and theoretically grounded tool for examining the entrepreneurial mindset of future teachers.

Table 3. Scales and items of the entrepreneurial thinking questionnaire

Scale	Item no.	Statement	Rating (1–5)
Initiative	1	I often come up with new ideas on my own.	1 2 3 4 5
	5	I take initiative, even when not required.	1 2 3 4 5
	8	I can explain why my ideas are valuable.	1 2 3 4 5
	12	Making my own decisions is important to me.	1 2 3 4 5
	18	I believe I can shape my career path.	1 2 3 4 5
Creativity	3	I look for creative ways to solve problems.	1 2 3 4 5
	7	I enjoy making new things.	1 2 3 4 5
	11	I can quickly think of new ideas.	1 2 3 4 5
	14	I always try to improve my ideas and projects.	1 2 3 4 5
Risk-taking	2	I'm comfortable making risky decisions.	1 2 3 4 5
	6	I can work well in uncertain situations.	1 2 3 4 5
	10	I'm willing to take responsibility for risks.	1 2 3 4 5
	13	I can work with unclear information.	1 2 3 4 5
	16	I'm not afraid to try something new.	1 2 3 4 5
Result orientation	4	I feel responsible for my results.	1 2 3 4 5
	9	I see mistakes as a way to learn.	1 2 3 4 5
	15	I can present my ideas clearly.	1 2 3 4 5
	17	I can lead others to complete a project.	1 2 3 4 5
	19	I like to set big goals.	1 2 3 4 5
Persistence	20	I keep going until I reach my goals.	1 2 3 4 5

2.5. Teacher training

To ensure high-quality and consistent delivery of the course, teachers involved in its implementation underwent targeted training. The training spanned two days (totaling 8 hours) and equipped teachers with a comprehensive methodological and ethical toolkit for course delivery and data collection, as shown in Table 4. The training comprised two main components.

2.5.1. Methodological preparation for teaching the innovative course

All teachers delivering the module participated in a two-day training organized by the university's educational and methodological department in collaboration with the course development team. The training aimed to: i) familiarize teachers with the course content and structure; ii) train them in active learning methods, including project work, case studies, and business games; iii) develop their skills to foster entrepreneurial thinking among education students; and iv) identify potential classroom challenges and discuss strategies to address them. Upon completion, teachers received a methodological manual, a detailed course summary, and a set of student assessment materials.

2.5.2. Briefing on the questionnaire procedure

Prior to data collection, all teachers attended a brief (2-hour) session covering: i) standardized administration of the questionnaire; ii) ethical considerations such as voluntariness, anonymity, and avoiding coercion; and iii) consistent instructions to students, including timing and conditions for questionnaire administration. All preparatory activities were approved by the faculty's methodological commission and conducted in accordance with the internal regulations of the experimental site.

Table 4. Teacher training program structure

No.	Training module	Module objective	Main content	Format
1	Introduction to the course	Familiarization with the course concept and its place in the curriculum	Course goals, structure, expected learning outcomes, teacher's role	Presentation, discussion
2	Methodology for developing entrepreneurial mindset	Training in pedagogical strategies for fostering entrepreneurial mindset (EM)	Principles of EM development, link to 21st-century competencies, student perception features	Lecture, case analysis
3	Active learning methods	Practice of active teaching methods: project work, cases, business games	Case structure, facilitation of discussion, evaluation of project work	Workshop, business game
4	Assessment and feedback	Development of formative and summative assessment skills	Developing assessment criteria, providing feedback, student reflection	Master class, group work
5	Organization and ethics of survey administration	Ensuring correct data collection within the research framework	Instructions, anonymity, standardization of conditions, procedure	Instruction, role-playing simulation

2.6. Data analysis

To analyze the quantitative data collected in the study, various statistical methods were employed to assess the central tendencies, variability, distribution normality, and significance of changes in entrepreneurial thinking scores before and after the course. Table 5 summarizes the statistical techniques used, their purposes, and the criteria for significance. All analyses were performed using SPSS software, version 27.0, with a significance level set at $p<0.05$.

Table 5. Statistical methods used for quantitative analysis

Method	Purpose
Mean (M)	Calculation of the mean score for each subscale of the entrepreneurial mindset and the overall integral score
Standard deviation (SD)	Measurement of variability of responses within each subscale
Shapiro–Wilk test	Assessment of normality of data distribution
Paired-samples t-test	Evaluation of statistically significant changes between pre- and post-course results (for normally distributed data)
Wilcoxon signed-rank test	Evaluation of changes for non-normal distributions (non-parametric alternative to the t-test)

Note: the significance threshold was set at $p<0.05$. Data analysis was conducted using SPSS (version 27.0).

3. RESULTS AND DISCUSSION

Before the course, participants completed an entrance test to assess their entrepreneurial thinking across key components. This baseline measurement was necessary to evaluate the initial development level of each subscale prior to the educational intervention. The results for the subscales and the overall score are presented in Table 6. Before the course, students demonstrated an average level of entrepreneurial thinking. The highest scores were observed in the "initiative" and "persistence" scales, while the propensity for risk remained relatively low. This may indicate a need to develop students' confidence in navigating uncertain conditions, which is crucial for entrepreneurial activity. After completing the course, a final test was administered using the same scales [25]–[27].

Table 6. Pre-test results for entrepreneurial mindset subscales

Subscale	M	SD
Initiative	3.40	0.50
Creativity	3.20	0.60
Risk-taking	3.10	0.70
Result orientation	3.20	0.60
Persistence	3.30	0.50
Overall entrepreneurial mindset	3.24	0.55

A comparative analysis of the pre-post design data allows us to evaluate changes in the level of entrepreneurial thinking development among students, as shown in Table 7. Following the completion of the course, there is a clear overall improvement across all indicators of entrepreneurial thinking. This demonstrates the effectiveness of the educational program in fostering qualities such as creativity, initiative, and a results-oriented mindset. Scores on the "initiative" and "persistence" scales show particularly notable growth, indicating an increase in students' internal motivation and determination.

Table 7. Post-test results for entrepreneurial mindset subscales

Subscale	M	SD
Initiative	3.90	0.40
Creativity	3.80	0.50
Risk-taking	3.60	0.60
Result orientation	3.80	0.50
Persistence	3.90	0.40
Overall entrepreneurial mindset	3.80	0.47

To visually interpret changes in entrepreneurial thinking, a heat map was created, as in presented Figure 1, displaying the average values for each subscale before and after completing the course. The color scale—ranging from light (low values) to dark (high values)—allows for a quick and intuitive assessment of the growth in each studied characteristic. The figure clearly illustrates increased values across all subscales following the course, especially in initiative, creativity, and persistence. This visualization supports the quantitative findings and provides an accessible overview of the positive impact of the course. Particularly notable improvements were observed in initiative, creativity, result orientation, and persistence, indicating a positive effect of the educational program on developing key components of entrepreneurial thinking in participants [28], [29].

To assess whether parametric analysis methods are appropriate, the normality of data distribution was tested using the Shapiro–Wilk test. The results are shown in Table 8. Understanding the distribution is essential for choosing the correct statistical tests and ensuring the validity of conclusions drawn from the data.

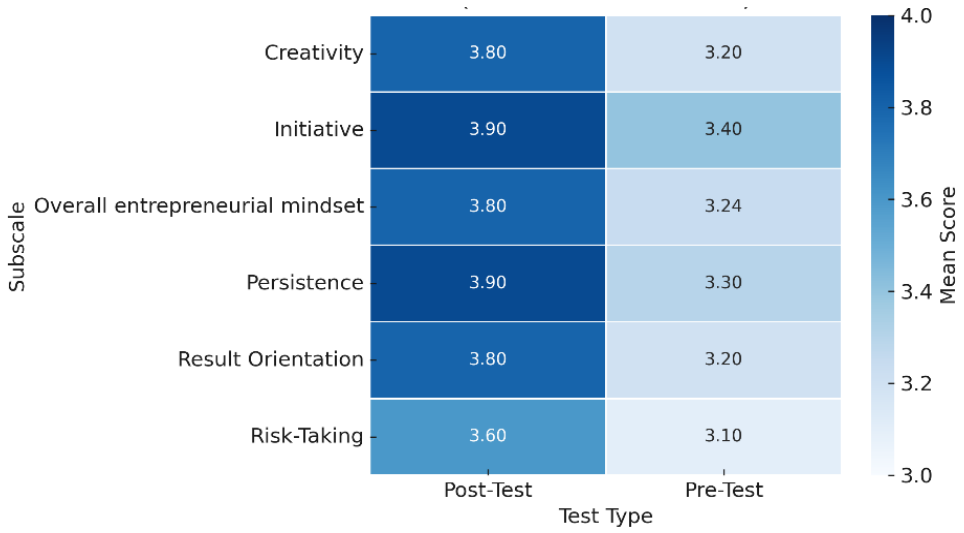

Figure 1. Heatmap of mean scores for entrepreneurial mindset subscales before and after the course

Table 8. Shapiro–Wilk test results for normality (n=220)

Scale	W statistic	p	Normality assumption	Recommended analysis method
Integral score	0.978	0.057	Yes	Parametric (t-test)
Initiative	0.965	0.022	No	Non-parametric (Wilcoxon)
Creativity	0.976	0.041	Marginal	Both methods considered (use cautiously)
Risk-taking	0.981	0.067	Yes	Parametric (t-test)
Result orientation	0.970	0.034	Marginal	Both methods considered (use cautiously)
Persistence	0.983	0.095	Yes	Parametric (t-test)

The results showed that not all scales met the criteria for normality. In particular, a statistically significant deviation from the normal distribution was observed for the Initiative scale. The p-values for the creativity and result orientation scales were close to the significance threshold ($p<0.05$), which may indicate minor deviations that became statistically significant due to the large sample size. The normality assumption was confirmed for the remaining scales. Accordingly, a combined analytical approach was applied for further comparisons: parametric methods were used for scales with normal distribution, while non-parametric tests were employed for scales violating normality. In borderline cases, analyses were conducted using both methods, providing an additional check on the stability of the results [30], [31].

A comparative analysis of the mean values before and after completing the course for each subscale of entrepreneurial thinking, as well as the integral indicator, is presented in Table 9. The corresponding statistical tests, their values, and significance levels are also indicated. All calculations were performed on a 1–5 scale for comparability. Following the course, statistically significant improvements were recorded across all scales of entrepreneurial thinking. Particularly pronounced changes were observed in components related to internal initiative, creative thinking, and readiness for action. This confirms that the course not only increased the overall level of entrepreneurial thinking but also positively impacted its key components essential for an independent and proactive professional stance [32], [33].

Additionally, a comparative analysis of changes in entrepreneurial thinking indicators by gender was conducted. Both genders demonstrated an increase in entrepreneurial thinking following the course, with female showing slightly more pronounced positive changes across most scales. This pattern may be partly explained by a higher responsiveness to educational interventions in the humanities or by lower baseline levels in certain components of entrepreneurial thinking. However, despite the overall improvement, the observed gender differences remain moderate and require further investigation [34]–[36]. Gender-specific changes in entrepreneurial mindset scores before and after the course were examined separately for female and male. The results of the paired-samples t-tests for female are presented in Table 10, while the corresponding results for male are shown in Table 11.

Table 9. Descriptive statistics and test results for entrepreneurial mindset scores before and after the course

Scale	M (pre)	SD (pre)	M (post)	SD (post)	Test statistic	p
Integral score	3.21	0.38	3.54	0.32	$t(219)=12.34$	<0.001
Initiative	3.22	0.64	3.70	0.58	$Z=-8.75$	<0.001
Creativity	3.35	0.68	3.78	0.63	$Z=-7.64$	<0.001
Risk-taking	3.26	0.62	3.52	0.56	$t(219)=6.82$	<0.001
Result orientation	3.14	0.56	3.40	0.52	$Z=-6.10$	<0.001
Persistence	3.18	0.46	3.45	0.42	$t(219)=5.12$	<0.001

Table 10. Entrepreneurial mindset scores before and after the course: female (n=170)

Female scale	M (pre)	SD (pre)	M (post)	SD (post)	Test statistic	p
Integral score	2.82	0.39	3.12	0.35	$t(169)=7.52$	<0.001
Initiative	2.86	0.50	3.22	0.42	$t(169)=6.38$	<0.001
Creativity	2.80	0.53	3.15	0.50	$t(169)=6.15$	<0.001
Risk-taking	2.80	0.56	3.10	0.50	$t(169)=5.84$	<0.001
Result orientation	2.76	0.48	3.00	0.44	$t(169)=4.92$	<0.001
Persistence	3.55	0.85	4.05	0.70	$t(169)=5.44$	<0.001

Table 11. Entrepreneurial mindset scores before and after the course: male (n=50)

Male scale	M (pre)	SD (pre)	M (post)	SD (post)	Test statistic	p
Integral score	2.86	0.38	3.15	0.36	$t(49)=3.98$	<0.001
Initiative	2.90	0.48	3.26	0.46	$t(49)=3.30$	0.002
Creativity	2.78	0.55	3.20	0.53	$t(49)=3.48$	0.001
Risk-taking	2.86	0.52	3.14	0.48	$t(49)=2.89$	0.006
Result orientation	2.82	0.50	3.06	0.46	$t(49)=2.62$	0.011
Persistence	3.65	0.80	4.10	0.65	$t(49)=2.14$	0.038

A comparison of students by year of study was conducted to identify potential differences in the dynamics of entrepreneurial thinking development. Detailed results for 3rd-year students are presented in Table 12, while the corresponding data for 4th-year students are shown in Table 13. Analysis by year shows that both 3rd- and 4th-year students exhibited comparable positive changes. The slight advantage observed in 4th-year students may be attributed to their higher level of awareness and professional maturity. However, statistically significant progress was noted across all groups, confirming the universal effectiveness of the course regardless of the stage of study. The results demonstrated significant improvements in both the integrated indicator of entrepreneurial thinking and its key components—initiative, creativity, risk appetite, result orientation, and persistence. The average increases on the scales ranged from 0.3 to 0.5 points on a 5-point scale, indicating a noticeable enhancement in the development of these competencies.

Table 12. Entrepreneurial mindset scores before and after the course: 3rd-year students (n=120)

3rd year students scale	M (pre)	SD (pre)	M (post)	SD (post)	Test statistic	p
Integral score	2.81	0.40	3.11	0.35	$t(119)=7.28$	<0.001
Initiative	2.84	0.48	3.20	0.44	$t(119)=6.10$	<0.001
Creativity	2.78	0.55	3.13	0.53	$t(119)=5.95$	<0.001
Risk-taking	2.80	0.54	3.08	0.50	$t(119)=5.76$	<0.001
Result orientation	2.76	0.48	2.98	0.46	$t(119)=4.73$	<0.001
Persistence	3.50	0.85	4.00	0.75	$t(119)=5.18$	<0.001

Table 13. Entrepreneurial mindset scores before and after the course: 4th-year students (n=100)

4th year students scale	M (pre)	SD (pre)	M (post)	SD (post)	Test statistic	p
Integral score	2.88	0.38	3.14	0.34	$t(99)=6.15$	<0.001
Initiative	2.94	0.50	3.24	0.40	$t(99)=5.14$	<0.001
Creativity	2.85	0.50	3.20	0.48	$t(99)=5.22$	<0.001
Risk-taking	2.88	0.54	3.12	0.48	$t(99)=4.30$	<0.001
Result orientation	2.80	0.50	3.04	0.42	$t(99)=4.25$	<0.001
Persistence	3.65	0.80	4.10	0.60	$t(99)=4.08$	<0.001

The observed changes can be attributed to the use of active, practice-oriented teaching methods—such as case studies, project activities, and business games. These methods facilitated the development of students' skills in independently solving problems and making decisions under conditions of uncertainty, aligning with contemporary theories of experiential learning and the promotion of student autonomy. The findings are consistent with previous research, as well as international studies demonstrating that programs focused on developing entrepreneurial thinking enhance creativity, risk appetite, and proactive behavior [37]–[39]. The practical significance of this study lies in the potential integration of such business-oriented courses into the curricula of pedagogical universities. Incorporating project assignments and business games into pedagogical training modules can increase student motivation and engagement while fostering universal competencies essential for thriving in a rapidly evolving educational environment.

However, the research acknowledges several limitations of this study: the sample was drawn from a single university, which limits the generalizability of the findings; the absence of a control group restricts the ability to establish causal relationships; and reliance on self-report measures may introduce systematic biases. To enhance the reliability of future research, we recommend longitudinal study designs, expanded samples including students from multiple universities, and the use of objective assessment methods (observation, instructor evaluations). Promising avenues for further research include comparative analyses of entrepreneurial course effectiveness across diverse educational contexts, investigations into the impact of entrepreneurial thinking on teachers' professional activities, and the development of tailored training programs that consider students' individual and age-related characteristics.

The analysis revealed statistically significant improvements in key components of entrepreneurial thinking—initiative, creativity, and persistence—after the course. These findings align with previous research emphasizing the role of targeted educational interventions in enhancing entrepreneurial traits among students [40], [41]. For instance, Motta and Galina [42] found that project-based learning enhances creativity and risk-taking, competencies critical for entrepreneurial success. However, the findings of only moderate improvement in risk propensity differ from Vaughn *et al.* [43] who reported significant gains. This discrepancy might be explained by the specific pedagogical context and cultural factors influencing risk attitudes among Kazakh pre-service teachers [44]. It underscores the need to tailor entrepreneurial education to local contexts for maximum effectiveness. Moreover, the persistence dimension improved notably, confirming the course's success in nurturing perseverance—a critical trait for educators who face ongoing challenges in the classroom [45]. This supports the argument that entrepreneurial thinking is not limited to

business contexts but also vital in educational settings [46], [47]. Importantly, this study contributes novel insights by providing empirical evidence from a post-Soviet, developing country context—a setting underrepresented in the global entrepreneurship education literature. The tailored approach that integrates culturally relevant pedagogical methods and business-oriented content addresses a critical gap in teacher education, offering a model that can inform similar transition economies facing comparable challenges in educational modernization.

Furthermore, the findings have broad implications for international educational policy and practice. By demonstrating the feasibility and effectiveness of incorporating entrepreneurial thinking into teacher training, this research supports global calls for educational reforms that prepare teachers to foster innovation, adaptability, and problem-solving skills in students. This aligns with UNESCO's and OECD's agendas on 21st-century skills development, suggesting that integrating entrepreneurial competencies into teacher curricula worldwide can enhance educational systems' responsiveness to rapid societal and labor market changes. Thus, these results demonstrate that integrating business-oriented modules within teacher training can effectively develop essential entrepreneurial competencies.

3.1. Limitations

One key limitation of this study is the absence of a control group, which limits the ability to attribute the observed improvements in entrepreneurial thinking exclusively to the educational intervention. Without a comparison group, alternative explanations—such as external influences, participant maturation, or concurrent learning experiences—cannot be ruled out, thereby constraining the internal validity of the findings. Additionally, the study was conducted within a single institutional setting, which restricts the generalizability of the results. The relatively homogeneous sample may not reflect broader demographic, institutional, or cultural diversity. To address these limitations, future research should incorporate randomized controlled designs with adequate comparison groups. Expanding the sample to include multiple universities and diverse educational contexts would further enhance external validity. Moreover, employing mixed-methods approaches could provide richer insights into the mechanisms through which entrepreneurial education influences student outcomes.

3.2. Implications

This study offers several important implications. Practically, it demonstrates that integrating business-oriented and culturally adapted entrepreneurial education within teacher training programs can effectively enhance key competencies such as initiative, creativity, and persistence. This approach provides a replicable model for post-Soviet and developing countries seeking to modernize pedagogical curricula to meet the demands of the 21st century. Importantly, the course's modular design and focus on active, experiential learning methods make it well-suited for adaptation to broader educational contexts, including rural teacher education and in-service training programs. This scalability supports continuous professional development and helps address regional disparities in teacher readiness. Tailoring course content to align with local cultural and infrastructural conditions will be crucial for maximizing its effectiveness across diverse settings. Theoretically, the research extends entrepreneurial mindset frameworks (EMP and EAO) into the educational domain of teacher preparation, validating their applicability beyond traditional business settings. This cross-contextual validation enriches the global entrepreneurship education literature by incorporating perspectives from underrepresented regions. These novel insights underscore the critical role of entrepreneurial thinking in shaping resilient, innovative educators who are prepared for rapidly evolving educational landscapes worldwide.

4. CONCLUSION

The hypothesis of this study was confirmed: a business-oriented educational course significantly contributes to the development of entrepreneurial thinking in students pursuing pedagogical careers. Positive changes were recorded in key indicators, including initiative, creativity, risk-taking, goal orientation, and persistence. These findings provide empirical support for the theoretical framework informed by the EMP and EAO models. Statistically significant gains in initiative, creativity, and persistence align with established constructs of entrepreneurial thinking, affirming the effectiveness of structured pedagogical interventions. Based on these results, it is recommended that teacher training programs integrate entrepreneurial education modules. Practical formats such as case studies, project-based tasks, and business simulations can foster decision-making skills, independence, and proactive behavior—competencies essential for modern educators. The implementation of such approaches contributes to the modernization of pedagogical education and supports the formation of innovative, reform-oriented professionals capable of adapting to change and leading educational transformation. Future research should examine the long-term impact of entrepreneurial thinking

on teaching practices and career trajectories. Exploring its effects across different cultural, institutional, and age-group contexts will also provide valuable input for tailoring educational strategies more effectively.

Based on the findings, it is recommended that entrepreneurial thinking modules be integrated into teacher education curricula, ensuring they are tailored to the specific cultural and educational contexts of the learners. Active, experiential teaching methods, such as case studies, project work, and business simulations, should be utilized to effectively develop key entrepreneurial competencies. Furthermore, longitudinal and multi-site studies are encouraged to assess the sustained impact of entrepreneurial education on teaching practices and professional outcomes. Finally, establishing support mechanisms and professional development opportunities for teacher educators is essential to enhance their capacity to deliver entrepreneurship content and adopt innovative pedagogical approaches.

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AUTHOR CONTRIBUTIONS STATEMENT

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Name of Author	C	M	So	Va	Fo	I	R	D	O	E	Vi	Su	P	Fu
Nurzhaugan Balginbayeva	✓		✓	✓	✓	✓		✓	✓	✓			✓	
Aktoty Akzholova		✓		✓		✓		✓	✓	✓	✓	✓		
Zhuldyzai Baimaganbetova	✓		✓		✓		✓			✓	✓		✓	✓
Abay Duisenbayev		✓	✓	✓	✓	✓		✓	✓	✓			✓	✓
Saule Yerkebayeva	✓			✓		✓	✓		✓		✓	✓		✓
Alua Smanova		✓	✓		✓	✓		✓	✓	✓			✓	✓
Elmira Aitenova	✓		✓		✓	✓		✓		✓	✓		✓	✓

C : **C**onceptualization
M : **M**ethodology
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Va : **Va**lidation
Fo : **Fo**rmal analysis
I : **I**nvestigation
R : **R**esources
D : **D**ata Curation
O : Writing - **O**riginal Draft
E : Writing - Review & **E**diting
Vi : **Vi**sualization
Su : **Su**pervision
P : **P**roject administration
Fu : **Fu**nding acquisition

CONFLICT OF INTEREST STATEMENT

Authors state no conflict of interest.

DATA AVAILABILITY

The corresponding author may provide study data upon reasonable request.

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BIOGRAPHIES OF AUTHORS

Nurzhaugan Balginbayeva is a Ph.D. student of the Department Primary Education of the Faculty of Pedagogy and Psychology, Abai Kazakh National Pedagogical University. She has completed international internships in Lithuania and Spain, and participated in international academic conferences. Her research focuses on educational innovation, the professional preparation of future teachers, and business-oriented approaches in teacher education. She is the founder of the Smart Coach business-innovation club, promoting entrepreneurial competence in pedagogy. She is also the founder and academic director of Smart Hub, educational center specializing in innovative English language instruction and teacher development. She can be contacted at email: balginbaeva_95@mail.ru.

Aktoty Akzholova is an associate professor in the Department of Primary Education at the Faculty of Pedagogy and Psychology of Abai Kazakh National Pedagogical University. Her research focuses on children's literature, innovative teaching methods, and training future primary school teachers. With over 30 years of teaching and administrative experience, she currently serves as Vice Dean for Academic Affairs. She is the author of more than 80 scientific publications, including monographs and textbooks. She can be contacted at email: aktoty_72@mail.ru.

Zhuldyzai Baimaganbetova is a senior lecturer at Korkyt Ata Kyzylorda University with 23 years of teaching experience. She completed advanced training in inclusive education, digital transformation, and early childhood pedagogy. She is the author of over 98 scientific articles in international conferences and journals, including topics on innovative technologies and child development. Her research includes the development of self-assessment skills in primary school and national games in motor learning. She has received multiple appreciation letters, including from the Rector of Korkyt Ata University and for her active participation in national Olympiads. She can be contacted at email: Erkon69@mail.ru.

Abay Duisenbayev is an associate professor at the Department of Pedagogy and Educational Management, Al-Farabi Kazakh National University. Dr. Duisenbayev's research focuses on the theory and methodology of education, ethnopedagogy, and the use of media and digital technologies in pedagogy. He is actively involved in academic research and contributes to the modernization of pedagogical practices in Kazakhstan. As an experienced educator and scholar, he has participated in various national and international conferences and continues to mentor young researchers in the field of education. He can be contacted at email: adk7575@mail.ru.

Saule Yerkebayeva is a Ph.D. senior lecturer of the Abai Kazakh National Pedagogical University. In 2023, she defended her doctoral dissertation at the Abai Kazakh National Pedagogical University. Conducts research on the development of speech in preschool children, the development of preschool inclusive education, the formation of digital competence in education. She is the author of the projects "improving the soft skills of teachers of preschool organizations in terms of gamification", "improving the speech of preschool children-the method of mnemonics", and author's programs. She can be contacted at email: Saule877@mail.ru.

Alua Smanova holds a Ph.D. and is acting associate professor and head of the Department of Preschool and Primary Education. Her research interests include dual education, student-centered learning, and teacher training. She is a member of national research projects and an expert at the Republican Scientific and Practical Center "Textbook". Dr. Smanova has authored over 50 publications, monographs, and teaching aids. She completed professional training in Germany and France, and holds certificates in online education, inclusive pedagogy, and university management. She can be contacted at email: alua_87.87@mail.ru.

Elmira Aitenova is a postdoctoral fellow at the Department of Pedagogy, Faculty of Pedagogy and Psychology of Abai Kazakh National Pedagogical University. She completed international internships in Turkey and participated in international scientific conferences. Her research focuses on educational innovations, professional training of future teachers, and dual-oriented approaches in teacher education. She is the author of more than 50 scientific publications, including monographs and textbooks. She can be contacted at email: emma_14@mail.ru.