

Development of emotional empathy in future educators during the process of professional formation

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ABSTRACT

The aim of this study is to analyze the structural components of empathy among students majoring in pedagogical disciplines and to evaluate the effectiveness of an educational program designed to foster empathy during their professional training. The study involved 120 undergraduate students from two Kazakhstani universities enrolled in creative fields. An experimental approach was adopted in the research. To assess empathy levels, validated questionnaires and psychodiagnostics scales were used. The results of statistical analysis indicated that empathy levels did not significantly change following the completion of the empathy enhancement program. The mean scores across all measurement tools shifted only marginally, and the t-statistics and p-values ($p > 0.05$) pointed to a lack of statistically significant differences. Additionally, analysis of variance (ANOVA) did not reveal any significant differences in the cognitive ($F = 0.42$, $p = 0.53$), emotional ($F = 0.38$, $p = 0.54$), or behavioral ($F = 0.31$, $p = 0.58$) dimensions of empathy. These findings may be attributed to senior students already possessing a relatively high level of empathy, making further development within a short-term program more challenging. The practical significance of the study lies in its in-depth analysis of students' empathy levels.

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1. INTRODUCTION

In the contemporary world, marked by rapid social transformations and increasingly complex interpersonal interactions, the role of the educator has gained particular significance. The relationships that students form with teachers and peers during the educational process are pivotal to their academic, social, and emotional development [1]. The educator is not only a transmitter of knowledge but also a key figure in shaping students' personalities and influencing their emotional and social growth.

Empathy, the ability to understand and share the emotions of others, is a fundamental element of effective communication between educators and students [2]. Moreover, it is a determining factor in educators' attitudes toward their profession, with its level directly linked to the degree of empathy development [3]. Awareness of one's own professional interest in teaching and the development

of pedagogical competence play crucial roles in teachers' professional formation [4]. Within this context, the development of emotional empathy among future educators becomes a central aspect of their professional growth, as emotional empathy enhances educational quality and fosters a positive learning environment [5].

In the educational sphere, a lack of empathy among teachers can lead to a range of adverse outcomes [6], [7]. Educators with low levels of empathy may struggle to build trusting relationships with students, potentially resulting in decreased student motivation and academic performance [6]. Furthermore, a lack of empathy can contribute to conflictual interactions between students and teachers [5]. Emotional support among participants in the educational process is widely recognized in higher education as a practice that facilitates students' integration into socially safe groups, ultimately improving their learning outcomes and social competencies [8]. The development of empathy is also a core component in fostering ethical values, which are vital for professional teacher formation [9].

Emotional empathy is essential for the successful personal development of individuals [10]. In educational systems such as those of Russia and the United States, efforts have been made to integrate empathy training into teacher education programs [11], [12]. Cultivating empathy as a professional trait is a priority task that can be addressed through targeted, deliberate, and reflective training and self-education [11]. A well-developed empathic capacity contributes to improved mental and physical health, academic success, and enhanced professional opportunities [12].

In Kazakhstan, the system of teacher education faces several challenges related to the development of emotional empathy among future educators [13]. Within traditionally hierarchical educational structures, where formal authority and control dominate, there is a pressing need for more flexible approaches that nurture empathic qualities in teachers. Such approaches help create a more open and supportive educational environment where emotional empathy becomes a vital component of teachers' professional formation [14]. Empathy encourages students to engage in critical discussions, deepen their understanding, and emotionally connect with global issues [15]. The absence of systematic initiatives to assess and enhance empathy in future teachers results in the graduation of professionals who are insufficiently prepared for effective interaction with students [16]. This inadequacy affects both the quality of education and the psychological climate in educational institutions [17]. Therefore, a systemic approach is needed to foster professionally significant personal qualities such as emotional and social empathy, self-reflection, and positive thinking in the training of future educators.

The scientific novelty of this study lies in the empirical discovery of high levels of empathy among student teachers. This high level of empathy allows for a new interpretation of the results of empathy-focused interventions and highlights the need to assess students' empathic abilities before program development. Furthermore, it opens the possibility of moving from short-term to long-term and more differentiated interventions.

2. LITERATURE REVIEW

Empathy, as the ability to perceive another person's perspective through emotions, imagination, and personal experience, is essential for understanding cultural, social, and individual differences. In today's multicultural world, it plays a vital role in fostering tolerance, mutual understanding, and effective interpersonal communication [2]. Within contemporary pedagogical and psychological discourse, empathy is considered a key quality necessary for effective professional practice in education [5]. It profoundly influences young people's personal development and cultural awareness, including their understanding of traditions, values, and social norms [18]. Given empathy's impact on personality development and social relationships, it is crucial to investigate how it can be cultivated in young people [19], [20].

Some researchers have proposed including empathy in the Big Five personality traits [21]. The structure of empathy is typically divided into several key components, each reflecting a different aspect of the phenomenon. The cognitive component refers to the ability to understand another person's internal state, the emotional component pertains to emotional responsiveness to others' experiences, and the behavioral component relates to the willingness to engage in empathic interaction and provide support [22]. Cognitive empathy begins to form as children transition from primary to middle school and continues developing throughout adolescence and adulthood [23]. The emotional component, comprising empathic concern, personal distress, and emotional contagion, is often associated with lower rationality [24], while behavioral empathy, which involves responding to others' emotions and needs through action, is built upon both cognitive and emotional components [25].

In this context, the development of empathy in educators is crucial, as teachers help shape an environment conducive to the formation of empathic behavior in students. The importance of fostering empathy in future educators is underscored by data showing that 80% of surveyed teachers reported a decline

in empathy levels among students, a trend that highlights the urgent need to train educators in cultivating students' empathic abilities [20]. One perspective attribute this decline to the rise of social media and digital technologies [26]. In this regard, emotional self-regulation is a key factor in future educators' professional development and their ability to interact effectively with students [27].

International teacher training practices illustrate various approaches to developing empathy. Professional empathy is the foundation of successful communication skills and contributes to a teacher's self-confidence and professional competence [11]. Nonetheless, some studies have noted a decline in empathy levels among educators [28]. A comprehensive approach is therefore essential for developing empathy in future teachers. Such an approach should include recognizing empathic processes, enhancing reflective abilities, and the creation of learning environments in which empathy can be practiced in real pedagogical settings [2].

Empathy is also moral, expressed through a sense of responsibility for others' well-being, compassion, and a desire to help people in need [10]. Emotional education plays a critical role in cultivating empathy in future educators, as it supports the development of skills for recognizing and regulating emotions, which are crucial for effective teacher-student interaction [29], [30]. Teacher preparation programs must incorporate elements of empathic culture, including traits that foster empathic attitudes toward students and the development of personalized teaching styles focused on student interaction [31], [32].

To maintain empathic culture and emotional competence, it is essential that teachers not only develop emotional awareness and regulation but also apply these skills positively and constructively. This helps prevent manipulation or antisocial behavior that may arise when emotional abilities are misused [33]. A review of the literature reveals that questions remain unresolved regarding the effectiveness of various methods for developing empathy in educators. Furthermore, the impact of different factors on the formation of empathy in future teachers is insufficiently explored. This study aims to analyze the structure of empathy and examine the effectiveness of an empathy development program that integrates cognitive, emotional, and behavioral dimensions.

Despite the considerable number of studies devoted to the investigation of empathy, as reflected in the literature review, several unresolved issues remain regarding its structural components, developmental models, and assessment methodologies. This underscores the need for a comprehensive exploration of this phenomenon within the context of teacher professional formation. The purpose of this study is to analyze the structural components of empathy among pre-service teachers and to evaluate the effectiveness of a pedagogical program aimed at developing these components during their professional training. The study seeks to determine whether participation in the empathy development program leads to significant changes in students' levels of cognitive, emotional, and behavioral empathy. The research objectives were as: i) to assess the level of empathy among education students before and after participation in the training program; ii) to analyze the impact of the training program on the various components of student empathy; and iii) to examine the factors contributing to the obtained results and to identify directions for future research.

3. METHOD

3.1. Study design

An experimental approach was employed in this study, enabling an in-depth examination of the process of empathy development among future educators within the context of an educational environment. This methodological choice was guided by the need to obtain data in a natural pedagogical setting without artificially altering factors that influence the professional formation of students. The study was conducted in five stages: i) preparatory stage: this involved a literature review, the establishment of a theoretical framework, the development of a model for empathy formation, and the design of assessment tools [15], [16], [31]; ii) diagnostic stage: at this stage, baseline levels of empathy among pre-service teachers were assessed using standardized tests, questionnaires, and expert evaluations; iii) formative stage: the implementation of a technological model for empathy development was carried out, incorporating training sessions and practice-oriented methods designed to enhance empathic abilities; iv) control stage: participants were retested to evaluate changes in empathy development. The results were analyzed, and a comparative analysis was performed to identify statistically significant shifts; and v) final stage: this phase included the synthesis of research findings, the formulation of conclusions, and the development of practical recommendations for integrating empathy development strategies into teacher education programs.

3.2. Participants

The study involved 120 third- to fifth-year students from two Kazakhstani universities: Abai Kazakh National Pedagogical University (educational programs: Music Education, Graphic Design, and Art Education) and Khoja Ahmed Yasawi International Kazakh-Turkish University (educational programs:

Music Education, Artistic Labor, and Graphic Design). The sample included monolingual Russian speakers and bilingual students proficient in Kazakh and Russian.

The selection of this particular group was justified by the fact that students specializing in art education actively develop communicative and emotional competencies during their studies, making them a promising population for examining the formation of empathy. Participant recruitment was carried out through the respective universities' faculty deans' offices, ensuring access to students who met the study's inclusion criteria. Students were informed about the purpose and methodology of the research during group briefings and voluntarily consented to participate. The average age of participants was 21.4 years. The sample consisted of 75 female and 45 male students, reflecting the typical gender distribution in pedagogical fields as shown in Table 1.

The inclusion criteria for the sample were: enrollment in the 3rd to 5th year of study; specialization in Music Education, Art Education, Graphic Design, or Artistic Labor; and the absence of pronounced cognitive impairments that could hinder participation in diagnostic procedures. The exclusion criteria included: enrollment in other years or academic programs; transfer to another specialization or withdrawal from the university during the study.

Table 1. Distribution of study participants

University	Specialization	Year of study	Number of participants	Men	Women
Khoja Ahmed Yasawi International Kazakh-Turkish University	Educational Program in Music Education	3rd year	10	4	6
		4th year	8	3	5
		5th year	12	8	4
	Educational Program in Artistic Labor and Graphic Design	3rd year	9	3	6
		4th year	9	3	6
		5th year	12	2	10
	Total for the university		60	23	37
Abai Kazakh National Pedagogical University	Music Education	3rd year	9	3	6
		4th year	8	2	6
		5th year	8	2	6
	Graphic Design	3rd year	7	4	3
		4th year	7	4	3
		5th year	6	3	3
	Art Education	3rd year	6	2	4
		4th year	5	1	4
		5th year	4	1	3
	Total for the university		60	22	38
	Total number of participants		120	45	75

3.3. Research tools

To assess the level of empathy among future educators, the study employed a set of widely used psychodiagnostics instruments. These tools were selected due to the need for a comprehensive analysis of empathic traits, encompassing cognitive, emotional, and behavioral components. All instruments underwent reliability testing using Cronbach's alpha coefficient and were validated through expert review. The expert panel included faculty in psychology, specialists in pedagogy, psychodiagnostics, and research methodology. Experts were selected based on their academic qualifications, professional experience in relevant fields, and publication records related to the topic of study. This approach ensured objectivity and methodological rigor in the evaluation of the applied instruments.

- Empathy potential test [34]. This test is designed to comprehensively assess empathy as an integrative personality trait. It includes subscales measuring emotional, cognitive, and behavioral dimensions of empathy. Widely used in psychological research, the test is well-suited for Russian-speaking populations. The Cronbach's alpha coefficient for this test was 0.84, indicating high internal consistency. Expert validity: 92% of experts confirmed that the tool met the stated evaluation criteria.
- Emotional responsiveness scale [35]. This instrument measures the general predisposition to empathy and the ability to perceive others' emotional states. It consists of 33 statements reflecting emotional reactions and sensitivity to others' emotions. The Cronbach's alpha coefficient was 0.81, demonstrating strong reliability. Expert validity: 89% of experts affirmed its high diagnostic accuracy.
- Empathic ability level diagnostic tool [36]. This diagnostic tool evaluates empathy across three dimensions: intuitive, emotional, and rational. It is widely used in educational psychology to assess empathic competencies. The test achieved a Cronbach's alpha of 0.87, indicating excellent reliability. Expert validation: 94% of experts confirmed the method's applicability within educational contexts.

- Questionnaire of cognitive and affective empathy (QCAE) [37]. The QCAE allows for the differentiation of cognitive and affective empathy. It contains 31 items targeting various aspects of empathic behavior and has been adapted for Russian-speaking populations. The Cronbach's alpha coefficient was 0.85, reflecting good internal consistency. Expert validity: 91% of experts confirmed that the scales aligned with the intended measurement criteria.

3.4. Procedure

During the preparatory stage, a comprehensive review of the literature on empathy was conducted, enabling the exploration of existing theoretical approaches and scientific advancements in the field. It was established that empathy is characterized by the ability to perceive and share the emotional states of others, manifested through emotional responsiveness and attentiveness to others' feelings. Empathy is also shaped during professional development through the cultivation of emotional awareness and social competencies. The theoretical framework of the study encompassed key concepts of empathy and contemporary methods for its assessment. Participants' empathy levels were confirmed using diagnostic tools such as the empathy potential test, the emotional responsiveness scale, and others, which provided objective measurements of empathic potential at various stages of the research. A central aspect of the preparatory phase was the development of an empathy formation model tailored to the age-specific and professional characteristics of the study participants. Additionally, an evaluation toolkit was created, incorporating validated instruments and psychodiagnostics methods aligned with the research objectives.

Prior to the intervention, a baseline assessment was conducted to confirm that participants had equivalent initial levels of empathy. Diagnostic testing was administered online in university classrooms using desktop computers. Faculty members from the departments of psychology and education supervised the testing process. Participants completed four questionnaires: Yusupov's empathy potential test, the emotional responsiveness scale by Mehrabian and Epstein, Boyko's empathic ability level diagnostic tool, and the QCAE. The full assessment process lasted approximately 90 minutes. Before testing, participants were informed of the study's purpose and conditions. To ensure objectivity, all participants received standardized instructions. Completed questionnaires were anonymized through coding, each participant was assigned a unique identification number to replace personal information, thereby minimizing the influence of subjective factors.

Following the preliminary assessment, participants began the empathy development training program. The program was designed using contemporary psycho-pedagogical approaches and included a series of interactive sessions targeting the cognitive, emotional, and behavioral components of empathy. The training spanned 12 weeks and was organized into three key modules.

The first module focused on the cognitive dimension of empathy. Students explored the theoretical foundations of empathy, its role in education, and the mechanisms underlying the recognition of students' emotional states. Case-based learning, analysis of educational scenarios, and discussion of practical examples were utilized. The second module addressed the development of emotional perception and empathic responsiveness. This component included training exercises aimed at enhancing sensitivity to non-verbal cues, role-playing activities, and techniques for attentive listening. Emphasis was placed on cultivating the ability to emotionally respond to others' experiences, a vital element of pedagogical empathy. The third module concentrated on the behavioral aspect of empathy, where students applied their acquired knowledge in practical settings. They engaged in educational simulations and developed strategies for interacting with students. Feedback techniques, analysis of video recordings of classroom communication, and self-assessment of behavior in various educational scenarios were employed. To implement the empathy development program, several innovative technologies and digital applications were integrated, facilitating the connection between theoretical knowledge and practical skills in the learning process. The technologies used in the study are presented in Table 2.

Each of these technologies supported different dimensions of empathy and facilitated deeper student engagement in the learning process. The use of interactive and innovative platforms enabled students not only to gain a theoretical understanding of the concept of empathy but also to apply this knowledge in practice through active interaction with peers and instructors. Upon completion of the program, post-testing was conducted using the same diagnostic instruments as those employed during the preliminary assessment. The testing procedure replicated the conditions of the initial stage, thereby ensuring consistency and objectivity in the comparison of results.

3.5. Data analysis

Data analysis was conducted using IBM SPSS Statistics 27, a software package selected for its robust capabilities in processing psychological and educational data, as well as its high reliability in statistical computations. During the preliminary assessment stage, Levene's test for homogeneity of variances was applied to verify the uniformity of the sample. The test yielded a value of 0.287, indicating that there were no

statistically significant differences in variance between the groups ($p > 0.05$). This result confirmed the homogeneity of the sample and the comparability of participants in terms of their baseline empathy levels prior to the training intervention.

To evaluate the effectiveness of the intervention, a paired Student's t-test was employed to assess changes in participants' empathy scores following completion of the program. This statistical test was chosen due to the repeated-measures design of the study (pre- and post-intervention), and its appropriateness given the data's conformity to a normal distribution. In addition, repeated-measures analysis of variance (ANOVA) was used to examine the program's impact on different components of empathy. This method allowed for the identification of overall changes and pinpointed which specific aspects (cognitive, emotional, or behavioral) demonstrated the most significant improvements.

Table 2. Innovative technologies for instruction

Training module	Technologies and applications	Purpose of the technology
Cognitive module	Kahoot!	Used for conducting interactive quizzes and tests on the theoretical aspects of empathy, which helped stimulate students' interest and actively engage them in the learning process. The gamified approach increased both involvement and retention of material.
	Padlet	Applied for organizing collaborative discussions and idea exchange related to case-based learning and pedagogical scenarios. Students were able to post their reflections and proposed solutions on a virtual board, fostering active interaction and experience-sharing.
	Mentimeter	Used for designing surveys and questionnaires, allowing students to anonymously express their views on the importance of empathy in education and suggest approaches to pedagogical challenges. This promoted critical thinking and active engagement with the content.
Emotional module	Affectiva	Employed to analyze students' emotional responses to video materials and role-playing activities. Artificial intelligence technology detected emotional cues (e.g., facial expressions) and provided feedback, helping students to better understand and regulate their emotional reactions.
	Zoom	Utilized for conducting role-playing exercises and training sessions in a virtual format. The platform enabled group-based simulations and interactions, and supported analysis of non-verbal signals (such as facial expressions, gestures, and tone of voice) through video communication.
	Calm, Headspace	Implemented to cultivate mindfulness and enhance sensitivity to the emotional states of others. Students practiced meditative techniques and exercises aimed at improving focus and emotional perception in the educational context.
Behavioral module (application of knowledge in practice)	Oculus Rift	Used to create pedagogical simulations, allowing students to engage with virtual learners in various scenarios. This enabled the modeling of real-life teaching situations and the assessment of students' responses in a safe and controlled environment.
	Flipgrid	Employed for recording and sharing student-generated video responses to empathy-related pedagogical tasks. Students could review their recordings and receive feedback from instructors and peers, supporting self-assessment and reflection on their pedagogical behavior.
	Google Classroom	Applied for organizing feedback and supervision sessions by instructors, where students could upload their projects, review peers' work, and receive targeted recommendations for improving their teaching strategies.

3.6. Ethical issues

Prior to the commencement of the study, all participants were fully informed about its objectives, procedures, and methodological approaches. Participation was entirely voluntary, and each student signed an informed consent form, indicating their understanding of the research process and their willingness to participate. It was explicitly stated that refusal to participate would in no way affect their academic performance or any other aspect of their education. Confidentiality and anonymity of data were strictly maintained. All data were anonymized and encrypted to eliminate any possibility of respondent identification. Access to the data was restricted to the research team directly involved in data analysis. Throughout the study, careful consideration was given to ensuring that the diagnostic tools and educational programs used did not negatively impact participants' psychological well-being. Participants were also informed of their right to withdraw from the study at any point without providing a reason, should they experience emotional discomfort.

3.7. Research limitations

One of the limitations of the study was the sample size: although 120 participants provided sufficient statistical power, a larger sample would have enhanced the generalizability of the findings to a broader population of education graduates. Another limitation was the duration of the study: the program lasted 12 weeks, which was adequate for capturing short-term effects; however, a longer observation period would be beneficial for assessing the sustainability of changes in empathy over time. The study also relied on self-report methods, which are inherently subjective. Although the instruments used demonstrated high

validity, the potential for socially desirable responses remains a concern. Furthermore, the study was conducted at several universities in Kazakhstan, which may limit the generalizability of the results to other teacher education institutions with different curricular structures and approaches to pre-service teacher training.

4. RESULTS

To assess the homogeneity of the sample, Levene's test was conducted, which demonstrated that the participant groups were statistically similar in their baseline empathy levels ($p=0.287$), confirming the absence of significant differences between the groups prior to the intervention. A paired Student's t-test was employed to evaluate changes in empathy levels following the completion of the program. Table 3 presents the results of the comparative analysis conducted before and after the training program.

Table 3. Pre-test and post-test scores on empathy levels

Method	Preliminary level (M $\pm$ SD)	Final level (M $\pm$ SD)	t-statistic	p-value
Empathy potential test	4.12 $\pm$ 0.32	4.15 $\pm$ 0.30	0.49	0.63
Emotional responsiveness scale	3.95 $\pm$ 0.29	3.98 $\pm$ 0.28	0.51	0.61
Empathic ability level diagnostic tool	4.08 $\pm$ 0.35	4.09 $\pm$ 0.33	0.57	0.57
Cognitive and affective empathy questionnaire	4.05 $\pm$ 0.30	4.08 $\pm$ 0.29	0.55	0.58

The results presented in Table 3 indicate that the levels of empathy, as measured by various psychodiagnostics instruments, did not demonstrate statistically significant changes between the pre-test and post-test assessments. For all methods employed, the calculated t-statistics did not exceed a value of 1. The mean scores across all instruments remained relatively stable, and both the t-statistics and p-values confirmed the absence of statistical significance, with all $p>0.05$. Thus, while the data revealed a positive trend in empathy development among participants, the short duration of the intervention limited the magnitude of observable changes. This finding highlights the importance of conducting further research over longer periods to evaluate the sustained effects of such training programs. The current data suggest the potential effectiveness of the applied methodology, warranting additional investigation under long-term implementation conditions. Table 4 presents the results of the ANOVA across the three core components of empathy: cognitive, emotional, and behavioral. Across all components, only slight differences were observed in empathy levels before and after the intervention, which is further confirmed by F-statistics (all less than 1) and p-values exceeding 0.05.

Table 4. ANOVA results for different components of empathy

Empathy component	F-value	p-value
Cognitive aspect	0.42	0.53
Emotional aspect	0.38	0.54
Behavioral aspect	0.31	0.58

The ANOVA results further confirmed that the training program did not have a significant impact on the development of the cognitive, emotional, or behavioral components of empathy among participants. Specifically, no statistically significant improvements were observed in the cognitive component ($F=0.42$, $p=0.53$) or the emotional component ($F=0.38$, $p=0.54$). The behavioral component likewise did not demonstrate significant changes ($F=0.31$, $p=0.58$). The F-values for each component ranged from 0.31 to 0.42, indicating negligible differences between pre- and post-intervention measurements. Additionally, all p-values exceeded the conventional significance threshold of 0.05, further supporting the conclusion that the observed changes were not statistically significant. Figure 1 illustrates that participants' empathy levels remained largely unchanged throughout the course of the study.

Several factors may have influenced the results of this study. First, the findings may be attributed to the initially high levels of empathy among participants. As indicated by the data, undergraduate students already demonstrated relatively elevated levels of empathy at the outset, making it difficult to detect significant behavioral changes. In such groups, empathy may be sufficiently developed at the initial stage, which explains the absence of substantial differences following the completion of the training program.

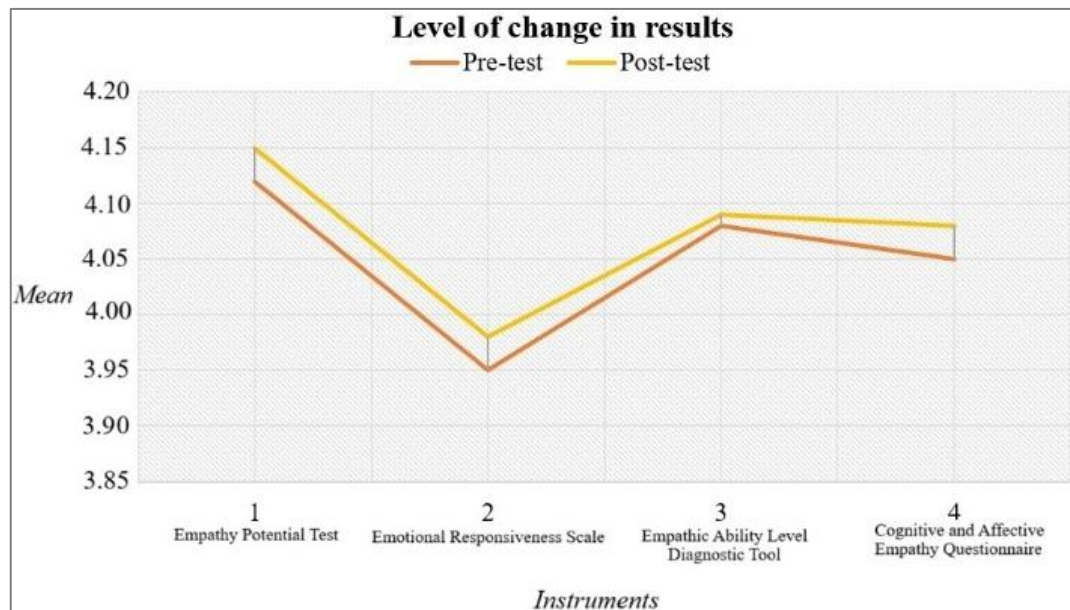


Figure 1. Changes in empathy scores between pre-test and post-test

Additionally, the educational program on empathy development may not have been intensive or long enough to induce meaningful changes in participants' empathy levels. The intensity of instructional activities and the degree of student engagement are critical to the program's effectiveness. The methods employed in this study should be considered for extended application in future research to assess their potential impact over a longer timeframe. It is also important to acknowledge that empathy is a complex and multifaceted construct that can be cultivated at various levels. Improvements in one component of empathy (e.g., cognitive) do not necessarily translate into notable changes in other components (e.g., emotional or behavioral). To gain a more comprehensive understanding of empathy development, more detailed observation of its individual components is required, along with more adaptive and differentiated instructional approaches.

5. DISCUSSION

The findings of this study indicate that no statistically significant changes in students' empathy levels occurred following the completion of the educational program. As demonstrated by the comparative data obtained using the paired student's t-test, the differences between the pre-test and post-test did not reach statistical significance. Similarly, ANOVA revealed no significant differences in the cognitive, emotional, or behavioral components of empathy. These results suggest that the implemented educational program did not have a substantial impact on the development of empathy-related skills among participants. This aligns with the findings of Belogai *et al.* [38], where no significant changes in empathy levels were observed following psychological training.

When comparing the present results with those of other studies, some notable contrasts emerge. According to the Gonski Institute for Education [20], educators report a decline in student empathy, which is attributed to the prolonged use of digital technologies: 78% of teachers noted a reduction in students' ability to concentrate on academic tasks, 80% reported decreased empathy, and 60% indicated a decline in physical activity. In contrast, Kazakhstani researchers have shown that the introduction of electronic participatory scientific activities may reduce anxiety and increase stress resilience and emotional empathy among students [39].

In the present study, no decrease in empathy was recorded, but nor was there any significant increase. This suggests a stability in empathy levels among participants, likely due to the already high levels of empathic traits observed at the outset of the program. While international data point to a concerning trend of declining empathy, our results emphasize the resilience of empathy indicators within this particular sample.

Samuels and Onuoha-Jackson [40] noted that a personalized educational program had a significant impact on the development of affective empathy, although it only modestly influenced cognitive empathy. Similarly, Torres *et al.* [41] found higher scores in the cognitive dimension of empathy, particularly on the emotional understanding subscale. By contrast, in this study, none of the empathy components showed

significant improvement: the mean values across all applied methods changed only marginally, and both t-statistics and p-values ($p > 0.05$) did not indicate statistical significance. ANOVA also failed to detect significant differences across the cognitive ($F=0.42$, $p=0.53$), emotional ($F=0.38$, $p=0.54$), and behavioral ($F=0.31$, $p=0.58$) dimensions. These results may be explained by the high pre-test empathy scores and the short duration of the intervention, both of which may have limited the potential for observable changes.

According to the study by Krizhovetskaya and Sizova [42], higher levels of empathy among teachers positively correlate with student academic performance. However, the results of our study do not support a similar conclusion, as no statistically significant changes were found in students' empathy levels: both cognitive and affective empathy remained virtually unchanged after the completion of the educational program, as indicated by p-values greater than 0.05 across all tests. Nevertheless, teachers in special education settings were found to demonstrate higher empathy levels than those working in general education schools [43], suggesting that the conditions of professional practice and the specific nature of interaction with diverse student populations influence the development of empathic qualities. Furthermore, critical thinking skills play a crucial role in personal development, self-actualization, and the advancement of emotional empathy in the professional activities of future educators [44].

According to Çelikkaleli and Ökmen [3], teachers' attitudes toward teaching did not differ significantly by gender, educational background, or school location but did vary with teaching experience. Moreover, empathic tendencies, beliefs about teaching self-efficacy, and job satisfaction were found to exert a significant and positive influence on teachers' professional orientation. Future research aiming to explore the dynamics of professional development in educators should therefore take into account these factors to provide a more comprehensive understanding of the relationship between empathy and teaching practice.

Study by Prueksapitak *et al.* [45] highlighted the effectiveness of using theatrical practice to improve communication skills, including empathy, within the framework of professional training. This was grounded in the "source-message-channel-receiver" communication model and cognitive learning theory. Similarly, Hoffmann *et al.* [27] reported statistically significant improvements in participants' communication skills following an empathy training program, with changes evident across all measured domains and significant at the 0.01 level. These results suggest that such programs can be effective under certain conditions. However, in the present study, the implemented program did not yield significant improvements in empathy, which may be attributed to its limited intensity, duration, or sample characteristics. ANOVA did not identify statistically significant differences in empathy's cognitive, emotional, or behavioral components; the F-values ranged from 0.31 to 0.42, indicating no substantial difference between pre- and post-test measurements.

In summary, comparative analysis with existing literature reveals a mixed picture. While some studies have reported positive changes in empathy levels following training programs, the present study did not find statistically significant improvements. Possible explanations include initially high empathy levels among participants, insufficient duration or intensity of the program, or the specific features of the assessment tools used. These findings underscore the need for further research into the mechanisms of empathy development and the identification of more effective pedagogical strategies for fostering empathy within educational settings.

6. CONCLUSION

The findings of the study indicate that the training program aimed at developing empathy in pre-service teachers did not lead to statistically significant changes in participants' empathy levels. The main finding of the study is that future teachers already possess a high level of empathy, significantly limiting the potential of short-term programs to further develop this quality. The lack of significant changes in the cognitive, emotional, and behavioral components of empathy confirms that future teachers' empathy is already relatively well developed at this stage of their training and is difficult to change through short-term pedagogical interventions. This highlights the need for an initial assessment of empathy levels when developing educational programs and a more precise selection of the forms and methods of pedagogical interventions.

The scientific contribution of the study lies in its detailed examination of emotional and other structural components of empathy, as well as in the evaluation of the effectiveness of educational technologies designed to foster this quality in future educators. The practical value of this research lies in the potential application of its findings for the refinement of teacher training programs, the development of new approaches to fostering empathy in future educators, and the improvement of diagnostic methods for assessing empathic abilities. The results may inform practices in higher pedagogical education, teacher professional development initiatives, and continuing education programs. This is particularly relevant for the transition from general, short-term professional development to long-term, differentiated programs that take into account the individual empathy profiles of students. Moreover, data on empathy levels among senior

students may support the adaptation of instructional strategies and the integration of more effective practical methods for empathy development into teacher education curricula.

Future research directions may include analyzing additional factors influencing empathy development in prospective teachers, such as personality traits, practical teaching experience, and psychological preparedness. It would also be useful to study the impact of long-term educational programs with elements of supervision and practical training, as well as conduct longitudinal studies to assess the sustainability of changes in empathy at different stages of teacher development. Further research could include various pedagogical specializations and the specific characteristics of working with students of different age groups. This would allow for the development of more targeted and methodologically sound models of empathy development in teacher education and contribute to the creation of more adaptive and effective empathy development programs within teacher training.

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AUTHOR CONTRIBUTIONS STATEMENT

This journal uses the Contributor Roles Taxonomy (CRediT) to recognize individual author contributions, reduce authorship disputes, and facilitate collaboration.

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C : Conceptualization

M : Methodology

So : Software

Va : Validation

Fo : Formal analysis

I : Investigation

R : Resources

D : Data Curation

O : Writing - Original Draft

E : Writing - Review & Editing

Vi : Visualization

Su : Supervision

P : Project administration

Fu : Funding acquisition

CONFLICT OF INTEREST STATEMENT

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

INFORMED CONSENT

We have obtained informed consent from all individuals included in this study.

ETHICAL APPROVAL

The research was conducted ethically in accordance with the World Medical Association Declaration of Helsinki. The research received approval from the Local Ethics Commit-tee of the Abai Kazakh National Pedagogical University (protocol No. 945502 dated August 7, 2020).

DATA AVAILABILITY

The authors confirm that the data supporting the findings of this study are available within the article.

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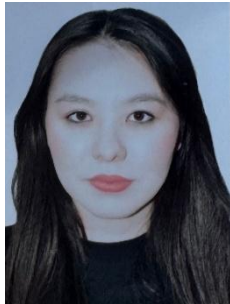
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