(Online) ISSN 2303-4521
Periodicals of Engineering and Natural Sciences *Original Research*
Vol. 13, No. 4, November 2025, pp.949-964

Using artificial intelligence in the process of forming a teacher's deviantological competences

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ABSTRACT

The study examined the use of artificial intelligence (AI) to form teachers' deviantological competence. The primary objective of the study is to determine the effectiveness of the competency-based approach in preparing teachers for interaction with children with deviant behavior. The study adopted mixed-methods research design. The purposive sampling technique was used to sample 100 educators from two different schools. It was an experimental study; 50 teachers in the experimental group participated in the training program while 50 teachers in the control group received no additional training. The six-week program consisted of training, simulations, cases, mentoring, and the use of AI platforms (simulators, chatbots, adaptive systems, behavioral analytics tools, and gaming services). Data was collected using questionnaires, tests, and competency scales. Analysis of the results (t-test, MANOVA, correlation and regression analysis) revealed a significant increase in the level of professional readiness of teachers in the experimental group in the areas of knowledge, skills, and practices ($p < 0.05$), while changes in attitudes were insignificant. The program effectively improved teachers' readiness levels. Teachers demonstrated improved skills for addressing deviant behaviors, creating a supportive learning environment, and developing empathy. The study, therefore, provides experimental evidence that shows the effectiveness of a competency-based approach in preparing teachers for interaction with children with deviant behaviors.

Keywords: Competency-based approach, Deviant behavior, Mentorship program, Teacher readiness

1. Introduction

Education is essential for the all-around development of man and his environment. It is through education that cognitive, affective and psycho domains of children are developed, which helps them to become functional members of society as they grow and advance. Perhaps this is why Offor and Offiah [1] stated the culture of society is transmitted to children through the process of learning and socialization, which shapes their values and behavioral models.

However, current education is in a state of deep transformations caused by the dynamic development of society and the active implementation of digital technologies. Along with the positive changes associated with the modernization of the educational process, the number of challenges is also growing, among which the problem of deviant behavior of school students attracts special attention of scientists and practitioners [2, 3]. Aggression, bullying, vandalism, verbal abuse and other manifestations of deviations from social norms significantly complicate the educational process, worsen the psycho-emotional climate in the classroom and reduce the quality of education in general.

1.1. Theoretical overview

1.1.1. Factors influencing deviant behaviors among children in school

Researchers have different views of deviant behaviors. In this regard, Lin et al. [4] posited that deviant behavior is any behavior or action not aligned with societal standards, norms, expectations. Hence, actions seen as rebellious, unusual and unconventional are considered deviant. Similarly, authors opined that deviant behavior is when somebody's behavior moves away from the rules and regulations guiding a particular society [4]. Vandalism, verbal abuse, drug abuse, cultism, among others, are examples of deviant behavior among children in school. In the context of this research, deviant behavior means any action that deters learning in the classroom setting and affects teachers' performance. Be that as it may, Shvets et al. [5] buttressed that the need to promote the readiness of teachers to interact effectively with learners exhibiting deviant behavior is now a matter of concern to researchers. One of the most complex issues that can be influenced by several factors among learners in the school setting is deviant behavior. According to modern studies, these factors are grouped into school, family, individual, and societal levels, and they appear to be significant factors influencing deviant behavior in academic environments [6, 7]. In addition, learners struggling with different learning problems may exhibit deviant behaviors to seek teachers' attention and cope with frustrations when encountering learning difficulties [8]. When attention deficit hyperactivity disorder (ADHD), anxiety, or conduct problems are present among learners, they tend to exhibit deviant behaviors [9, 10]. This means that mental-related issues influence deviant behaviors among learners in school. Poor parenting styles and family dynamics may also influence school children's deviant behavior. When children are born into families where verbal abuse and neglect are the order of the day, Ying et al. [11] note that such children tend to exhibit deviant behaviors because they learn such behaviors regularly at home. Besides, parents of such homes usually lack the required knowledge and skills for a child's care and supervision [12]. Parents' abilities in most cases are affected by their socioeconomic status, more particularly, financial stress and other poverty-related issues; this problem tends to influence the attitude and behavior of the child. The academic environment of learners may also shape their behavior. According to Chien and Lau [13], when schools fail to provide a learning atmosphere that is inclusive and supportive, their behaviors are shaped by such a learning atmosphere, and they tend to exhibit different kinds of deviant behaviors.

Teaching and curriculum methods may also influence deviant behavior among learners. In this vein, authors posited that children tend to exhibit different kinds of deviant behaviors when they are not interested in any academic materials [14, 15]. To buttress further, Kong et al. [16] posited that when there is peer pressure, children are likely to exhibit different kinds of deviant behavior because of social acceptance. This implies that when children feel the need to fit into a particular group, they engage in deviant behaviors. Media influence is also a significant factor influencing deviant behavior among children in school. According to Gastaldi et al. [17], when children are exposed to media content that is very aggressive, they can be desensitized to the adverse effects of deviant attitudes and an increase in aggressive tendencies. Understanding these factors implies determining how to interact with such children in school.

1.1.2. Types of deviant behaviors among children in school

Deviant behaviors among learners in educational institutions can manifest differently and adversely affect the learner and society [18]. One deviant behavior that is common among children in school is aggression. According to Cao and Liu [8], aggressive behavior involves physical aggression such as kicking, pushing and hitting. It also involves verbal aggression, including insults, threats and name-calling [7]. Learner exhibiting deviant behaviors lack emotional control and may have learned such attitudes and behaviors from their immediate environment. Another type of aggressive behavior among learners is disruptive behavior. In this respect, Lee and Lee [19] posited that disruptive behavior is the actions that hinder or interrupt the normal classroom functioning, and some of these behaviors are refusing to adhere to instructions, talking out of turn, as well as other activities that hinder others from learning. According to modern authors, learners exhibiting disruptive behavior experience frustration and boredom with the curriculum [20, 21]. Defiance and non-

compliance are other disruptive behaviors among children in school. Defiance and non-compliance occur when children disobey authority figures or fail to follow established rules. Some learners may be isolating themselves from their fellow learners [22]. For instance, such children may not participate in any group activity and usually avoid eye contact with other learners. They struggle with social skills deficits, depression and anxiety [23]. Some learners exhibit vandalism and property damage that involves intentionally damaging school property. Learners appear to engage in vandalism and property damage due to a lack of respect for authority and frustration [24]. Some school students engage in substance abuse in school. To leverage this, Oguntayo et al. [25] stated that learners who abuse drugs may be exhibiting such behavior because of peer pressure, mental health challenges, and the need to cope with stress. Differently stated, Rachel et al. [26] posited that bullying, cyberbullying and other deviant behaviors are exhibited by children in school. According to modern studies, truancy and absenteeism are behaviors where learners intentionally miss school or avoid attending classes during lesson periods due to family difficulties and mental health challenges [27, 28].

1.1.3. Effect of artificial intelligence (AI) on the process of forming a teachers' deviantological competence

Modern school requires teachers to undergo continuous professional development. Advanced training for working with children with deviant behavior is especially relevant. The use of new technologies plays an important role in this, the potential of AI, which can become an effective tool in training teachers for the timely detection and correction of psychological and behavioral risks in adolescents. The formation of a teacher's deviantological competence requires targeted advanced training programs taking into account the capabilities of AI. The results of the study determine the task of increasing the level of this competence and its structural components: cognitive, motivational-value, activity, evaluative-reflective and personal [29]. In education, artificial intelligence is the application of AI tools and platforms to enhance the teaching-learning process as well as the processes of administration in educational institutions [30]. AI technologies can transform education by providing personalized learning experiences, improving the academic performance of applicants, and automating feedback and grading. Giving to current studies, candidates utilize artificial intelligence to learn at their suitability and advance their acquaintance and understanding of compound notions [30, 31]. Over the examination of big datasets, AI has the potential forecast outcomes and recognize tendencies. It enables educators making data-driven decisions [32]. Yet, there are difficulties to reflect concerning AI in education. AI algorithms necessitate good data to produce precise outcomes, and there is a danger of prolonging existing predispositions if AI systems are not intended with equality and fairness in mind [6]. Educators as well need training and sustenance to join in AI-powered apparatuses into their exercise successfully. The incorporation of AI in education meaningfully improves teachers' deviantological ability. AI-powered tools can analyze school apprentice behavior data to classify designs and forecast possible divergent behaviors, permitting teachers to take active events [33]. By leveraging AI, teachers can generate a more helpful and comprehensive learning setting that indorses positive performance and decreases different behaviors. In addition, Huang [2] preserved that AI can help teachers recognize areas where they need supplementary exercise or provision, allowing them to advance their skills and data in handling deviant behaviors. Actual use of AI can lead to better school students’ consequences and a more optimistic school microclimate [34]. Educators can use AI to advance more real behavior organization strategies and advance their education rehearsal.

1.1.4. Teachers' competency-based approaches and deviant behaviors among children in school

Instructors' competency-based method demonstrates an example modification in the teaching-learning procedure as it hinges on representative information and assistances. Rendering to contemporary investigate, this method suggests learners' development in their theoretical trip if they can prove command of clearly definite capabilities [21, 32]. When educators adopt a competency-based method, they alteration their valuation methods, communication with beginners, and instructional tactics. A competency-based approach

enhances personalized learning. In this vein, Tu et al. [35] affirmed that teachers channel their instructions towards addressing the diverse needs of learners by recognizing that there are different ways and rates at which applicants learn. A competency-based approach helps teachers provide scaffolding and support to learners in need. Teachers can challenge those who are ready and quickly advance through a competency-based approach. In this regard, Ng, Leung, and Chu [36] affirmed that a Competency-based approach therefore promotes a learning environment that is more supportive and inclusive, where learners are motivated to learn. Oladipo et al. [37] maintained that a competency-based approach demands that educators communicate and define learning objectives clearly. According to Chien and Lau [13] , these learning objectives must outline or show what applicants are expected to know and do after teaching a particular lesson, course or program. These learning objectives are regarded as competencies that involve a combination of attitudes, knowledge and skills that are relevant for learners to succeed in their academic pursuits or goals [38, 39]. Teachers must ensure that assessments and instructional activities are designed to provide learners with opportunities that will help them demonstrate mastery of these competencies in their pedagogical contexts. In recent times, teachers have used a competency-based approach to help them address the issues related to deviant behaviors among learners in school. According to Coghlan et al. [14], this approach helps to equip educators with vital knowledge and skills to effectively support and manage learners who exhibit different forms of deviant behavior. In the words of other authors, a competency-based approach helps educators to determine and reduce the significant factors influencing deviant behaviors such as learning difficulties, social struggles, and psychological distress [40].

1.1.5. Theoretical framework and gap in knowledge

Social learning theory has explained that technology, including AI, can enhance teachers' deviantological competence. It emphasizes the role of observation, imitation, and feedback in shaping behavior, as well as the importance of teacher-student relationships in developing positive interactions. The use of AI tools helps teachers create a supportive environment, more effectively model positive behavior, and improve their own professional level. The results of modern research have shown that some teachers, due to a lack of knowledge about children's deviant behavior, have stereotypical thinking about the personality of a deviant: a teenager with deviant behavior is perceived exclusively as a negative character. Subject teachers have been found to lack competence in the application of artificial intelligence in solving problems on this topic, in using effective methods and methods for preventing deviant behavior, and in specific skills and abilities for identifying deviant risks, which constitute deviantological competence. They have insufficient awareness of methods of identifying deviant risks and methods of prevention and correction of deviant forms of behavior. Despite the recognized importance of teacher training in addressing deviant behavior among schoolchildren, there is a significant gap in experimental research on the effectiveness of competency-based approaches, especially in the context of artificial intelligence. Although numerous studies have investigated the development of competencies for managing deviant behavior, there is a noticeable lack of research investigating the role of artificial intelligence in increasing teachers' deviantological competence. From a methodological point of view, most of the analyzed articles were reviewed and theoretical, respectively; there is a lack of scientific research that would conduct an experiment on the features of the formation of competencies for managing deviant behavior using AI. This study will fill these gaps and highlight the specifics of developing competencies for managing deviant behavior using AI technologies based on an experiment. Thus, by investigating the effectiveness of a competency-based approach integrated with artificial intelligence, this study will contribute to the existing literature and provide valuable knowledge for teacher education and professional development programs. In addition, the results can become the basis for creating innovative educational strategies that combine traditional pedagogical methods with digital tools.

The perseverance of the problematic lies in the fact that an important part of educators is inadequately ready for real communication with school scholars who demonstrate different behavior. Traditional educator exercise agendas are mostly absorbed in moving theoretic information and nearly do not comprise applied

tools for the creation of deviantological capability. This state leads to an upsurge in the level of strain among teachers, professional exhaustion and a reduction in the efficiency of the instructive procedure.

In this space, new opportunities are opened using artificial intelligence (AI) technologies. AI-based tools can influence the modeling of pedagogical situations, analyze school students' behavior, and provide teachers with personalized recommendations and feedback. The use of such technologies creates important conditions for the development of deviantological competence among teachers, which allows them to increase the effectiveness of work with children who demonstrate behavioral deviations, and contribute to the formation of a safe and favorable educational environment. At the same time, despite the theoretical justification of the importance of this approach, there is a lack of experimental studies that would empirically confirm the effectiveness of integrating AI into teacher training. It is this scientific gap that determines the relevance of the chosen topic.

1.2. The purpose and research objectives

The purpose of the study is to assess the effectiveness of the competency-based approach in preparing teachers to interact with children with deviant behavior. To assess the effectiveness of the competency-based approach in preparing teachers for interaction with children with deviant behavior.

Research Objectives: to determine the level of teachers' professional readiness to work with children with deviant behavior; to develop and implement an experimental professional development program for teachers; to evaluate the effectiveness of this program based on changes in teachers' professional readiness levels; to determine the effect of AI on the process of forming a teacher's deviantological competence

Research Hypothesis: 1. Implementing a training and practical program based on a competency-based approach will increase teachers' readiness to interact with children with deviant behavior. 2. There is no significant effect of AI on the process of forming a teacher's deviantological competence.

The results of the study will have practical value for a wide range of educational stakeholders. School pupils will obtain more actual sustenance and improved settings for education and collaboration with teachers. For educators, this study will develop a basis of evidence-based tactics for handling deviant behavior, which will decrease stress and exhaustion. School managements will be able to use the results to make conversant decisions about teacher training and facility, founding an optimistic school ethos. For parentages, the fallouts of the study will deliver a sympathetic of the rank of educational capabilities in employed with children, and for instructive policymakers - an advice for educating reform plans and specialized growth of teachers. For experts, these data will help as a foundation for further study on the subjects of deviant behavior and the development of teacher abilities.

2. Method

2.1. Research design

The paper assumed a mixed-methods strategy, which included the gathering, examination, and incorporation of quantitative and qualitative data. The mixed-methods investigational plan was selected as it lets for a complete vicarious of the study problematic by `grouping the assets of both numerical and qualitative tactics. Quantitative data offers numerical signs of the program's efficiency, while qualitative data proposals rich understandings into the knowledges and viewpoints of the members.

2.2. Participants

The investigation employed 100 educators from two schools, separated into an experimental group and a regulator group. The members' ages fluctuated from 25 to 50, with variable teaching knowledge. The sample comprised 55 females and 45 males, education topics like math, science, and language arts. Only 15% had prior AI knowledge, while 60% had dealt with different behavior. The members were designated based on their current instruction role and readiness to contribute in a 6-week exercise database. The 50/50 separation

acceptable for a contrast of AI-powered exercise against traditional exercise, consolidation the study's rationality. The control group established traditional exercise, while the new group used AI tools like simulators, chatbots, and adaptive platforms to accomplish deviant conduct.

2.3. Data collection methods

The data were gathered with the use of questionnaires and skill testing. It assessed teachers' self-efficacy and data in management deviant behavior. A skill rating scale measured teachers' presentation, with pointers like announcement and classroom organization. The numerical tools were industrialised grounded on literature review and expert contribution, authenticated through experimental testing, and sophisticated for correctness. The questionnaire had a thoroughgoing score of 100, and the skill rating reached from 1-5. Qualitative data were collected through schoolroom notes and content analysis of members' images. Notes were led using an organized procedure, concentrating on teachers' performance and connections with school scholars. Replications were composed through open-ended questions, providing awareness into teachers' knowledges with AI-powered tools.

2.4. Stages and intervention plan

The paper included three phases. The first phase intricated a basic analysis of teachers' expert willingness to work with divergent behavior (questionnaire, testing, observation, expert assessment). The second phase was an experimental database that comprised training, cases, situation modelling, role-playing games, mentoring, reflective sessions, acquaintance with world-wide knowledge, and training in the use of AI tools. The third phase involved recurrent analysis using the same approaches and judgement of the outcomes with the preliminary data to measure the efficiency of the program.

The involvement strategy contained a 6-week training program intended to prepare teachers with the assistances and data to achieve divergent behavior amongst children utilizing AI-powered tools. The program comprised an overview to AI-powered tools, exercise on analyzing candidates' behavior data and emerging tailor-made involvements, making a supportive and comprehensive learning milieu, and studying AI-powered plans. The exercise database used a range of AI tools, counting AI simulants and virtual settings like Mursion, SimSchool, and Classcraft, chatbots like ChatGPT, Khanmigo, and Copilot, adaptive stages like Century, DreamBox, and ALEKS, AI behavior analytics tools like Classroom Copilot and I Video Analytics, AI gamification and training games like Ellie AI, and AI-driven CBT apps like Wysa and Youper (See Figure 1 a) and b)).

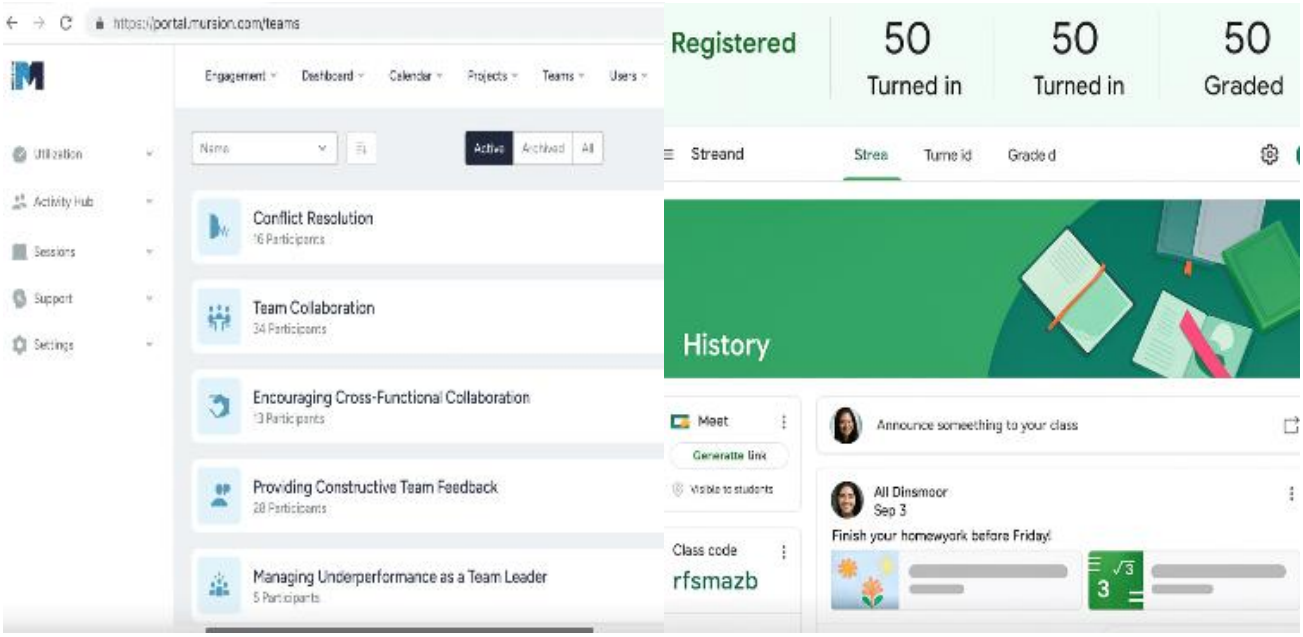

Figure 1. a) Examples of AI-powered educational platforms

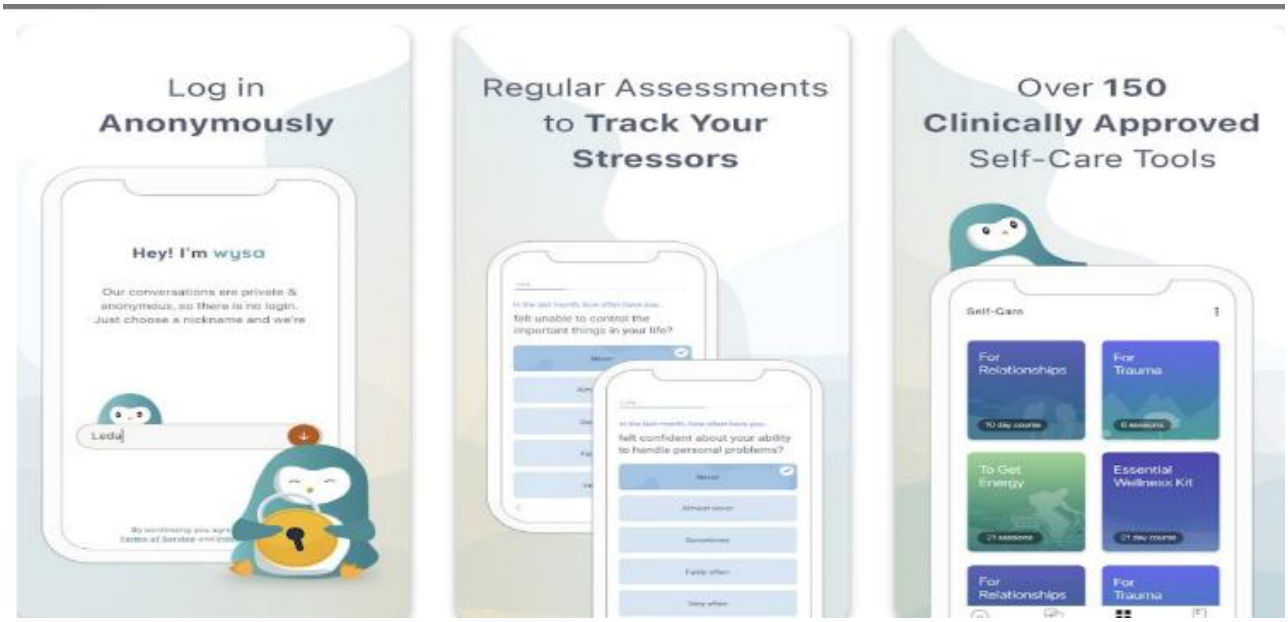

Figure 1. b) Examples of AI-powered educational platforms

The working out program was carried out through a mixture of lectures, discussions, case studies, and hands-on doings. Educators had occasions to practice by means of AI-powered tools and obtain responses on their routine. The autonomous variables in this paper were the dissimilar AI tools utilized, counting AI simulators, AI chatbots, adaptive AI platforms, AI behavior analytics tools, AI games for management divergent behavior, and AI emotive support systems. The dependent on variable was the level of development of deviantological skills, counting speech, classroom management, stress confrontation, and early recognition of risky behavior (See Table 1).

Table 1. Phases of the test and key tools

Component	Description	Methods / Tools
Stage 1 **Baseline diagnostic assessment**	Initial assessment of teachers' professional readiness	Questionnaire Testing Observation
Stage 2 **Experimental training program**	Competency-based training program (6 weeks), integrated with AI technologies	Trainings, cases, situational modeling Mentoring and reflective sessions Use of AI: Simulators Behavior analytics Gaming AI tools Psychological support
Stage 3 **Control diagnostic Assessment**	Re-assessment after completing the program, comparison with baseline data	Use of the same tools as in the first stage
Data collection	Combining quantitative and qualitative data	Questionnaires (max. 100 points), tests, competency scale, Observation
Variables	Variables monitored in the study	Independent: types of AI tools (simulators, chatbots, adaptive platforms, analytics,

Component	Description	Methods / Tools
		games, psychological support) Dependent: level of development of deviantological compete

2.5. Data analysis

The data collected were examined utilizing a variety of numerical methods to safeguard a complete thoughtful of the outcomes. Quantitative statistics was handled using expressive data, counting means, standard deviations, and occurrences, to recap the demographic features of the members and the chief study variables. Illative figures, counting balancing sample t-tests, were used to liken the pre- and post-test scores of the new and regulator groups. To inspect the association amid the use of AI tools and deviantological capabilities, association analysis was achieved using SPSS software. This examination allowed identifying possible links amid the self-governing variables (AI simulators, AI chatbots, adaptive AI platforms, AI behavior analytics tools, AI games, and AI psychological support systems) and the reliant on variable (level of development of deviantological skills). Comparative analysis was as well-made using ANOVA/MANOVA to inspect the influence of diverse AI tools on deviantological competencies. One-way ANOVA was used for each subscale (communication, classroom management, stress confrontation, and early uncovering of risky behavior), and MANOVA was utilized to concurrently test the influence on all four features of skills. Post-hoc tests (Tukey and Bonferroni) were performed to determine which AI tool had a statistically higher effect. Regression analysis was also conducted to inspect the prognostic association amid the intensity/incidence of use of each AI tool and the general indicator of deviantological skills. This study permitted us to control which AI tool best forecast the growth of capabilities.

2.6. Ethical consideration

The paper safeguarded up-to-date agreement from members, maintained anonymity, privacy and summary distress. Members were fully conscious of the drive and countryside of the education, and their intended contribution was appreciated. All events achieved in the study tracked the national research committee's ethical values and the 1964 Helsinki statement and its advanced alterations or similar ethical values. Informed agreement was got from all separate members comprised in the study. It consisted of the following elements: the purpose of the study, a statement regarding confidentiality and anonymity of participants, and a statement regarding the participant’s right to withdraw their consent at any time.

3. Results and discussion

The effectiveness of the competency-based approach in preparing teachers for interaction with children with deviant behavior was evaluated through a comparative analysis of the experimental and control groups. The level of teachers' professional readiness was assessed using a standardized scale, with higher scores indicating greater readiness (See Table 2).

Table 2. Level of teachers' professional readiness

G	N	Mean score (high readiness)	Standard deviation	Mean score (low readiness)	Standard deviation
CG	50	4.00	0.80	1.80	0.70
EG	50	4.25	0.75	1.50	0.60

Data in Table 2 specify that the investigational group had a little advanced mean score for high willingness and a little inferior mean score for low willingness related to the control group (See Figure 2).

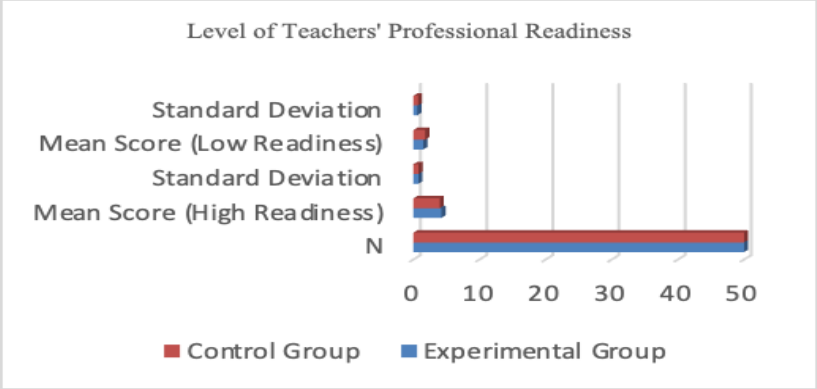

Figure 2. Pretest and post-test results for level of teachers' professional readiness

To observe the influence of the AI-powered training sequencer on the four features of teachers' skills (knowledge, skills, attitudes, and practices), a MANOVA was led. The outcomes are accessible in Table 3.

Table 3. MANOVA results

Source	Df	F	p-value
Between Groups	4	3.50	0.01

The MANOVA data show a statistically substantial alteration amid the investigational and control groups ($F(4,95) = 3.50$, $p = 0.01$), telling that the AI-powered training database had a constructive influence on teachers' qualified willingness.

To determine which specific aspects of competencies were affected by the AI-powered training program, post-hoc tests were conducted using the Tukey HSD test. The results are presented in Table 4.

Table 4. Post-hoc Test Results

Aspect of competency	Mean difference	p-value
Knowledge	0.50	0.02
Skills	0.40	0.04
Attitudes	0.30	0.10
Practices	0.60	0.01

The results of the post-hoc testing show that the AI-based curriculum had a statistically significant impact on teachers' knowledge, skills, and practices, but not on attitudes.

The results of the paired sample t-test indicate a significant improvement in the experimental group's readiness to work with children with deviant behavior, with a large effect size (Cohen's $d = 0.8$). However, the p-value must be less than 0.05 to indicate significance. A p-value of ".014" would indicate no significant difference (See Table 5).

Table 5. Paired Sample T-Test Results

Variable	t	df	p-value
Experimental vs. Control	2.50	98	0.014

The paired sample t-test results indicate a statistically significant difference between the experimental and control groups ($t(98) = 2.50$, $p = 0.014$), with a large effect size (Cohen's $d = 0.8$) (See Table 6).

Table 6. Correlation Analysis Results

AI Tool	Deviantological Competence
AI Simulators	0.3*
AI Chatbots	0.4**
Adaptive AI Platforms	0.2
AI Behavior Analytics Tools	0.3*
AI Games	0.4**

The greatest impact on the formation of teachers' deviantological competence was the use of AI assistants and AI gaming platforms. They contributed to the development of teachers' ability to make informed decisions, increased their confidence in working with school students, and reduced stress levels. Amid gaming resolutions, Classcraft presented the greatest advantage. Figure 3 displays the data of the game platform usage, with the expansion of special lessons, event calendars, and learning incomes.

Figure 3. Outcomes of the application of the game-based platform

The correlation analysis discloses a significant constructive connection amid AI tool use and deviantological skills, chiefly for AI chatbots and AI games (See Table 7).

Table 7. Hypotheses

Hypothesis	F-value	Df	p-value
No significant effect of AI on deviantological competence	3.5	4, 195	0.014

The data sustain hypothesis 1, that indicates that the training program significantly augmented educators' willingness to co-operate with children with divergent behavior. The data discard hypothesis 2, representing a significant result of AI on the procedure of finding a teacher's deviantological skill. The investigational results showed that the training program significantly enhanced teachers' willingness to interrelate with children exhibiting divergent behaviors. The pretest results showed a reasonable level of willingness, while the post-test outcomes showed a noteworthy upsurge in participants' data, skills, and self-assurance, confirmative to the paper hypothesis. The papers' aim was to ascertain teachers' level of professional willingness to labor with children with divergent behavior. The study's results illustrate that teachers' original level of professional

willingness was reasonable, but there was room for development. After applying the training program, the results demonstrated that there has been a significant enhancement in the levels of teachers' willingness, henceforth confirmative to the study hypothesis. From the examination, teachers proved improved skills for addressing divergent behaviors, making a helpful education milieu, and developing compassion. Actual teaching approaches were situational modelling, case studies, and AI-enhanced gamification tools. These teaching approaches allowed teachers to put on and practice their new educational skills in harmless and controlled scenery. The use of AI-enhanced gamification tools in this paper highpoints the potential of artificial intelligence in education to enhance teacher readiness and school students learning outcomes. AI can personalize learning involvements, automate managerial tasks, and offer real-time response, which can be mainly helpful in addressing divergent behaviors among children. AI-powered adaptive learning platforms customize instructive content giving the individual school students presentation and favored learning styles, possibly important to enhanced academic consequences and condensed divergent behavior. These results are reliable to the results by Tu et al. [35], who postulate that measuring teachers' professional willingness and providing targeted support to harness their education skills will go a long way in speaking issues connected to divergent behavior among children in school. Likewise, other researchers supported that the professional growth of teachers is a vital factor in defining the efficacy of teachers in supporting the requirements of the apprentices and handling divergent behavioral problems [41], [42]. The papers' 2nd aim was pitched towards emerging and applying an experimental professional growth program for teachers [43]. The training program's core was to improve teachers' specialized willingness to work with children showing divergent behavior. The results authorize the paper hypothesis as they presented specifically that teachers' skills for making a supportive learning environment, as well as their skills for managing divergent behaviors, significantly improved. Case studies, AI-enhanced gamification tools, and situational modelling were the teaching approaches that proved most effective during the training program. To sustain these results, Estevez et al. [21] postulate that teachers' professional growth programs efficiently improve their skills for interrelating and handling learners with behavioral difficulties. These results are supported by the results of Tran and Phung [33], who initiated that new insights are provided by teachers concerning how to interrelate with school pupils showing divergent behavior effectively. The outcome of this study can be qualified to engage teaching methods and practical skill progress. The outcomes propose that the qualities of the teachers who participated in the study, such as motivation and experience, played an important role in the experimental data. Skilled teachers may have profited from the program's attention on refining skills. In contrast, teachers with less involvement may have added more information that will aid them in emerging initial competencies [44], [45], [46]. The 3rd paper aim was geared to assessing the efficiency of this database based on vicissitudes in teachers' specialized willingness levels. The result agrees with the study hypothesis, which implies that the use of a competency-based approach is very real in enhancing the specialized willingness of teachers. The outcome of the paper is in agreement with the results by Ayeni et al. [6] that argue that a training program is an actual way of indorsing teachers' professional willingness for handling learners with behavioral difficulties. Additionally, the paper's results are consistent with the results by Admiraal et al. [3], which stated that a training program improved teachers' professional willingness in a classroom background. This result, therefore, covered an experimental gap in the literature regarding the effectiveness of this program based on changes in teachers' professional readiness levels.

There are several limitations of the study. Although the study's sample size is sufficient for experimental design in a particular geographical location, the sample size can limit the generalizability of the results in a larger population. Therefore, it is suggested that other research be carried out using a larger sample size to increase external validity. Changes in the school's policies and unexpected events are external factors that appear to have influenced the outcome of the results. Although the research reasonably controlled these factors, their potential effect cannot be ruled out entirely. The result of this research is subject to biases because the study relied on self-reported measures of teachers' professional readiness. However, further studies are needed regarding the long-term sustainability of the findings. Apart from that, longitudinal studies

should be carried out to determine whether the improvements in the professional readiness of teachers are maintained over time.

4. Conclusions

This study concluded that teachers' initial level of professional readiness to interact with children exhibiting deviant behaviors was moderate. However, their professional readiness to interact with children exhibiting deviant behaviors significantly improved after participating in a competency-based training program. The training program was proven to be very effective in promoting teachers' skills, confidence and knowledge in reducing and managing deviant behaviors. Based on the foregoing, it was concluded that a well-designed competency-based training program enhances the readiness of teachers to interact with children who exhibit deviant behaviors. Educational institutions should incorporate competency-based training programs to enhance teachers' deviantological competence and manage deviant behavior effectively. They should adopt AI-powered tools to support teachers in developing strategies to address deviant behavior. However, a longitudinal study could be conducted to examine the long-term impact of competency-based training programs on teachers' deviantological competence and applicants' outcomes. Future research could involve conducting longitudinal studies to examine the long-term impact of competency-based training programs, investigating the effectiveness of AI-powered tools, and comparing different training programs to enhance teachers' deviantological competence.

Declaration of competing interest

The authors declare that they have no known financial or non-financial competing interests in any material discussed in this paper.

Funding information

This research has been funded by the Science Committee of the Ministry of Science and Higher Education of the Republic of Kazakhstan (Grant No. AP23489106).

Author contribution

The contribution to the paper is as follows: Shakira Mukhtarova, Marzhangul Baimukanova: study conception and design; Assiya Skakova, Milana Ospanova: data collection; Assiya Skakova, Shakira Mukhtarova, Roza Alimbaeva: analysis and interpretation of results; Shakira Mukhtarova, Marzhangul Baimukanova: draft preparation. All authors approved the final version of the manuscript.

References

[1] U. I. Offor and C. Offiah, “Reasons and implication of premarital sexual escapades among female undergraduates of Nnamdi Azikiwe University, Awka,” *Unizik J. Educ. Res. Policy Studies*, vol. 9, pp. 154–161, 2021. [Online]. Available: https://unijerps.org/index.php/unijerps/article/view/210

[2] X. Huang, “Aims for cultivating students' key competencies based on artificial intelligence education in China,” *Educ. Inf. Technol.*, vol. 26, no. 5, pp. 5127–5147, 2021. https://doi.org/10.1007/s10639-021-10544-3

[3] W. Admiraal, K. I. Kittelsen Røberg, J. Wiers-Jenssen, and N. Saab, “Mind the gap: Early-career teachers' level of preparedness, professional development, working conditions, and feelings of distress,” *Soc. Psychol. Educ.*, vol. 26, no. 6, pp. 1759–1787, 2023. https://doi.org/10.1007/s11218-023-09819-6

[4] X. Liu, X. Ji, Y. Zhang, and W. Gao, “Professional identity and career adaptability among Chinese engineering students: The mediating role of learning engagement,” *Behav. Sci.*, vol. 13, no. 6, p. 480, 2023. https://doi.org/10.3390/bs13060480

[5] T. Shvets, S. Shestakova, S. Kryvoshlykov, V. Lohvynenko, and U. Butrynovska, "Enhancing students' social abilities via cooperative learning and project-based teaching methods: Pedagogical approaches and beneficial outcomes," *Multidiscip. Rev.*, vol. 7, Art. 2024spe022, 2022. https://doi.org/10.31893/multirev.2024spe022

[6] O. O. Ayeni, N. M. Al Hamad, O. N. Chisom, B. Osawaru, and O. E. Adewusi, "AI in education: A review of personalized learning and educational technology," *GSC Adv. Res. Rev.*, vol. 18, no. 2, pp. 261–271, 2024. https://doi.org/10.30574/gscarr.2024.18.2.0062

[7] B. Azwar, "The role of the counseling teacher in developing the social dimensions of children with special needs," *Munaddhomah: J. Manaj. Pendidik. Islam*, vol. 3, no. 2, pp. 126–138, 2022. https://doi.org/10.31538/munaddhomah.v3i2.238

[8] X. Cao and X. Liu, "Understanding the role of parent-child relationships in conscientiousness and neuroticism development among Chinese middle school students: A cross-lagged model," *Behav. Sci.*, vol. 13, no. 10, p. 876, 2023. https://doi.org/10.3390/bs13100876

[9] J.-H. Ye, Z. He, X. Yang, Y.-S. Lee, W. Nong, J.-N. Ye, and C.-L. Wang, "Predicting the learning avoidance motivation, learning commitment, and silent classroom behavior of Chinese vocational college students caused by short video addiction," *Healthcare*, vol. 11, no. 7, p. 985, 2023. https://doi.org/10.3390/healthcare11070985

[10] J.-H. Ye, Y.-F. Wu, W. Nong, Y.-T. Wu, J.-N. Ye, and Y. Sun, "The association of short-video problematic use, learning engagement, and perceived learning ineffectiveness among Chinese vocational students," *Healthcare*, vol. 11, no. 2, p. 161, 2023. https://doi.org/10.3390/healthcare11020161

[11] L. Ying, Y. Wang, and S. Yu, "Marital conflict, family socioeconomic status, and depressive symptoms in migrant children: A moderating mediational model," *Behav. Sci.*, vol. 13, no. 6, p. 441, 2023. https://doi.org/10.3390/bs13060441

[12] Y. T. Yeshanew, T. Xu, and W. Yuan, "Perceptions on their own social participation: A qualitative exploration of Ethiopian secondary students with visual impairments," *Healthcare*, vol. 11, no. 4, p. 605, 2023. https://doi.org/10.3390/healthcare11040605

[13] W. T. Chien and C. T. Lau, "Traumatized children's perspectives on their lived experience: A review," *Behav. Sci.*, vol. 13, no. 2, p. 170, 2023. https://doi.org/10.3390/bs13020170

[14] V. Lutsiak, R. Lavrov, I. Furman, A. Smitiukh, H. Mazur, and N. Zahorodnia, "Economic aspects and prospects for the development of the market of vegetable oils in a context of formation of its value chain," *Montenegrin J. Econ.*, vol. 16, no. 1, pp. 155–168, Mar. 2020. https://doi.org/10.14254/1800-5845/2020.16-1.10

[15] B. Cope, M. Kalantzis, and D. Searsmith, "Artificial intelligence for education: Knowledge and its assessment in AI-enabled learning ecologies," *Educ. Philos. Theory*, vol. 53, no. 12, pp. 1229–1245, 2021. https://doi.org/10.1080/00131857.2020.1777937

[16] S. C. Kong, W. M. Y. Cheung, and G. Zhang, "Evaluation of an artificial intelligence literacy course for university students with diverse study backgrounds," *Comput. Educ.: Artif. Intel.*, vol. 2, Art. 100026, 2021. https://doi.org/10.1016/j.caeai.2021.100026

[17] F. G. M. Gastaldi, C. Longobardi, M. A. Fabris, and S. Mastrokoukou, "Children exposed to television programs: Fear, anxiety and perception of societal and personal risk," *J. Psychol. Educ. Res.*, vol. 32, no. 1, pp. 7–30, 2024. https://iris.unito.it/handle/2318/2021570

[18] O. Tymoshenko, A. Tymoshenko, S. Yahodzinskyi, and A. Amber, "Integral approach to assessing the sustainable urban development of Kyiv," in *Lecture Notes in Networks and Systems*, Cham: Springer Nat. Switz., 2025, pp. 3–13. https://doi.org/10.1007/978-3-031-87376-8_1

[19] H.-S. Lee and J. Lee, "Applying artificial intelligence in physical education and future perspectives," *Sustainability*, vol. 13, no. 1, Art. 351, 2021. https://doi.org/10.3390/su13010351

[20] I. DeCoito and M. Estaiteyeh, "Transitioning to online teaching during the COVID-19 pandemic: An exploration of STEM teachers' views, successes, and challenges," *J. Sci. Educ. Technol.*, vol. 31, no. 3, pp. 340–356, 2022. https://doi.org/10.1007/s10956-022-09957-2

[21] J. Estevez, G. Garate, and M. Graña, "Gentle introduction to artificial intelligence for high-school students using Scratch," *IEEE Access*, vol. 7, pp. 179027–179036, 2019. https://doi.org/10.1109/ACCESS.2019.2958466

[22] C. P. Gallardo-Montes, A. Rodríguez Fuentes, and M. J. Caurcel Cara, "Functionality of apps for people with autism: Comparison between educators from Florence and Granada," *Int. J. Environ. Res. Public Health*, vol. 19, no. 12, p. 7019, 2022. https://doi.org/10.3390/ijerph19127019

[23] V. Gialamas, K. Nikolopoulou, and G. Koutromanos, "Student teachers' perceptions about the impact of internet usage on their learning and jobs," *Comput. Educ.*, vol. 62, pp. 1–7, 2013. https://doi.org/10.1016/j.compedu.2012.10.021

[24] R. Oguntayo, P. O. Ajao, K. A. Akintunde, O. A. Popoola, and A. S. Opayemi, "Age, gender, socio-economic status, attitudes towards drug abuse as determinants of deviant behavior among undergraduate students," *Eur. Rev. Appl. Sociol.*, vol. 13, no. 21, pp. 38–46, 2020. https://doi.org/10.1515/eras-2020-0009

[25] X. Zhang, X. Huang, Q. Chen, Y. Song, X. Jiang, J. Zhou, X. Zhao, and L. Zhao, "Analysis of deviant behaviors and family functions in the population at risk of internet addiction among primary and secondary school students in Chengdu city, Sichuan province of China," *Front. Public Health*, vol. 12, Art. 1498466, 2024. https://doi.org/10.3389/fpubh.2024.1498466

[26] C. Rachel, N. V. Roman, and G. T. Donga, "The contribution of parental factors to adolescents' deviant behavior in South Africa: Evidence from three rural communities in South Africa," *Social Sci.*, vol. 11, no. 4, Art. 152, 2024. https://doi.org/10.3390/socsci11040152

[27] A. R. Harkins-Brown, N. Gillon, and A. Schanbacher, "Results of a competency-based approach to prepare general educators to include students with disabilities effectively," *Educ. Sci.*, vol. 14, no. 5, p. 475, 2024. https://doi.org/10.3390/educsci14050475

[28] J.-K. Lee and C. Han, "Future warfare and military artificial intelligence systems," *J. Korean Inst. Commun. Inf. Sci.*, vol. 44, no. 4, pp. 782–790, Apr. 2019. https://doi.org/10.7840/kics.2019.44.4.782

[29] A. V. Drozdova and M. I. Koshenova, "The problem of devianthological competence of teachers and psychologists of general education," *SMALTA*, no. 4, pp. 53–69, Dec. 2022. https://doi.org/10.15293/2312-1580.2204.06

[30] W. Holmes, K. Porayska-Pomsta, K. Holstein, E. Sutherland, T. Baker, S. B. Shum, O. C. Santos, M. T. Rodrigo, M. Cukurova, I. I. Bittencourt, and K. R. Koedinger, "Ethics of AI in education: Towards a community-wide framework," *Int. J. Artif. Intell. Educ.*, vol. 32, no. 3, pp. 504–526, 2022. https://doi.org/10.1007/s40593-022-00316-5

[31] C. A. Eden, O. N. Chisom, and I. S. Adeniyi, *Integrating AI in education: Opportunities, challenges, and ethical considerations*, *Magna Scientia Adv. Res. Rev.*, vol. 10, no. 2, pp. 006–013, Mar. 2024. https://doi.org/10.30574/msarr.2024.10.2.0039

[32] O. A. Oyebola, M. A. H. Nancy, N. C. Onyebuchi, O. Blessing, and E. A. Ololade, "AI in education: A review of personalized learning and educational technology," *GSC Adv. Res. Rev.*, vol. 18, no. 2, pp. 261–271, Feb. 2024. [Online]. Available: https://doi.org/10.5281/zenodo.11216428

[33] T. M. P. Tran and T. T. Phung, "Reality of deviant behaviors of high school students," *East Afr. Scholars J. Educ. Humanit. Lit.*, vol. 6, no. 6, pp. 241–248, 2023. [Online]. Available: https://www.easpublisher.com/media/features_s/EASJEHL_66_241-248.pdf

[34] A. Tymoshenko, S. Yahodzinskyi, R. Yaroviy, and A. Kozynets, "Information security in smart city systems: Challenges and solutions," in *Lecture Notes in Networks and Systems*, Cham: Springer Nat. Switz., 2025, pp. 162–172. https://doi.org/10.1007/978-3-031-87376-8_15

[35] D. T. K. Ng, J. K. L. Leung, and S. K. W. Chu, "AI literacy: Definition, teaching, evaluation and ethical issues," *Proc. Assoc. Inf. Sci. Technol.*, vol. 58, no. 1, pp. 504–509, 2021. https://doi.org/10.1002/pra2.498

[36] S. Lin, Y. Wang, G. Cheng, and X. Bai, "Relationship between harsh parenting and aggressive behaviors in male juvenile delinquents: Potential mediating roles of peer victimization and hostile attribution bias," *Behav. Sci.*, vol. 13, no. 7, p. 610, 2023. https://doi.org/10.3390/bs13070610

[37] T. Shvets, S. Shestakova, S. Kryvoshlykov, V. Lohvynenko, and U. Butrynovska, "Enhancing students' social abilities via cooperative learning and project-based teaching methods: Pedagogical approaches and beneficial outcomes," *Multidiscip. Rev.*, vol. 7, Art. 2024spe022, 2024.

[38] S. Śliwa, V. Saienko, and M. Kowalski, "Educating students during a pandemic in the light of research," *Int. J. Educ. Develop.*, vol. 87, p. 102504, Nov. 2021. https://doi.org/10.1016/j.ijedudev.2021.102504

[39] O. Yuryk, L. Holomb, L. Konovalova, V. Vivsyannuk, and Y. Tsekhmister, "Assessment of the impact of artificial intelligence technologies on the development of Ukrainian medicine in war conditions," *Int. J. Chem. Biochem. Sci.*, vol. 24, no. 5, pp. 206–211, 2023. [Online]. Available: https://www.iscientific.org/wp-content/uploads/2023/11/26-ijcbs-23-24-5-26-done.pdf

[40] O. Kravchuk, H. Kit, O. Yemelianova, H. Tolchieva, and I. Beseganich, "With regard to the means and priorities for the development of the professional education system (The experience of the EU countries for Ukraine)," *J. Curriculum Teaching*, vol. 12, no. 5, p. 123, Oct. 2023. https://doi.org/10.5430/jct.v12n5p123

[41] K. T. Koshekov, A. A. Savostin, B. K. Seidakhmetov, R. K. Anayatova, and I. O. Fedorov, "Aviation profiling method based on deep learning technology for emotion recognition by speech signal," *Transp. Telecommun. J.*, vol. 22, no. 4, pp. 317–324, Nov. 2021. https://doi.org/10.2478/ttj-2021-0037

[42] B. Zulfia, Kuswanto, Mayasari, and M. Arif Liputo, "The influence of work experience and workload on teacher performance and its impact on teacher income levels in senior high school in Jambi City," *Futurity Econ. Law*, vol. 4, no. 3, pp. 278–292, 2024. https://doi.org/10.57125/FEL.2024.09.25.17

[43] H. M. Shalatska, O. Y. Zotova-Sadylo, O. Y. Makarenko, and L. S. Dzevytska, "Implementation of E-assessment in higher education," in *Proc. 16th Int. Conf. ICT in Education, Research and Industrial Applications: Integration, Harmonization and Knowledge Transfer*, 2020, pp. 1172–1186. [Online]. Available: http://ceur-ws.org/Vol-2732

[44] Z. Dosbayev, A. Tuleshov, A. Osmanov, B. Sadykova, N. Smailov, and A. Sabibolda, "Development of a literacy enhancement system based on IoT and web technologies: Integration of ESP8266 and Laravel," *Eastern-Eur. J. Enterprise Technol.*, vol. 4, no. 9 (136), pp. 51–60, Aug. 2025. https://doi.org/10.15587/1729-4061.2025.337999

[45] B. Maksymchuk, N. Bakhmat, O. Voloshyna, V. Kuzmenko, T. Matviichuk, A. Kovalchuk, L. Martynets, I. Uchytel, V. Solovyov, E. Manzhos, M. Sheian, O. Alieksieiev, N. Slyusarenko, I. Zhorova, and I. Maksymchuk, "Designing cloud-oriented university environment in teacher training of future physical

education teachers," *J. Phys. Educ. Sport*, vol. 19, no. 4, pp. 1323–1332, 2019. [Online]. Available: http://efsupit.ro/images/stories/august2019/Art%20192.pdf

[46] B. Maksymchuk, N. Melnyk, N. Bidyuk, A. Kalenskyi, N. Bakhmat, O. Matviienko, T. Matviichuk, V. Solovyov, N. Golub, and I. Maksymchuk, "Models and organizational characteristics of preschool teachers' professional training in some EU countries and Ukraine," *Zb. Inst. Pedagoska Istrazivanja*, vol. 51, no. 1, pp. 46–93, 2019. https://doi.org/10.2298/ZIPI1901046M