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Pedagogical Mechanisms for Preparing Future Education Managers for Administrative Activities to Support Quality Education in the Sustainable Development Goals (SDGs) Era

Dustnazar Omonovich Khimmataliev[1,], Nilufar Pardaqizi Omonova[1], Hasan Nematovich Bozorov[2], Munisa Aminovna Davlatova[1], Shoira Isajanovna Abdullayeva[3], Lola Muhiddinkizi Sunnatova[4], Xoshimjon Abdumalikovich Mamajonov[1], Zakiya A. Narimbetova[1]*

[1]Chirchik State Pedagogical University, Chirchik, Uzbekistan
[2]Uzbekistan National Pedagogical University, Tashkent, Uzbekistan
[3]Tashkent University of Information Technologies, Tashkent, Uzbekistan
[4]Samarkand State University, Samarkand, Uzbekistan
[*]Correspondence: E-mail: d.khimmataliyev@gmail.com

A B S T R A C T

This study seeks to enhance the managerial readiness of future education professionals through structured pedagogical processes. An experiment with experimental and control groups was conducted, both receiving identical content but different teaching strategies. The developed model combined conceptual, technological, and reflective components, supported by digital tools and project-based learning. Results showed that students in the experimental group demonstrated stronger competence in planning and managing educational activities. This improvement stemmed from structured, goal-oriented experiences reinforced by formative evaluation. By integrating strategic management with pedagogical conditions, the model encouraged autonomy and reflective thinking. The findings emphasize the value of targeted pedagogical interventions in preparing competent education managers. Moreover, the study contributes to Sustainable Development Goals (SDGs), particularly in advancing quality education through innovative approaches to professional training.

1. INTRODUCTION

The transformation of the education system in the context of rapidly evolving societal demands and market-based relations requires a fundamental shift in educational management paradigms (Adeoye, 2022). This transformation necessitates a move away from traditional administrative-command structures toward more democratic and economically responsive models of management. As a result, the mechanisms of educational governance have become central to discourse on institutional effectiveness, particularly in terms of strategic planning, forecasting, and the functional development of leadership capacities across all levels of the educational hierarchy (Karshiev, 2020a; Oreshkina, 2014).

Recent theoretical developments emphasize the importance of creating organizational and pedagogical conditions that support the training of future education managers (Adeoye *et al.,* 2023; Glushchenko, 2022). This includes building systems that equip them with knowledge, skills, and competencies aligned with contemporary challenges. However, the current system of professional preparation remains fragmented and insufficient, often relying on outdated internal management models and lacking mechanisms for adaptive change. Consequently, future managers are frequently unprepared to respond to dynamic educational environments due to limitations in both theoretical understanding and practical readiness (Salomova, 2020; Akhlan *et al.,* 2024).

Educational process management is defined as a systemic response to internal and external factors influencing the learning environment, particularly regarding innovation, assessment, and adjustment mechanisms. A comprehensive management model must integrate leadership, planning, and organization to ensure that educational institutions respond effectively to change. Within this context, pedagogical models for managerial training must adopt a multi-dimensional framework, including conceptual, technological, and reflective components. These frameworks should be grounded in scientific, digital, and practice-oriented content, utilizing interactive and problem-based methodologies to build managerial competence (Khimmataliyev & Burieva, 2024; Usarov *et al.,* 2024).

Based on our previous studies (Usarov *et al.,* 2024; Mukhamedov *et al.,* 2024; Mukhamedov *et al.,* 2025), this study aims to develop and implement a pedagogical model for enhancing the managerial readiness of future education professionals. The novelty of this approach lies in the integration of digital tools, reflexive evaluation methods, and strategic content selection to cultivate professional competence. Its impact is expected to support the realization of Sustainable Development Goal (SDGs) by producing education managers capable of leading inclusive and high-quality institutions (Ragadhita *et al.,* 2026). Through this work, the study contributes both theoretically and practically to the discourse on effective management education in higher education settings.

2. METHODS

Recent studies in the field of education management emphasize the necessity of aligning pedagogical training with contemporary challenges in institutional leadership. Scholars have increasingly focused on the integration of systemic, project-based, and reflective approaches in the development of managerial competencies. These perspectives highlight those educational institutions must prepare future managers to operate within evolving digital ecosystems, emphasizing innovation, strategic decision-making, and human-centered leadership (Khimmataliyev *et al.,* 2023; Karshiev, 2020b).

At the core of managerial training is the development of professional competencies that encompass analytical, organizational, research, pedagogical, and technological dimensions. These competencies must be fostered through pedagogical conditions that promote active engagement, self-reflection, and interdisciplinary integration. Several principles have been identified to guide this process, including scientific orientation, continuity, facilitation, and reflexivity. These principles underscore the importance of lifelong learning, trust-building in the educational environment, and the capacity to identify and address institutional challenges through participatory leadership (Salomova, 2020; Andreev, 2004). **Figure 1** presents the conceptual principles proposed for enhancing managerial training. These include:

(i)   scientific orientation, where education is grounded in research-based practice;
(ii) continuity, where learning is understood as an ongoing process across formal and informal settings;
(iii) facilitation, which involves creating inclusive, student-centered environments; and
(iv) reflexivity, which cultivates the ability to self-analyze and adapt based on outcomes.

These principles reflect the shift from linear, prescriptive training models to dynamic, student-responsive frameworks rooted in the principles of democratic leadership and institutional accountability.
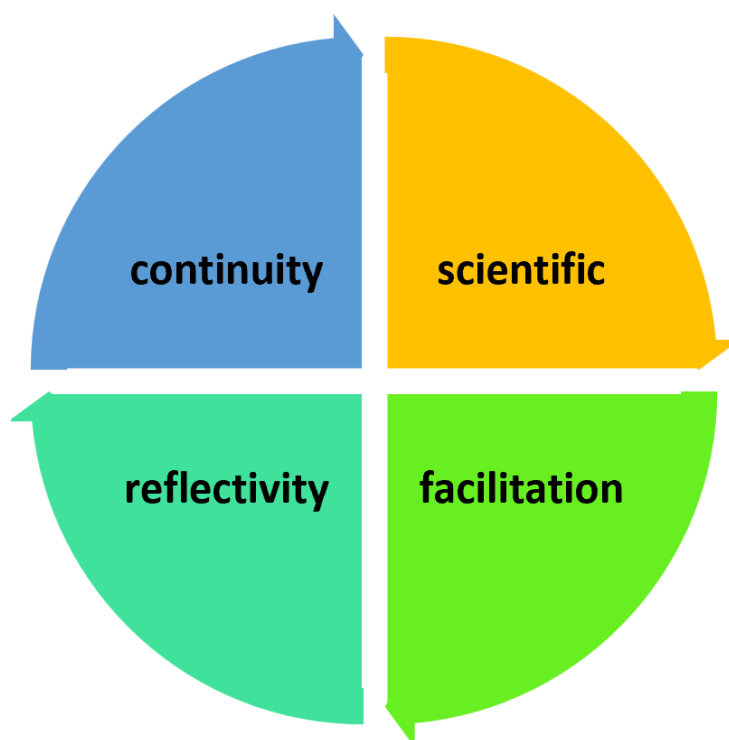

Figure 1. Principles for improving the training of educational managers for management activities.

Further models of leadership effectiveness, such as those by Mitchell and House, highlight how motivation, satisfaction, and performance are interrelated and can be shaped by managerial behaviors such as support, participation, and goal orientation (Peterson, 1991). Similarly, the Plan-Do-Check-Act (PDCA) model from quality management theory has been adapted to education as a continuous cycle of improvement. These frameworks reinforce the need for future managers to be equipped with tools for critical analysis, strategic

implementation, and adaptive planning, all of which are essential in ensuring institutional resilience and responsiveness.

3. RESULTS AND DISCUSSION

The research employed a systematic self-assessment approach to explore the effectiveness of innovative management technologies in higher education institutions. This approach included methods such as simulated participation, document review (prospectus), matrix analysis, and questionnaire-based diagnostics. These techniques enabled a comprehensive evaluation of both the learning environment and student development.

Figure 2 illustrates the Deming Cycle for PDCA, which was adopted as a guiding framework in this study to support continuous quality improvement in the management training process. The PDCA model (comprising planning, implementation, verification, and action) was used to design the stages of pedagogical intervention. It served as a means to analyze educational management processes, identify institutional gaps, and optimize student competencies in real time.
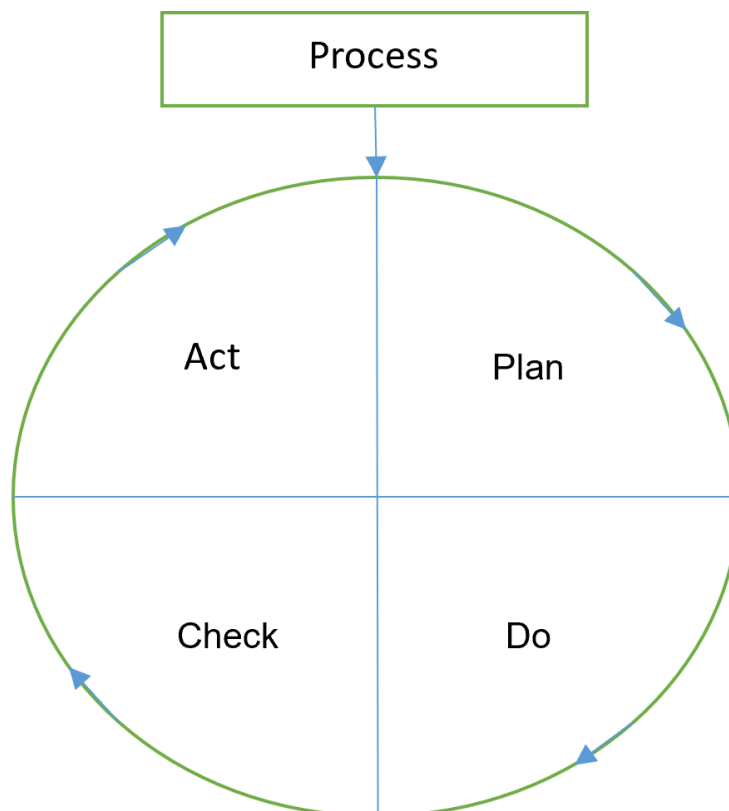
Figure 2. Deming cycle.

One of the primary instruments used in the study was the RADAR self-assessment method, which allowed for a structured evaluation of educational quality. RADAR (an acronym for Results, Approach, Deployment, Assessment, and Review) provides a quantitative means of measuring institutional effectiveness. It assesses both the outcomes achieved and the methodologies employed to attain those outcomes. As shown in **Table 1**, RADAR evaluates institutional performance across several dimensions, including strategic planning, implementation, and feedback mechanisms for continuous improvement.

Table 1. RADAR method.

Element	What is evaluated?
Results	The main achievements of the educational institution, its performance indicators: all indicators of the management system, reflecting the implementation of financial, production, organizational policies and strategies.
Approach	The plans of the educational institution and the reasons for their adoption, the effectiveness of the approaches used to achieve the planned results.
Implementation	Broadness, systematic application of approaches, how to place within an educational institution to implement adopted plans and strategies.
Assessment and Review	How to study the approaches used in educational institutions, analyze the results obtained and determine directions for further improvement.

The pedagogical experiment was conducted at Chirchik State Pedagogical University using a quasi-experimental design. The sample consisted of two groups: an experimental group and a control group. Both groups received the same instructional materials, but the experimental group engaged with a pedagogical model that integrated digital tools, reflexive evaluation, and competency-based training. In contrast, the control group followed traditional instructional approaches without exposure to the new model. Each group was evaluated on its readiness for managerial activity before and after the intervention.

The tools developed for the experimental process included custom methodological guidelines, instructional software, and electronic educational resources. These tools supported interactive learning and fostered students' ability to independently design and manage educational processes. Feedback was collected through observations, interviews, and structured questionnaires, ensuring the inclusion of qualitative and quantitative data in evaluating the effectiveness of the model.

3.1. Presentation of the Development Model

Figure 3 depicts the pedagogical model developed by the researchers to improve the managerial readiness of future education professionals. This model serves as a conceptual and operational framework designed to guide students toward acquiring core competencies in educational leadership. It consists of three main components: the conceptual-methodological block, the content-technological block, and the evaluative-reflective block. Each component plays a strategic role in building a well-rounded capacity for management tasks within educational institutions.

The conceptual-methodological block reflects the foundational goals and approaches of the training process. It articulates the underlying pedagogical philosophy, emphasizing a competency-based orientation. This block identifies the social need for competent education managers and positions the development of readiness for managerial activity as the central goal. Within this block, pedagogical planning is aligned with principles such as systematicity, goal-orientation, consistency, active engagement, and self-development. These principles aim to foster a deep-rooted understanding of managerial responsibilities through sustained and scaffolded learning processes (Khimmataliyev & Burieva, 2024).

The model also integrates multiple approaches (competency-based, acmeological, systemic, methodological, perceptual, and project-based) that contribute to the strategic development of managerial skills. These approaches ensure that the training model is adaptable and responsive to different institutional contexts and student profiles. For instance, the systemic approach allows the model to function holistically, while the project-

based approach encourages students to solve real-life problems, thereby enhancing their ability to function in professional settings (Usarov *et al*., 2024).

In terms of educational structure, the content-technological block outlines the learning forms, methods, and tools employed during the instructional process. The model specifies various instructional formats such as lectures, practical classes, learning circles, and independent study. It also emphasizes student-centered, problem-based learning strategies, including design-based projects, role-playing simulations, and research-based activities. These methods are supported by the use of digital educational environments, electronic resources, and specialized software tools. The goal is to ensure that learners not only absorb theoretical content but also acquire the ability to apply this knowledge in realistic managerial scenarios (Karshiev, 2020b).
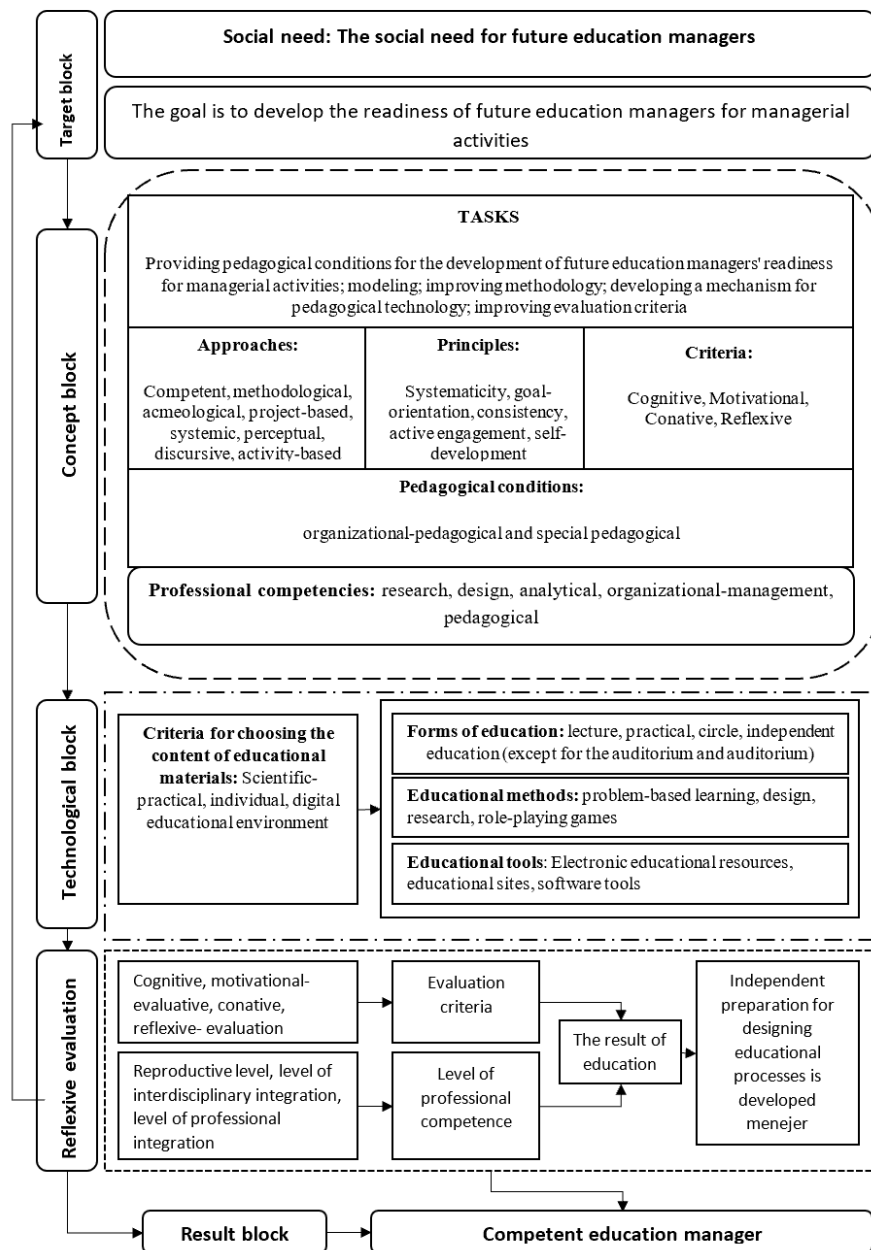

Figure 3. A model for developing the readiness of future education managers for managerial activities.

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This block also identifies criteria for selecting educational content, which include scientific-practical relevance, individualization, and compatibility with digital technologies. The aim is to create a learning experience that is both personalized and aligned with the demands of modern educational institutions. In doing so, the model ensures that managerial training is not reduced to administrative routines but instead encourages innovation, decision-making, and leadership. These competencies are essential for realizing the broader objectives of Sustainable Development Goal 4, which calls for inclusive and equitable quality education supported by effective educational leadership (Akhlan *et al.*, 2024).

The third component, the evaluative-reflective block, is critical for measuring student progress and institutional outcomes. It includes four levels of evaluation: cognitive, motivational-evaluative, conative (action-based), and reflexive. This multi-level system allows instructors to assess both the internalization of knowledge and the behavioral readiness of students to engage in managerial tasks. Each level is tied to specific indicators such as information assimilation, ability to analyze and apply knowledge, independent initiative, creative activity, and the capacity for reflective thinking.

Evaluation criteria are classified into three tiers: the reproductive level, which involves the repetition of known procedures; the interdisciplinary integration level, which reflects students' ability to synthesize concepts across domains; and the professional integration level, where students demonstrate readiness for independent design and implementation of educational processes. These levels help instructors identify strengths and areas for development in student performance, allowing for ongoing pedagogical adjustments (Khimmataliyev *et al.*, 2023).

The outcome of the model, as outlined in the result block, is the formation of a competent education manager who is independently capable of designing and managing educational processes. This is not only a pedagogical achievement but also a strategic institutional gain, as such professionals are well-equipped to contribute to the development of quality assurance systems in their respective institutions. The model aims to cultivate reflective practitioners who can navigate the complexities of educational change through informed leadership and participatory management.

Importantly, the pedagogical conditions identified in this model are both organizational and specific. Organizational-pedagogical conditions refer to the structural and administrative support systems within the university, such as curricular design, instructor training, and institutional policies. Special pedagogical conditions refer to classroom-based interventions such as differentiated instruction, digital platform use, and formative feedback mechanisms. Together, these conditions form the environment in which students can achieve transformative learning experiences.

This model was not only conceptual but also operationalized in the pedagogical experiment conducted in this study. It served as the foundation for curriculum design, instructional

material development, and student engagement strategies in the experimental group. By applying this model in a real instructional setting, the researchers were able to test its effectiveness and collect data on its impact. The model thus serves as both a theoretical contribution and a practical tool for educational institutions aiming to modernize their approach to managerial training.

In essence, the model embodies a multidimensional view of educational management preparation: one that bridges theory and practice, integrates technology and human development, and aligns institutional goals with global educational standards. Through its application, students are not only trained in administrative functions but are also prepared to lead, innovate, and reflect critically on the future of education. This aligns with global trends in higher education that emphasize leadership capacity as a key driver of educational quality and institutional sustainability (Khimmataliyev *et al*., 2023).

3.2. Results of the Pedagogical Experiment

Figure 4 presents the outcomes of the pedagogical experiment conducted to assess the effectiveness of the developed model in enhancing students' readiness for managerial activities. The experiment involved 188 students from Chirchik State Pedagogical University, divided into an experimental group (95 students) and a control group (93 students). Both groups were taught using the same instructional materials; however, the experimental group engaged with the pedagogical model outlined previously, while the control group followed conventional instructional approaches.
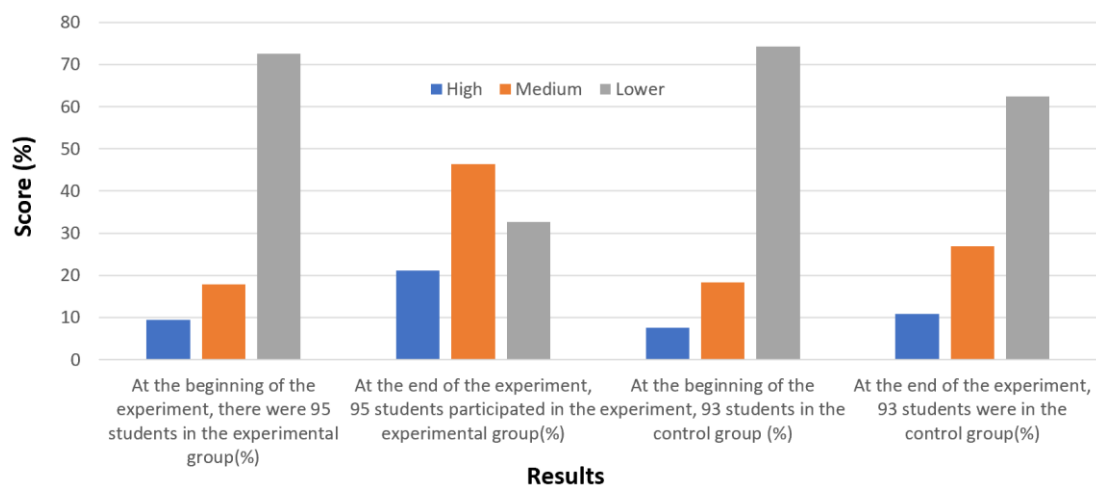

Figure 4. The level of improvement in students' readiness for managerial activities.

At the start of the experiment, the baseline data revealed that the readiness of students in both groups was predominantly at a low level. Specifically, in the experimental group, only 9.47% of students demonstrated a high level of readiness, while 72.64% were categorized as having low readiness. The average level accounted for 17.89% of the group. These figures suggest that the majority of students initially lacked sufficient preparation to assume managerial responsibilities within an educational context.

By the end of the experiment, significant improvements were observed within the experimental group. The proportion of students reaching a high level of managerial readiness increased to 21.05%, representing a more than two-fold increase. Likewise, the percentage of students at the average level rose substantially to 46.32%, while the number of students at the low level decreased sharply to 32.63%. These changes indicate the effectiveness of the

pedagogical model in supporting students' professional development through strategic, structured learning interventions.

In contrast, the control group showed only marginal improvement. The percentage of students at a high level of readiness increased slightly from 7.53 to 10.75%, and those at the average level rose from 18.28 to 26.88%. Meanwhile, the proportion of students at the low level decreased from 74.19 to 62.36%. Although there was some positive change, it was significantly lower than that of the experimental group. These findings highlight the value of using a model grounded in digital tools, reflexive evaluation, and competency-based learning, compared to traditional lecture-based methods (Usarov *et al.*, 2024).

The effectiveness of the model is further supported by qualitative observations and student feedback collected during the experiment. Many students in the experimental group reported feeling more confident in handling planning, organizing, and evaluating educational tasks. They attributed their development to the use of interactive tools, role-play simulations, and project-based activities that allowed them to apply theoretical knowledge in practical situations. The integration of digital technologies was particularly influential in enhancing their engagement and motivation to participate actively in the learning process.

The structured nature of the model, particularly its evaluative-reflective block, enabled students to develop self-awareness and monitor their progress over time. Reflexive evaluation (through self-assessment, peer feedback, and instructor observations) played a key role in helping students identify their strengths and weaknesses. This process fostered a culture of continuous improvement and personal accountability, aligning well with quality assurance principles found in the PDCA and RADAR frameworks (Peterson, 1991).

Another noteworthy outcome was the improvement in students' ability to integrate interdisciplinary knowledge into their managerial practice. The model's design facilitated connections between educational theory, organizational strategy, and digital competencies. Students engaged in scenario-based tasks that required them to synthesize knowledge from multiple domains, enhancing their cognitive flexibility and critical thinking. This interdisciplinary integration aligns with the model's mid-level evaluative criteria and reflects a progression from reproductive learning toward professional autonomy (Khimmataliyev *et al.*, 2023).

The educational tools developed and implemented during the experiment also contributed to the observed outcomes. These included custom-designed software applications, electronic learning modules, and instructional materials tailored to the model's structure. These tools were not merely supplemental but central to the instructional approach, offering students real-time feedback, interactive content, and opportunities for collaborative learning. The use of such tools reflects global trends in educational technology integration, reinforcing the relevance of this study to contemporary educational management practices (Akhlan *et al.*, 2024).

Beyond individual learning gains, the experiment demonstrated broader pedagogical implications. The data suggest that institutional implementation of structured, model-based training can lead to measurable improvements in students' preparedness for leadership roles. The application of strategic educational models supports institutional goals related to capacity-building, quality assurance, and alignment with the SDGs, particularly SDG 4 on inclusive and equitable quality education. By equipping future education managers with the skills and competencies needed for effective leadership, such interventions contribute directly to national and global educational reform agendas (Ragadhita *et al.*, 2026).

Furthermore, the findings provide practical insights for curriculum designers and educational leaders seeking to modernize professional preparation programs. The success of the experimental group suggests that incorporating reflexive, technologically supported, and student-centered pedagogies can yield substantial benefits. These strategies not only enhance individual performance but also promote a culture of leadership and accountability within educational institutions.

It is important to note that the model's success was not due solely to its structure but also to the implementation fidelity. Instructors in the experimental group were trained to use the model as an integrated system, rather than as a set of isolated techniques. Their ability to guide, facilitate, and assess learning in alignment with the model's principles was instrumental in achieving the observed outcomes. This reinforces the need for institutional commitment and professional development support when implementing innovative pedagogical frameworks (Ashurova, 2021).

The results of this pedagogical experiment confirm that readiness for managerial activity is not merely a function of content knowledge but is deeply connected to how that knowledge is applied, reflected upon, and continuously improved. This understanding necessitates a shift in how educational institutions approach leadership training, moving away from didactic instruction toward holistic, experiential, and adaptive learning environments.

In summary, the 13% higher effectiveness observed in the experimental group reflects the tangible impact of a carefully constructed pedagogical model on students' managerial competence. This improvement is not only statistically relevant but pedagogically significant, as it validates the integration of multiple theoretical, technological, and evaluative dimensions in preparing future leaders in education.

3.3. Alignment with SDGs

The implementation of this pedagogical model contributes directly to the attainment of SDG 4, which emphasizes inclusive and equitable quality education and the promotion of lifelong learning opportunities for all. By focusing on the development of managerial competencies among future education professionals, the model ensures that institutions are led by individuals who are not only administratively competent but also socially responsive and pedagogically reflective.

One of the key aspects of SDG 4 is the improvement of education systems through qualified personnel who can promote innovation and equity. The model used in this study embeds strategic planning, reflexive assessment, and interdisciplinary integration, all of which align with SDG 4's targets for education quality and institutional effectiveness.

 Moreover, the use of digital tools and student-centered methods supports SDG Target 4.7, which calls for transformative education that promotes sustainable development.

The results of the pedagogical experiment showed not only a quantitative increase in students' readiness for managerial roles but also a qualitative transformation in their leadership mindset. By preparing future managers to implement participatory, inclusive, and adaptive leadership practices, the model enhances the sustainability and accountability of educational institutions.

This strategic alignment positions the study as a meaningful contributor to both national education reform and global development agendas. Finally, this study adds new information regarding SDGs, as reported elsewhere (**Table 2**).

Table 2. Previous studies on SDGs.

No	Title	Ref
1	Low-carbon food consumption for solving climate change mitigation: Literature review with bibliometric and simple calculation application for cultivating sustainability consciousness in facing SDGs	Nurramadhani *et al.* (2024)
2	Assessment of student awareness and application of eco-friendly curriculum and technologies in Indonesian higher education for supporting SDGs: A case study on environmental challenges	Djirong *et al.* (2024)
3	Effect of substrate and water on cultivation of Sumba seaworm (nyale) and experimental practicum design for improving critical and creative thinking skills of prospective science teacher in biology and supporting SDGs	Kerans *et al.* (2024)
4	What evidence supports the advancement of language learning through digital innovation? Toward achieving SDGs in the 21st century completed with bibliometric analysis	Al Husaeni and Haristiani (2025)
5	Developing an inclusive ICT-based academic information system using REST API to promote SDGs in higher education	Prasetyo *et al.* (2025)
6	Enhancing human evolution literacy through PraksaraVerse: A gamified science learning innovation supporting SDGs	Aman *et al.* (2025)
7	Enhancing professional readiness in vocational education through an integrative approach aligned with the SDGs	Khamdamovna (2025)
8	School feeding program and SDGs in education: Linking food security to learning outcomes in Timor-Leste	Ximenes (2025)
9	Efforts to improve SDGs through education on diversification of food using infographic: Animal and vegetable protein	Awalussillmi *et al.* (2023)
10	Analysis of student's awareness of sustainable diet in reducing carbon footprint to support SDGs 2030	Keisyafa *et al.* (2024)
11	Smart learning as transformative impact of technology: A paradigm for accomplishing SDGs in education	Makinde *et al.* (2024)
12	The relationship of vocational education skills in agribusiness processing agricultural products in achieving SDGs	Gemil *et al.* (2024)

4. CONCLUSION

The pedagogical experiment confirmed the effectiveness of a structured model in improving students' readiness for educational management. Students in the experimental group showed marked improvement in cognitive, evaluative, and reflective competencies, validating the model's integrated approach. The use of digital tools, strategic planning, and reflexive assessment methods contributed significantly to learner development and leadership confidence. Because the model supports personalized, competency-based, and adaptable learning, it provides a scalable solution for institutions aiming to modernize leadership training. Importantly, the study advances the objectives of Sustainable Development Goal 4 by fostering inclusive, high-quality, and accountable educational leadership. This contribution holds practical relevance for curriculum developers, policymakers, and institutional leaders seeking to strengthen education systems through evidence-based training frameworks.

5. AUTHORS' NOTE

The authors declare that there is no conflict of interest regarding the publication of this article. Authors confirmed that the paper was free of plagiarism.

6. REFERENCES

Adeoye, M.A. (2022). Advanced supervision in educational management: Differences between supervision, accreditation, inspection, collaboration, evaluation, and quality assurance. *ASEAN Journal of Educational Research and Technology*, *1*(2), 169-176.

Adeoye, M.A., Jimoh, H.A., and Abdulkareem, H.B. (2023). Leadership and organizational cultural roles in promoting sustainable performance appraisal and job satisfaction among academic staff. *ASEAN Journal of Economic and Economic Education*, *2*(2), 115-124.

Akhlan, R. N. R., Khimmataliyev, D. O., and Qizi, O. N. P. (2024). The importance and role of inclusive education in educational institutions. *Proceeding of International Conference on Special Education in South East Asia Regio*n, *3*(1), 400–405.

Al Husaeni, D.N., and Haristiani, N. (2025). What evidence supports the advancement of language learning through digital innovation? Toward achieving Sustainable Development Goals (SDGs) in the 21st century completed with bibliometric analysis. *ASEAN Journal of Science and Engineering, 5*(2), 327-356

Aman, A., Prasojo, L.D., and Agustinova, D.E. (2025). Enhancing human evolution literacy through PraksaraVerse: A gamified science learning innovation supporting Sustainable Development Goals (SDGs). *ASEAN Journal of Science and Engineering, 5*(3), 579-602.

Ashurova, D. N. (2021). Aralash ta'lim modellari. *O'zbekistonda Xorijiy Tillar*, 1(36), 115–127.

Awalussillmi, I., Febriyana, K.R., Padilah, N., and Saadah, N.A. (2023). Efforts to improve sustainable development goals (SDGs) through education on diversification of food using infographic: Animal and vegetable protein. *ASEAN Journal of Agricultural and Food Engineering*, *2*(2), 113-120.

Djirong, A., Jayadi, K., Abduh, A., Mutolib, A., Mustofa, R.F., and Rahmat, A. (2024). Assessment of student awareness and application of eco-friendly curriculum and technologies in Indonesian higher education for supporting sustainable development goals (SDGs): A case study on environmental challenges. *Indonesian Journal of Science and Technology, 9*(3), 657-678.

Gemil, K.W., Na'ila, D.S., Ardila, N.Z., and Sarahah, Z.U. (2024). The relationship of vocational education skills in agribusiness processing agricultural products in achieving sustainable development goals (SDGs). *ASEAN Journal of Science and Engineering Education, 4*(2), 181-192.

Glushchenko, V.V.A. (2022). General theory of organizational behavior: An educational perspective. *Indonesian Journal of Multidiciplinary Research*, *2*(2), 453-468.

Karshiev, A. A. (2020a). O'quvchilarning axborot kompetentligini rivojlantirishning metodik jihatlari. *Tafakkur Ziyosi, 1*, 117–120.

Karshiev, A. A. (2020b). The structure of information competence of high school students. *The American Journal of Social Science and Education Innovations, 2*(3), 98–107.

Keisyafa, A., Sunarya, D.N., Aghniya, S.M., and Maula, S.P. (2024). Analysis of student's awareness of sustainable diet in reducing carbon footprint to support Sustainable Development Goals (SDGs) 2030. *ASEAN Journal of Agricultural and Food Engineering, 3*(1), 67-74.

Kerans, G., Sanjaya, Y., Liliasari, L., Pamungkas, J., and Ate, G., Y. (2024). Effect of substrate and water on cultivation of Sumba seaworm (nyale) and experimental practicum design for improving critical and creative thinking skills of prospective science teacher in biology and supporting sustainable development goals (SDGs). *ASEAN Journal of Science and Engineering, 4*(3), 383-404.

Khamdamovna, K.S. (2025). Enhancing professional readiness in vocational education through an integrative approach aligned with the Sustainable Development Goals (SDGs). *ASEAN Journal for Science Education, 4*(2), 143-154

Khimmataliyev, D. O., and Burieva, K. E. (2024). Dynamics and diagnosis of independent thinking processes of students (on the example of the first teenagers). *Journal of Education for Sustainability and Diversity, 3*(1), 238–252.

Khimmataliyev, D. O., Islamova, M. S., and Baratov, D. D. (2024). Content and pedagogical conditions of development of research skills of future engineers based on innovation approach. *Forum for Linguistic Studies, 6*(2), 162–169.

Khimmataliyev, D. O., Omonova, N. P., Jumanova, G. P., and Mamatkulova, G. B. (2023). Development of creative communicative skills of future educators as a pedagogical problem. *Science and Innovation International Scientific Journal, 8*(2), 547–551.

Khimmataliyev, D. O., Sultanova, D., and Omonova, N. P. (2023). Development of students' creative competencies based on individual approach in educational cluster conditions. *Science and Innovation International Scientific Journal, 8*(2), 678–684.

Makinde, S.O., Ajani, Y.A., and Abdulrahman, M.R. (2024). Smart learning as transformative impact of technology: A paradigm for accomplishing sustainable development goals (SDGs) in education. *Indonesian Journal of Educational Research and Technology, 4*(3), 213-224.

Mukhamedov, G. I., Ernazarov, A. N., Khimmataliev, D. O., Usarov, J. E., Nurmamatov, S. E., Omonova, N. P. Q., and Susilawati, A. (2025). Pedagogical training in enhancing students' practical competence in electromagnetism. *Journal of Engineering Science and Technology, 8*(8), 16-23.

Mukhamedov, G. I., Usarov, J. E., Khimmataliev, D. O., Kodirova, F. U., Raxmanova, M. K., Safiyeva, M. A. K., Eshbekova, N.J.K., Dekhkonov, H.U. and Susilawati, A. (2024). Creative competence of future chemistry for students relating to environment. *Journal of Engineering Science and Technology, 19*(6), 65-72.

Nurramadhani, A., Riandi, R., Permanasari, A., and Suwarma, I.R. (2024). Low-carbon food consumption for solving climate change mitigation: Literature review with bibliometric and simple calculation application for cultivating sustainability consciousness in facing sustainable development goals (SDGs). *Indonesian Journal of Science and Technology, 9*(2), 261-286.

Oreshkina, A. K. (2014). Teoreticheskie osnovy razvitiya obrazovatelnogo prostranstva sistemy nepreryvnogo obrazovaniya v kontekste yego sotsial'nykh izmereniy. *Innovatsionnye Obrazovatel'nye Tekhnologii, 2*(38), 4–7.

Peterson, P. B. (1991). Library of Congress archives: Additional information about W. Edwards Deming. *Journal of Management History*, 3(2), 98–119.

Prasetyo, I., Nugroho, A.A., Damayanto, A., and Fathoni, M.I. (2025). Developing an inclusive ICT-based academic information system using REST API to promote Sustainable Development Goals (SDGs) in higher education. *ASEAN Journal of Science and Engineering, 5*(2), 395-416.

Ragadhita, R., Fiandini, M., Al Husaeni, D. N., and Nandiyanto, A. B. D. (2026). Sustainable development goals (SDGs) in engineering education: Definitions, research trends, bibliometric insights, and strategic approaches. *Indonesian Journal of Science and Technology, 11*(1), 1-26.

Salomova, R. V. (2020). Features of the use of educational games in education. *Scientific Achievements of Modern Society, 4*(1), 321–323.

Usarov, J. E., Khimmataliev, D. O., Haydarova, S. A., Korayev, S. B., Khodjamkulov, U. N., Kodirov, I. D., Ibadullaev, K.M., Burieva, K.E., and Susilawati, A. (2024). Improving student practical competence in geography as science education. *Journal of Engineering Science and Technology*, *19*, 81-88.

Ximenes, S.M. (2025). School feeding program and Sustainable Development Goals (SDGs) in education: Linking food security to learning outcomes in Timor-Leste. *ASEAN Journal for Science Education, 4*(2), 155-168.