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METHODOLOGY AND ANALYTICS OF THE RESULTS OF AN EXPERIMENTAL STUDY OF THE FORMATION OF PEDAGOGICAL TOLERANCE OF FUTURE TEACHERS OF PROFESSIONAL EDUCATION BY MEANS OF INTERDISCIPLINARY INTEGRATION

*The study **aims** to highlight the specific methodological foundations for the formation of pedagogical tolerance of future teachers of professional education through interdisciplinary integration and the analysis of experimental research results. The **methodology included** the use of interactive, activity-based, contextual, role-playing, and project-oriented learning, supported by digital technologies and online/offline educational platforms. Experimental work involved dividing students into control and experimental groups, applying the interdisciplinary approach in the experimental group, and ensuring comparability of results with traditional training in the control group.*

*The **scientific novelty lies** in emphasizing the methodological opportunities of interdisciplinary integration for fostering pedagogical tolerance, including designing complex social and professional tasks, modeling quasi-professional situations, and stimulating students' cognitive, reflective, and value-based development. The developed methodology contributed to the creation of a tolerant educational environment, encouraging non-violent communication, dialogue, empathy, assertiveness, and communicative flexibility among future teachers. The effectiveness of the proposed approach was confirmed through statistical analysis of experimental data, revealing significant differences in the level of pedagogical tolerance formation between experimental and control groups.*

***Conclusion.** The results of the study confirm that the implementation of the structural-functional model and pedagogical conditions based on interdisciplinary integration positively influences the formation of pedagogical tolerance of future teachers of professional education. The methodology promotes the development of professional competences, reflective and communicative skills, and a tolerant attitude in educational practice, contributing to the preparation of specialists capable of creating inclusive, humanistic, and dialogically oriented educational environments.*

***Key words:** tolerance, pedagogical tolerance, future teachers of professional education, students, experiment.*

Problem statement. Reforming the education system, proclaiming the principles of humanism, individualization of education, and personal development drew the attention of researchers to the study of the phenomenon of tolerance in the pedagogical aspect. Tolerance in the context of professional interaction between a teacher of professional education and students determines the possibilities of personal self-development of subjects of the educational process, active assimilation of various methods of cognitive activity, openness to new educational

opportunities. The teacher of professional education is one of the key figures in the implementation of the declared approach. After all, it not only transfers knowledge, forms abilities and skills, but also psychologically affects the development of vocational education seekers. In interpersonal communication, the developed personality of the teacher of professional education acquires a special role, in connection with this, the object of close attention of the academic community is the individual and psychological features of the teacher's personality, which contribute to the creation of an atmosphere of openness and trust, tolerant behavior in pedagogical interaction. One of the important qualities of a modern portrait of a teacher of professional education is pedagogical tolerance. It is obvious that it is advisable to ensure the formation of the outlined phenomenon even during studies at higher education institutions.

The analysis of the latest research and publications testifies to the scientific interest of modern researchers in the problem of formation and development of professional tolerance of future teachers. Yes, in the works of T. Atroshchenko presents theoretical and practical aspects of the formation of inter-ethnic tolerance of future primary school teachers (Atroshchenko, 2017). T. Varenko investigated the essence and structure of pedagogical tolerance of the future teacher (Varenko, 2009). The conclusions of I. are correct. Voloshchuk and A. Vakulina regarding methodical vectors for the development of tolerant qualities of future teachers in the professional training system (Voloshchuk & Vakulina, 2020). The addition of this issue is reflected in the work of G. Hayduk, in particular, in the model of structural organization of professional tolerance of a teacher (Hayduk, 2018), K. Hnatovska (Hnatovska, 2022) and others. Instead, Yu. Gordienko directed his efforts to research the issue of formation of pedagogical tolerance of future teachers of foreign languages of primary school (Gordienko, 2017). Appealing to the conviction of A. Molchanova, that tolerance is the value basis of a teacher's professional activity (Molchanova, 2013).

Studying the problems of the development of professional tolerance of a teacher, B. Kindratyuk and S. Lytvyn-Kindratyuk pay attention to the organizational aspects of self-improvement of future teachers based on the diagnosis of propensity for professional activity (Kindratyuk & Lytvyn-Kindratyuk, 2023). In the works of I. Through the prism of explaining the main provisions of professional training of future social pedagogues, the structural components of intercultural tolerance are interpreted (Palko, 2023). In turn, E. Popova and V. Zhukov developed pedagogical support

for the process of training future teachers to educate schoolchildren's tolerance (Popova & Zhukov, 2020). At the same time, the issues of characterizing the methodology of forming pedagogical tolerance of future teachers of professional education with the involvement of means of interdisciplinary integration, as well as the analysis of research results, remain outside the attention of the scientific achievements of modern scientists or have not been sufficiently researched, which actualizes the need for expanded analytics of the subject of this research. Work on current research is devoted to the unresolved aspects of the process of formation of pedagogical tolerance in educational activities.

The purpose of the article is to highlight the specific methodological foundations of the formation of pedagogical tolerance of future teachers of professional education by means of interdisciplinary integration and analysis of the results of experimental research.

Presentation of the main material. The dynamics of the concept of the modern educational process in Ukraine forms the prerequisites for identifying the urgent need to develop new and optimize existing approaches to the innovative training of teachers of professional education. The structural and functional model of the formation of pedagogical tolerance of future teachers of professional education today should be responsible for the implementation and development of the principles of competitiveness, initiative, social adaptability and creativity. A teacher of professional education, in accordance with the global trends of transformation of the educational process, is positioned as a specialist, open to continuous professional growth and self-development, focused on improving professional activity and adapting it in accordance with the dynamics of demand from society. Such a specialist is able to independently master pedagogical innovations, involving innovative pedagogical technologies in the work process.

In order to implement all the tasks of the pedagogical experiment during the third stage of – forming –, the assumption that the introduction of means of interdisciplinary integration in the educational process, the ideas of which are synergized into the justification of pedagogical conditions and functional dependencies of the blocks of the developed model, has a positive effect on the formation of pedagogical tolerance of future teachers of professional education in comparison with the traditional approach. In order for that, the students who became participants in the experiment were divided into control groups

(hereinafter – KG) and experimental groups (hereinafter – EG). The purity of the experiment was ensured by the fact that future teachers of professional education who entered the EG studied according to the experimental method, while the traditional study of the disciplines «Man and environment», «Pedagogy», «History of Ukraine and national culture», «Psychology», «Philosophy» took place in the KG.

It should be noted that the implemented changes did not violate the disciplinary structure of professional training of future teachers of professional education, only updated and supplemented the content of the selected courses and appealed to the innovation of non-formal and informal education of students. Within the framework of conducting research and experimental steps with the aim of creating a continuum for the formation of pedagogical tolerance of future teachers of professional education in the educational environment of higher education institutions, interdisciplinary initial and methodological materials were developed, in particular, situational tasks (cases), problematic dilemmas, ethical situations, discussions-dilemmas, etc.), which were used in online and offline tapes with the help of technical capabilities of various digital technologies, applications, platforms.

The implementation of the developed materials involved the development of the content of methodical seminars for teachers who performed direct moderation, facilitation of educational interaction of future teachers of professional education; assessment of meaningful, temporary, spatial, material and technical and personnel resources of higher education institutions for conducting research and experimental work. Before the beginning of the formative stage of the experiment, teachers who became its participants were involved in a seminar-workshop and training. The content of these measures integrated information about the specifics of the implementation of pedagogical conditions and the expedient application of means of interdisciplinary integration to create a synergistic idea of the phenomenon of pedagogical tolerance in the minds of students.

Within the formative stage of the experiment, students of EG studied courses «Man and environment», «Pedagogy», «History of Ukraine and national culture», «Psychology», «Philosophy» took place through the purposeful implementation of means of interdisciplinary integration, and was organized within the framework of the implementation of the following principles:

- optimal application of digital technologies, which is reflected in the high-quality selection of electronic materials, teaching aids, forms and methods of working with them to achieve the maximum effect of integrating students' knowledge;

- the principle of using professionally colored interdisciplinary problem tasks, related to the motivation of future teachers of professional education to the practical application of the acquired knowledge, abilities and skills to expand the social and educational-professional experience of solving intolerant situations; on the other hand, the outlined prescription was aimed at stimulating students' cognitive interest and activating the atmosphere of competition, to revive their desire to solve the problem;

- rational ratio of group and individual training, which involved the initiation by teachers of various ways of interaction of future teachers of professional education in the educational process: individual work, work in pairs, in small and large groups;

- reflexivity, which involved conscious and active actions of future teachers of professional education regarding mastering the educational content of disciplines based on the manifestation of critical thinking, awareness of the value component of tolerant professional activity;

- of professional and practical orientation of education realized quasi-professionalism and cotextism in the plots of interdisciplinary tasks, because it appealed to taking into account the professional context. Adherence to these and other analyzed principles was important for the formation of pedagogical tolerance of future teachers of professional education, because it contributed to the creation of an interdisciplinary educational environment in the educational process to motivate students to tolerant solutions to quasi-professional tasks.

Significant features of interdisciplinary pedagogical cases were considered to be: the open nature of the task, which involves the possibility of finding different ways to solve the announced problem, the multivariate nature of answers and forms of presentation of solutions; interactive orientation of the task, which initiated the use of active methods of organizing the educational activities of future teachers of professional education to reproduce the scenario of the situation; provided for ensuring a rational combination of individual and collective forms of solving the task; manifested itself in ensuring a high level of student activity in educational communication; longitudinal educational effect from the performance of the task what was placed as an

opportunity to use future teachers of professional education the acquired knowledge, skills and experience of overcoming intolerance, establishing dialogic communication, etc. in practical activities within the framework of participation in volunteer initiatives, social and educational work, socially significant projects, educational and educational charity actions, etc.); modeling the context of interdisciplinary tasks, based on the appeal to ideas, methodical possibilities of problem-based learning methods.

Practical modeling of the developed tasks took place within the framework of the organization of the educational dialogue, all links of which appealed to the implementation of the subject orientation of the process of professional training of future teachers of professional education, activating the mechanisms of forming tolerant consciousness and behavior of students.

With this goal in cancer, the study of the discipline «Man and the environment», «History of Ukraine and national culture», and «Philosophy» EG students assigned and internalized higher human values, evaluated them and made the importance of nonviolent communication in pedagogical activities. This contributed to the development of the spiritual potential of future teachers of professional education in the process of personally significant educational activities.

In order to develop pedagogical tolerance, assertiveness, empathy, communicative flexibility and, in general, the ability to tolerate communication, the future teachers of professional education implemented various types of dialogues during the discussion of the content of the developed educational and methodological units. In the classes, situations were created when it was possible to «speak» or «argue», feel spiritual closeness or «differ in views» with the main protagonists of the situation and the participants of the case; with the authors of the textbook or a historical hero, an outstanding philosopher, teacher; with characters of the past; among themselves as representatives of different generations and subcultures of modern society. Such provocativeness was achieved by such selection of the content of the developed tasks that the educational material initiated the comparison of its and «Other» perceptions of certain facts, events, and processes of reality.

That is, in the process of lecture-seminar classes in EG, they created a problematic nature of mastering integrative informational materials from selected disciplines, which prompted future teachers of professional education to overcome the stereotypicality of thinking in the perception

of manifestations of religious, ethnic, subcultural, racial differences; stimulated their reflection; contributed to the design of the acquired knowledge in the field of one's own educational and professional activity.

The treatment of students as equal participants in subject interaction contributed to the acquisition of future professional education teachers «living knowledge» in the process of joint activity of the teacher and students. The implementation of the principle of an open position created the prerequisites for the emergence of a trusting relationship by opening one's own inner world, demonstrating oneself as a person who seeks, doubts, is indignant or rejoices. Implementing the principle of systemic pluralism during the organization of educational dialogues at lecture and seminar classes on the discipline «Philosophy», they created conditions for students to understand the holistic subject of knowledge in its multifacetedness.

The method of implementing the proposed pedagogical conditions was aimed at improving all aspects of fomenting the pedagogical tolerance of future teachers of professional education in higher education institutions through the purposeful implementation of means of interdisciplinary integration and was based on:

saturation of the content of the courses «Man and environment», «Pedagogy», «History of Ukraine and national culture», «Psychology», «Philosophy» with interdisciplinary information about the essence, meaning and practical expressions of pedagogical tolerance (announced information was presented in the form of complex social and professional tasks – cases reflecting the essence of general cultural and professional humanistic values, socio-economic processes, civilizational progress; problems of bullying, kenselling in educational institutions; questions regarding the establishment of a comfortable atmosphere in separate student teams, etc.).

Such a system helped to form in the minds of students integrative ideas about pedagogical tolerance, ways of organizing non-violent communication, pedagogical methods of dialogue based on the principles of humanization of education, recognition of the exclusivity of the individuality of each applicant, etc.

The use of methods of quasi-professional, contextual, role-based, activity-based, project-based, interactive learning, which involved modeling in the educational process interdisciplinarity problem cases (situations) imitating social, economic, psychological-pedagogical, ethical problems in society, the future profession and the educational community in general.

Confirmation of the effectiveness of the proposed methodology involved the application of mathematical and static methods that made it possible to analyze the research results.

The analytical-comparative stage of the research involves the analysis and generalization of the results of the formative stage of the experiment, the determination of the effectiveness of the implementation of pedagogical conditions and the structural-functional model of the formation of pedagogical tolerance of future teachers of professional education based on the comparison of the levels of formation of the announced ability at the beginning and at the end of expert actions to update the educational process in the aspect of implementation of interdisciplinary integration.

In fact, the key goal of this stage was to check the assumption about the effectiveness of the didactic possibilities of interdisciplinary integration regarding the formation of pedagogical tolerance of future teachers of professional education, which are the basis of the eradicated pedagogical conditions and the developed model.

To ensure the reliability of the research, measurements of the levels of formation of motivational-value, cognitive-rational, communicative-activity, perceptual-reflexive components of pedagogical tolerance of EG and KG students and pedagogical tolerance in general were carried out at the ascertaining and analytical-comparative stages by using various diagnostic methods (special psychodiagnostic methods, questionnaires, testing, solving professionally oriented problem tasks, participation in pedagogical quests, reflective practices, foresight sessions), which made it possible to record and analyze the dynamics of their changes. The obtained results of the analytical and final stage are summarized and summarized in Table 1.

Thus, it can be concluded that in comparison with traditional education, the use of didactic opportunities for the application of interdisciplinary integration to outline interdisciplinary goals and objectives for the development of knowledge, abilities and skills of future teachers of professional education, the organization of tolerant interaction in the educational environment, based on value-worldview beliefs, humanistic attitude towards each applicant; implementation of horizontal and vertical integration of the content of selected disciplines.

Table 1

**Dynamics of changes in KG and EG regarding the state of
formation of pedagogical tolerance future teachers of professional
education**

Levels	KG					E G				
	The beginning of the experiment		Completion of the experiment		Δ	The beginning of the experiment		Completion of the experiment		Δ
	Quantity	%	Quantity	%		Quantity	%	Quantity	%	
High	8	11,76	10	14,71	2,94	8	11,59	21	30,43	18,84
Sufficient	12	17,65	21	30,88	13,24	13	18,84	28	40,58	21,74
Average	42	61,76	36	52,94	-8,82	42	60,87	20	28,99	-31,88
Initial	7	10,29	1	1,47	-8,82	6	8,70	0	0,00	-8,70

Conclusions and prospects for further exploration of this issue.

Therefore, the results of the pedagogical experiment testify to the positive influence of the proposed pedagogical conditions and structural-functional model on the formation of pedagogical tolerance of future teachers of professional education by means of interdisciplinary integration. The results of the experimental work confirmed the effectiveness of the use in the educational process of inter-disciplinary forms of organization of educational activities of future teachers of professional education (integration of students into the volunteer community; participation of education seekers in reflective practices; self-educational work on the development of professional cases-projects for the tolerization of the educational environment by means of communication, dialogic, interactive technologies; on improving the teacher's own self-image; involvement of students in cross-cultural pedagogical conversations; participation in web conferences, using the possibilities of open online courses and trainings on increasing tolerance, etc.). In addition, in the process of analyzing the research results at the analytical-comparative stage of the experiment, significant differences in the level of formation of pedagogical tolerance of EG students compared to KG students were revealed.

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АНОТАЦІЯ

Дідур Андрій. Методика та аналітика результатів експериментального дослідження формування педагогічної толерантності майбутніх педагогів професійної освіти засобами міждисциплінарної інтеграції.

Дослідження присвячене проблемі формування педагогічної толерантності майбутніх педагогів професійної освіти засобами міждисциплінарної інтеграції. Сучасний освітній процес потребує підготовки фахівців, здатних до відкритої, гуманістично орієнтованої взаємодії з учнями та колегами, розвитку професійної емпатії, асертивності та комунікативної гнучкості. Для реалізації цих завдань у навчальних дисциплінах «Людина і навколишнє середовище», «Педагогіка», «Історія України та національна культура», «Психологія» та «Філософія» було впроваджено ідеї міждисциплінарної інтеграції, що в практичному вимірі спирались на інтерактивні методи, кейси, рольові та проектні завдання, проблемні та етичні ситуації, що моделюють реальні педагогічні та соціальні виклики. Експериментальна робота проводилася з контрольними та експериментальними групами, що дозволило порівняти ефективність традиційного та інноваційного підходів. Результати дослідження свідчать, що міждисциплінарна інтеграція сприяє активізації критичного мислення, розвитку толерантної поведінки та формуванню ціннісно-мотиваційних, когнітивно-раціональних, комунікативно-діяльних і рефлексивно-перцептивних компонентів педагогічної толерантності. Отримані дані підтверджують ефективність запропонованої моделі для створення інклюзивного та гуманістично орієнтованого освітнього середовища у закладах професійної освіти.

Ключові слова: толерантність, педагогічна толерантність, майбутні педагоги професійної освіти, студенти, експеримент.

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ЗМІСТОВО-ПРОЦЕСУАЛЬНІ ЗАСАДИ ДУАЛЬНОЇ ОСВІТИ В КРАЇНАХ ЄВРОПЕЙСЬКОГО СОЮЗУ

У статті висвітлено особливості організації дуальної освіти в закладах вищої освіти країн Європейського Союзу. На прикладі Університету Зігера продемонстровано зміст та особливості реалізації дуальної освітньої програми «Промислова механіка», що здійснюється в тісній взаємодії між трьома