















Fig. 5: Empirical values of Pearson's correlation coefficient (r)

The results of the diagnostic slice show a mostly low level of professional competencies in students of control and experimental groups. The need to study the identified problem is confirmed by the need to practice. Thus, according to the results of surveys conducted as part of the summative stage of the experiment, the importance of professional competence for future teachers is perceived by the majority of respondents (about 94%). Unanimity was also expressed on the following:

- 1) the need to show professional competencies in future teachers appears already in the period of practice in the specialty, organized on the basis of educational institutions;
- 2) the educational process of HEIs allows, without making significant changes in it, accumulating subjective experience of educational activities of future teachers as a factor in the development of their professional competencies (98% of respondents);
- 3) insufficient attention is paid to the development of professional competencies in the process of training future teachers (82% of respondents);
- 4) teachers involved in the training of future teachers would contribute to the development of professional competencies in students through the introduction of the project method, if they had developed and scientifically sound technologies (98% of respondents).

So, the summative stage of the study provided data on the low level of professional competencies and subjectivity in

future teachers, and identified the reasons why these levels were insufficient:

- 1) insufficient focus on the future profession, lack of clear ideas about the features of future professional activity;
- 2) lack of clear ideas about the place of competencies in future professional activities;
- 3) insufficient level of self-organization and self-education skills;
- 4) lack of communicative experience due to interaction with various subjects of the educational process;
- 5) lack of experience in learning information on the subjects not provided for in the curricula;
- 6) the lack of systemic and purposeful work on the development of professional competencies of future teachers in-class, in extracurricular activities, in independent activities of students.

The obtained results give grounds for the conclusion about the reasonability of making changes in the pedagogical process in order to develop professional competencies in future teachers.

The following scheme (Table 2) was chosen to test the effectiveness of certain pedagogical conditions for the effective implementation of the project method, taking into account the available capabilities of the pedagogical process.

Table 2. The scheme of checking the effectiveness of the proposed pedagogical conditions and their complex

Group	1	2	3	4	5	6	7	8	9
Conditions	1+2	1+3	1+2+3	1	1	2	3	1+2+3	2+3

According to the selected goals, the main objectives of the stage are:

- 1) determination of the direction of training of experts on general didactic and private methodical principles taking into account the purposes of a stage;
- 2) arrangement of the training conditions promoting effective subjective experience of educational and project activity of students;
- 3) training of specialists, which ensures the development of students' value attitude to active, independent educational and project activities as a prerequisite of success in future professional activities, organisation of students' mastery of educational and professional activities, development of skills of independent educational and project activities of future teachers;
- 4) Determining the levels of subjectivity and professional competencies of future teachers at the end of the adaptation and motivational stage (at the end of the first year of study);
- 5) Analysis of the results obtained in order to organise and implement corrective measures.

The adaptation and motivational stage is characterised to a greater extent by the subject—object relationship between teacher and student.

Therefore, in the first years of study teachers play the role of mentors, teaching general subjects and carrying out activities aimed at developing the experience of educational and project activities and elements of subjective experience.

This leads to the use of the following methods in this period: persuasive conversations, persuasive demonstrations, excursions, observations, exercises (practical assignments), discussions and educational aids: visual (including videos), public resources. During the first stage of the development of professional competencies the teachers should provide comprehensive assistance to students in effective adaptation to the educational process, provide assistance in creating the prerequisites for the ability to organise students' independent effective educational and professional activities.

The result of the adaptation and motivational stage is:

- 1) students' understanding of the content of future professional activity, awareness of the importance of active, independent educational and project activities;
- 2) mastering of methods of educational and professional activity by students;
- 3) experience of independent educational and project activity of students;
- 4) identification of the level of subjectivity and professional competencies of future teachers at the end of the adaptation and motivational stage;
- 5) corrective measures taken.

The traditional education system is focused on mastering the mandatory minimum content presented in state educational standards. Within this content, students majoring in pedagogy master classical methodologies, approaches to curriculum development, classical teaching methods, technologies of

organisation of interaction between participants of the educational process, etc.

## 4. Discussion

Thus, for the areas of professional training of teachers, whose activities involve participation in project activities or project management, a system is proposed in which the project method acts as the main means of learning, and its results — as an assessment tool. These results are confirmed by international studies by [11]. Having identified a product that is not only used for final certification in the HEI as a final result, but can also be presented to the employer to demonstrate professional training, we determined the structure, forms of training and basic assessment tools. This is also confirmed by the materials of the study by [13]. Decomposition of competencies can help determine the structure and content of the educational process, but considering this method as a basis for assessing the level of competencies, using it to justify the full preservation of disciplinary or project approach in education will mean only endless movement in a circle. [14, 15] expressed the same opinion in their articles.

The pedagogical principle “from simple to complex”, the movement from knowledge and skills to competencies should be reflected in the organisational structure of training, which is proposed to include three levels: higher level — project training with the development and implementation of professional projects evaluated by employers, intermediate level — development of training and proto-professional projects, with their evaluation by top-level teachers and at Ukrainian student rating competitions, initial level — traditional disciplinary training, with the evaluation and formation of “orders” for the evaluated product by middle-level teachers. This idea of implementing the project method is confirmed in the works of [3; 20].

The main problems of developing professional competence in future teachers were identified as a result of completing questionnaires, surveys of students and teachers, interviews with leaders of educational projects. In addition, the analysis of personal data and the results of surveys showed that teachers and future teachers themselves note the importance of the project method in acquiring professional competencies of future teachers, but purposeful work for the development of the studied phenomenon is not conducted in educational institutions. This is noted by [18; 23] in their studies.

The study took into account the gradual development of professional competencies in future teachers. At each subsequent stage of training, the methods and means of teaching changed in accordance with the change in the subjective experience of educational and professional activities of students. This is also reflected in the works of [17;19].



## 5. Conclusion

The research is topical because the educational process, which is based not on the logic of the subject, but on the logic of activities that have a personal meaning for the student, increases his/her motivation in learning; promotes the development of the necessary types of activities; deep, conscious development of basic knowledge due to their universal use in different situations; development of creative potential, communicative skills. The organisation of research activities of students in the implementation of projects on specialised subjects — elective subjects — contributes to the effective development of a number of professional competencies in future teachers.

The development of professional competencies of future teachers was determined at 3 levels (insufficient, sufficient, high); the criteria for assessing the levels of the student's subjectivity (his/her activity, independence, responsibility, communication, creativity, self-organisation and self-assessment skills in educational and professional activities) and his/her professional mobility (motivational and value, cognitive activity, reflexive evaluation criteria), as well as evaluation scales were developed. The level of subjectivity and professional competencies of future teachers was assessed through surveys, observations, analysis of student's products of activity, Delphi technique and mathematical statistics.

At the generalising stage of experimental work, the reliability of the obtained results is proved by the chi-square test ( $\chi^2$ ) at the level of statistical significance of 0.01. It allowed drawing a conclusion about the reasonability of applying the proposed project model to develop professional competencies in future teachers when acquiring subjective experience of educational and professional activity with all three pedagogical conditions of its effective functioning.

The research will be a valuable source in the preparation of programmes for the implementation of project methods in the training of future teachers. Despite the wide interest in the introduction of innovative methods of education in the development of professional competencies, the application of the project method remains poorly covered in the domestic scientific literature. Further prospects for research include finding optimal mechanisms for implementing the project method in the educational process.

## 6. Conflict of Interests

The authors declare that there is no conflict of interest.

### References

- [1] Z. K. Ismailova, K. Riskulova, M. U. Axmedov, Y. T. Ismoilova and N. R. Pulatova, "The role of electronic pedagogical tools in higher education," *J Crit Rev*, vol. 7, no. 5, pp. 396-398, 2020.
- [2] Z. Ismailova, R. Choriev, R. Salomova and Z. Jumanazarova, "Use of economic and geographical methods of agricultural development," *J Crit Rev*, vol. 7, no. 5, pp. 409-412, 2020.
- [3] S. Lee, H. Kim, B. Jeong and J. Yoon, "A training method for low rank convolutional neural networks based on alternating tensor compose-decompose method," *Appl Sci*, vol. 11, no. 2, p. 643, 2021.
- [4] D. O. Khimmataliev, K. T. Olmov, R. M. Abdullaeva, B. B. Ergashev and K. T. Chulponova, "Mechanisms of professional competence development in future teachers based on pedagogical and technical knowledge," *Annals Roman Soc Cell Biol*, vol. 25, no. 2, pp. 2950-2958, 2021.
- [5] P. Ellingsen, T. Tonholm, F. R. Johansen and G. Andersson, "Learning from problem-based projects in cross-disciplinary student teams," *Educ Sci*, vol. 11, no. 6, p. 259, 2021.
- [6] O. V. Bazeliuk, O. M. Spirin, L. M. Petrenko, A. A. Kalenskiy and L. A. Maiboroda, *Technologies of Distance Learning*, Zhytomyr: Polissia, 2018.
- [7] J. Záhorec, A. Hašková and A. Nagyová, A. "Innovations of teacher trainees pregradual training aimed at forming their digital competences," *J Technol Inf Educ*, vol. 12, no. 2, pp. 80-92, 2020.
- [8] C. Flores-Lueg and R. Roig-Vila, "Personal factors influencing future teachers' self-assessment about the pedagogical dimension of ICT use," *Rev Iberoam Educ Super*, vol. 10, no. 27, pp. 151-171, 2019.
- [9] S.A., Varela-Ordorica and J.R. Valenzuela-González, "Use of information and communication technologies as a transversal competence in teacher training," *Rev Electron Educ*, vol. 24, no. 1, pp. 172-191, 2020.
- [10] R. Pérez-Ordás, A. Nuviala, A. Grao-Cruces and A. Fernández-Martínez, "Implementing service-learning programs in physical education; teacher education as teaching and learning models for all the agents involved: a systematic review," *Int J Environ Res Public Health*, vol. 18, no. 2, p. 669, 2021.
- [11] M. B. Postholm, "Collaboration between teacher educators and schools to enhance development," *Eur J Teach Educ*, vol. 39, no. 4, pp. 452-470, 2016.
- [12] W. M. Admiraal and M. T. Hoeksma, "Assessment of teacher competence using video portfolios: reliability, construct validity, and consequences," *Teach Teach Educ*, vol. 27, pp. 1019-1028, 2011.
- [13] T. Bavčević, I. Prskalo and D. Bavčević, "A comparative analysis of different models for management of the teaching process in physical education," *Acta Kinesiologica*, vol. 12, no. 2, pp. 57-66, 2018.
- [14] G. Cebrián, M. Junyent and I. Mulà, "Competencies in education for sustainable development: emerging teaching and research developments," *Sustainability (Switzerland)*, vol. 12, no. 2, Art. 579, 2020.
- [15] E. Çetin, "Digital storytelling in teacher education and its effect on the digital literacy of pre-service teachers," *Think Skills Creat*, vol. 39, Art. 100760, 2021.
- [16] S. Pöntinen and S. Rätty-Záborszky, "Pedagogical aspects to support students' evolving digital competence at

- school.” *Eur Early Child Educ Res J.* 28, no. 2, pp. 182–196, 2020.
- [17] Z. K. Ismailova, D. O. Khimmataliev, N. M. Kuziiev, U. N. Shabarova and O. M. Almardonov, “Formation of a system of methods of technical thinking future engineers,” *J Crit Rev*, vol. 7, no. 5, pp. 787-794, 2020.
- [18] H. Hüttel and D. Gnaur, “If PBL is the answer, then what is the problem?” *J Probl Based Learn Higher Educ*, vol. 5, no. 2, pp. 1-21, 2017.
- [19] J. Bernate and J. Vargas, “Challenges and trends of the 21st century in higher education,” *Rev Cienc Soc*, vol. pp. 26, 141–154, 2020.
- [20] Y. V. Shuhailo and T. M. Derkach, “Project-based learning for undergraduate engineering students minoring in textile technology and design,” *J Phys Conf Ser*, vol. 1840, Art. 012042, 2021.
- [21] A.V. Fomina, L. A. Osipova and I.V. Slikishina, “Interactive learning as a means of forming professional competencies in the context of digitalization of education,” *Modern Pedagog Educ*, vol. 12, pp. 65-69, 2020.
- [22] J. M. Requies, I. Agirre, V. L. Barrio and M. Graellis, “Evolution of project-based learning in small groups in environmental engineering courses,” *J Technol Sci Educ*, vol. 8, no. 1, pp. 45-62, 2018.
- [23] S. Sadrina, M. Ramlee and I. Muhammad, “The evaluation of project-based learning in Malaysia: propose a new framework for polytechnics system,” *Jurnal Pendidikan Vokasi*, vol. 8, no. 2, pp. 143-150, 2018.
- [24] M. F. Silva, B. Malheiro, P. Guedes, A. Duarte and P. Ferreira, “Collaborative learning with sustainability-driven projects: a summary of the EPSAISEP programme,” *Int J Eng Pedagogy*, vol. 8, no. 4, pp. 106-130, 2018.
- [25] D. O. Khimmataliev, S. S. Bakhridinov and Z. K. Jumanazarova, “Case-study method in students training,” *Ann. Rom. Soc. Cell Biol.*, vol. 25, no. 4, pp. 7568-7578, 2021.
- [26] Z. Ismailova, D. O. Khimmataliev, M. K. Khashimova, M. K. Baybaeva and B. B. Ergashev, “Integrative approach to designing the content of secondary specialized vocational education,” *Opcion*, vol. 36, no. 91, pp. 25–41, 2020.
- [27] P. D. Sugiyono, *Metode Penelitian Bisnis: Pendekatan Kuantitatif, Kualitatif, Kombinasi, Dan R&D [Business Research Methods: Quantitative, Qualitative, Combination, and R&D Approaches]*, 3rd edition, Bandung: Alfabeta, 2018.

### **Contribution of individual authors to the creation of a scientific article (ghostwriting policy)**

All authors contributed equally to the creation of the given scientific article.