ISSN: 2181-3337 | SCIENTISTS.UZ VOLUME 5 ISSUE 9 | SEPTEMBER 2026

THE HARMONY OF INTERDISCIPLINARY TEACHING: ITS ESSENCE, STRUCTURE, AND DIDACTIC POTENTIAL

Fayzullayeva Gulchekhra[1], Rashidova Dildora[2]
Head of the Department of Primary Education, Faculty of Pedagogy,
Samarkand State Pedagogical Institute, Doctor of Science (DSc) in Pedagogical Sciences,
Associate Professor[1]
Lecturer, Department of Preschool Education, Faculty of Pedagogy,
Samarkand State Pedagogical Institute[2]

DOI: 10.67620/sai.59b0005

ABSTRACT
This article examines the concept of interdisciplinary teaching harmony as an integrative didactic quality and clarifies its structure and pedagogical potential. The study uses a theoretical literature review and conceptual analysis to distinguish multidisciplinary, interdisciplinary, transdisciplinary, cross-disciplinary, cross-curricular, integrated teaching, and integrated learning approaches. Particular attention is given to the conditions under which links among disciplines become pedagogically meaningful rather than remaining a simple combination of subject content. On the basis of the reviewed literature and the authors' conceptual synthesis, interdisciplinary teaching harmony is defined as the coordinated interaction of disciplinary content, concepts, methods of inquiry, learning activities, and assessment in pursuit of a common pedagogical goal or complex educational task. Seven interrelated features are identified: clarity and unity of purpose, conceptual connection, coherence of learning activities, complementarity of methods and evidence, agreement among participants about content, integrity of assessment and analysis, and situational application of knowledge. The analysis shows that effective interdisciplinary teaching requires preserving the disciplinary accuracy of each subject while organizing their contributions around a shared educational result. These features provide a theoretical basis for designing interdisciplinary instruction and for developing future teachers' professional-methodological competence. The proposed framework can also guide lesson planning, task design, and evaluation in teacher education.

ACCEPTED

28.09.26

Keywords:
interdisciplinary teaching; interdisciplinary harmony; interdisciplinary integration; didactic potential; educational process; pedagogical approach; professional-methodological competence.



Introduction

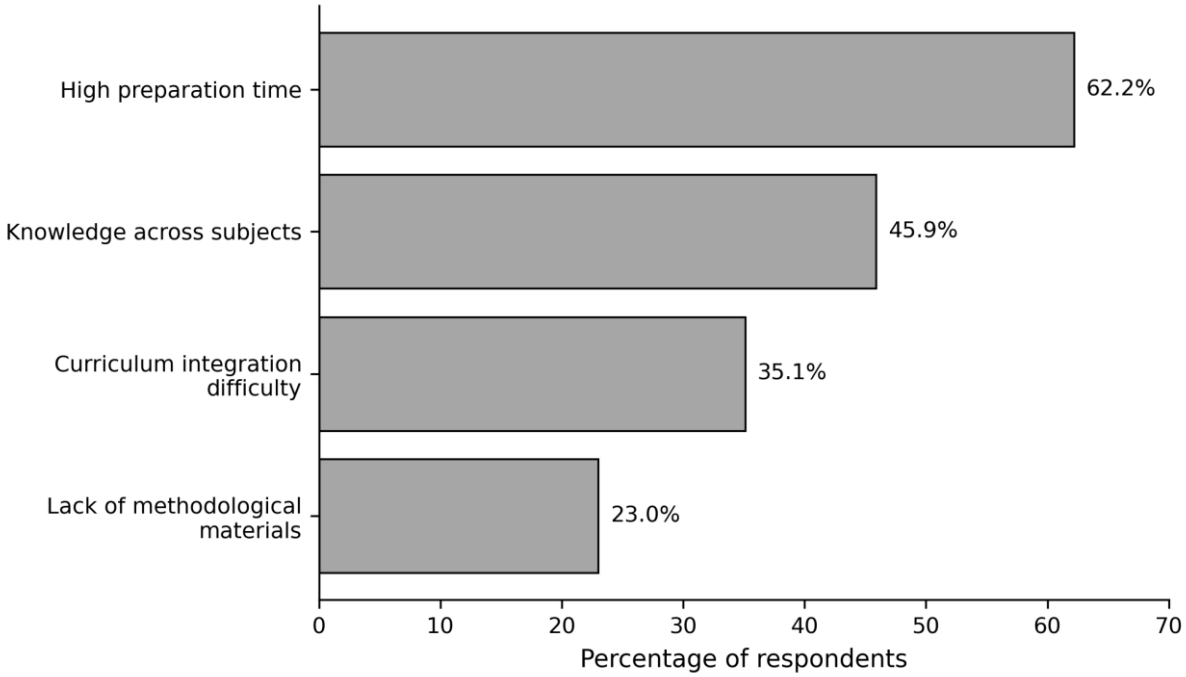
In recent years, the demand in the real situation requires a reasonable combination of its different aspects in the performance of a task. This in itself creates the need for the widespread application of interdisciplinary connections and integration concepts in education, as well as the practical implementation of its approaches and principles. In a simple case, a future teacher can include several subject titles in the lesson plan, choose a common topic, or share tasks with a colleague. However, if the main content that is relevant is not defined, if the methods of cognition do not complement each other, and if the result is not evaluated by a common criterion, the result becomes a sum consisting of fragments of activity. In this case,

the main contradiction is observed between the number of disciplines and their functional unity in the pedagogical task. At the same time, on the one hand, a complex phenomenon does not fit within the scope of a single discipline, and on the other hand, every additional point of view does not automatically unify the educational task. The educator must decide which knowledge to choose, in what sequence to use various cognitive methods, and by what fact to determine the integrative result. Therefore, the issue of developing professional-methodological competence based on ensuring the harmony of interdisciplinary teaching primarily requires identifying theoretical signs indicating the presence or absence of harmony.

Literature review and methodology. Scientists O.A. Likharyeva and D.Y. Pletneva studied the difficulties of interdisciplinary teaching through the practical experience of young educators. The work experience of the respondents participating in the study did not exceed five years. 74 educators from seven regions of Russia participated in the diagnostic survey. 46 respondents (62.2%) identified the high time required to prepare for an integrated lesson as an obstacle, 34 respondents (45.9%) - the need for knowledge in several subject areas, 26 respondents (35.1%) - the difficulty of including the lesson in the curriculum, and 17 respondents (23%) - the lack of methodological materials. An important aspect of this study is that it clarifies the difficulties in implementing interdisciplinary teaching by linking it to time, subject knowledge, curricula, and methodological resources. Additionally, Anoshina et al. (2024) examine readiness to implement mathematics–physics integration, while Narushevich (2022) examines subject-integrative methodological training in biology and chemistry. Although the pairs of disciplines and the scope of research differ, the intersection point of both works is expressed in the fact that the content interdisciplinary connection itself is insufficient, and the future teacher needs to be prepared to turn it into special methodological activity and design.

Figure 1

Reported Barriers to Implementing Interdisciplinary Teaching



Note. Percentages are based on the diagnostic survey data reported in the manuscript literature review (N = 74). The submitted manuscript does not provide complete bibliographic details for the Likharyeva and Pletneva source.

Spelt et al. (2009) identify the balance between disciplinary depth and the integration of subject knowledge, together with reflection on one's own thinking, as important factors in interdisciplinary study.

ISSN: 2181-3337 | SCIENTISTS.UZ

Analysis and interpretation. The modern development of interdisciplinary educational terminology intensified in the second half of the 20th century alongside growing tensions between disciplinary specialization and complex social and scientific problems (Stember, 1991). Although the OECD discussions of 1970 were a pivotal point in introducing multidisciplinary, interdisciplinary, and transdisciplinary approaches into scientific discourse institutionally, subsequent typologies differed in purpose, object, and epistemological position. In scientific research, these terms served to express the organizational form of knowledge production and the change in the boundaries of science, and in education, the degree to which educational content, activity and result are combined. Klein (2017) shows that typologies vary depending on purpose, context, and epistemological position, while the UNESCO International Bureau of Education (2013) presents interdisciplinary terms as working units describing various curriculum practices. The general conclusion of both sources is that multidisciplinary, interdisciplinary and transdisciplinary cannot be applied as universal levels outside the context.

In the research work, it is required to clarify the boundaries of the analysis process and the relevant direction, to distinguish the didactic function of interdisciplinary relations and related terms from the point of view of caution. In particular, in multidisciplinarity, one topic or problem is considered from the point of view of several disciplines, and each discipline mainly expresses its own question, method and result separately, that is, it is not necessary to combine the scientific contributions into a single integrative result. Therefore, its leading task is to combine and place the disciplines side by side. The concepts, evidence, and methods relevant to interdisciplinarity, from problem-solving to result interpretation, actively interact and create a holistic explanation or solution that an individual science cannot provide. This involves integrating the content, theory, methodology, and perspectives of two or more disciplines to gain a deeper understanding of a common topic or problem. Transdisciplinarity, on the other hand, may precede the order of the sciences, involve non-academic stakeholders in the creation of knowledge, or build a new sphere of meaning beyond existing boundaries. Teaching is organized around a real-life problem or a holistic theme, rather than based on the traditional boundaries of subjects. This triad should be understood not as a mandatory scale from simple to complex, but as various logics of relationships that are selected depending on the goal and task. Sometimes a multidisciplinary scope may be sufficient for some task, while a transdisciplinary breadth may be excessive for the learning objective. Drake and Reid (2020) distinguish the multidisciplinary form in educational typology by the parallel preservation of the purpose and evaluation specific to the disciplines, the interdisciplinary form by the open integration of interdisciplinary relations, and the transdisciplinary form by becoming the starting point of a real problem. For the authors, the distinguishing criterion is the degree of integration between content, activity, and result, rather than the number of disciplines.

At the same time, the terms cross-disciplinary, cross-curricular, curriculum integration, integrated teaching, integrated learning, and interdisciplinary teaching are frequently used in foreign scientific literature and do not express the same content. A cross-disciplinary approach can be a general expression of the intersection of disciplines or a view of an object of one science from the perspective of another, meaning that the concepts or methods of one science are applied to the study of an object of another science. Consequently, the term itself does not independently determine the degree of interaction. The main object of the cross-curricular - cross-subject linkage approach shows the placement of a topic, skill, or value across several subjects in the curriculum. Such placement can make interdisciplinary connections visible to students, but it does not involuntarily create general activity and integrative assessment. Curriculum integration is the process of integrating the content of a curriculum, combining content and subjects to ensure holistic study, or establishing meaningful connections between them. It may represent a decision on the structure of the curriculum, the distribution of time, and the boundaries of content. Another is integrated teaching, a model of teaching organized by a teacher within the framework of a common topic or task, linking the content of several disciplines, primarily signifying the teacher's efforts to organize

ISSN: 2181-3337 | SCIENTISTS.UZ

content and activities. Beane (1995) distinguishes curriculum integration from the partial adaptation of subject material under a general theme. In the context of foreign STEM research, the preference or prioritization of one of the disciplines may displace the contribution of the other disciplines. Although the objects of study are different, both analyses clarify the same boundary, that is, the status of integration does not by itself provide a reasonable balance of substantive interaction and scientific contributions. Integrated learning is the process of comprehensively understanding the complexity of a topic or problem by establishing connections between concepts, knowledge, and experiences. Integrated teaching emphasizes teacher activity, while integrated learning emphasizes the cognitive process occurring in the student. Integrated teaching and integrated learning refer to the manifestation of the aforementioned curriculum programs in teaching and learning, respectively; that is, the term itself does not indicate how deep the integration is. Recent work in primary education also emphasizes the movement from integrated planning toward coherent learning results (Avdiu & Gollopeni, 2026).

Interdisciplinary teaching - interdisciplinary teaching emphasizes the integration of relevant educational material, knowledge directly related to the lesson goal, conceptual apparatus, and cognitive methods into teaching activities around a general question, problem, or goal. Nikitina (2006) characterizes interdisciplinary teaching through three research strategies: contextualization, conceptualization, and problem-centered research. They are not strictly sequential steps, but are interpreted as different logics of linking the contributions of the sciences to the general question. This difference clarifies that the term "integrated teaching" itself refers only to the direction of teaching organization. Thus, the dynamics of the development of terms distinguish between organizational scale, semantic synthesis, and didactic execution. At this point, it becomes clear that the name of interdisciplinary teaching harmony does not replace a single ready-made term in international literature.

Results. Summarizing the research conducted above and the hypotheses put forward in the theme idea allowed for the development of the following author's definition: interdisciplinary teaching harmony is an integrative didactic quality characteristic of the interdisciplinary teaching process, arising from the mutual coordination of the content, concepts, and methods of cognition of various disciplines by educators and students in achieving a common pedagogical goal or a complex educational task. This quality is manifested through the preservation of the uniqueness of each subject, the complementarity of knowledge and methods, the compatibility of assessment with educational activities, and creates a basis for a holistic understanding of the phenomenon, the application of knowledge in a new situation, and the substantiated resolution of a complex problem.

The "integrative didactic quality" given in the definition refers to the holistic relationship that arises between the parts of learning. Therefore, harmony cannot be perceived as a separate method or a ready-made technology. The phrase "teachers and learners" means that this quality is manifested not only in the planned content but also in its study. What must be coordinated is not the entire content of the sciences, but the totality of concepts, facts, and methods necessary to perform a specific task. Their contribution to the overall conclusion in solving the problem should be substantiated. To characterize the integrative didactic quality, seven interrelated features are distinguished from each other. They consist of the unity and clarity of the goal, the connection of concepts, the compatibility of educational actions, the complementarity of scientific methods and evidence, the agreement of participants on the content, the integrity of assessment and analysis, and the orientation of knowledge application in accordance with the situation. Below, each feature is disclosed along with its content and professional-methodological significance. This division is the theoretical conclusion of this study and serves to characterize the quality of the educational process.

Discussion. In ensuring the harmony of interdisciplinary learning, the unity and clarity of the goal guide the choice of interdisciplinary content. When the educator determines which phenomenon needs to be explained or which problem to solve, the reason for turning to another subject becomes clear. Content

ISSN: 2181-3337 | SCIENTISTS.UZ

selected from various disciplines serves this purpose. For example, when studying the image of nature in the text, if biological information clarifies the meaning of the artistic expression, its inclusion is justified. However, additional information that is not related to the lesson's objective diverts attention elsewhere. For a future teacher, this feature allows for explaining the reason for selecting content and distinguishing between necessary and redundant material. An overly broad goal does not provide a sufficient basis for such a choice.

When a concept within one discipline is clarified with information from another discipline, a meaningful connection arises between the knowledge. This kind of connection helps the future teacher to build the content of the lesson on the basis of explanatory connections, rather than on the basis of a separate list of information. In this process, it is taken into account that the same term does not always mean the same thing. For example, in mathematics, "function" can refer to the relationship between one quantity and another, and in biology, it can refer to the function of an organ or structure. Linking the content also involves explaining this difference. If the teacher combines concepts based on similar sound or appearance, the student may generalize incorrectly. For this reason, the conceptual connection, that is, the meaningful relationship between concepts, is built based on the accuracy of the content of the science.

In ensuring the harmony of interdisciplinary learning, the consistency of learning activities is manifested through the application of selected knowledge in a common task. Observing the process, measuring, interpreting the text, and drawing conclusions can become interconnected parts of the same work. It is important that the results of the actions complement or verify each other. Then the student will understand why they are doing the measurement or what information they are looking for in the text. The didactic opportunity that opens up to the future teacher is also visible here; he learns to express the connection between subjects through the specific work performed by the student. Only the distribution of tasks does not yet ensure the interconnection of their results. This connection explains the consistency of educational activities. In a situation where one group calculates and another prepares a text, the overall result is not achieved by merely adding them together. The information obtained from the calculation can verify the conclusion in the text, and the content of the text can indicate which quantity should be selected for the calculation. The disclosure of this interaction is the didactic content of the task. In this case, the future teacher will have the opportunity to connect each student's action with the general learning goal, see the break between actions, and explain its cause.

Conclusion. This theoretical analysis provides grounds for interpreting the harmony of interdisciplinary teaching as an integrative didactic quality that expresses the correspondence between the general pedagogical goal, the substantive contribution of the disciplines, educational activity, and assessment. While interdisciplinary communication reveals the relationship between knowledge, integration unites them into a holistic explanation, and harmony describes how this unity is realized in the learning process. At the same time, the concepts and methods of argumentation of each science maintain their scientific accuracy while serving a common task. Thus, the transformation of semantic closeness into pedagogically grounded joint activity appears as a distinctive sign of harmony. The identified structural features demonstrate the interconnected aspects of this quality. The clarity of the goal guides the selection of the necessary content, and the connection of concepts and methods serves to transform the chosen knowledge into an educational action. The agreement of the participants on the content and the joint analysis of the result help to understand the basis of this action. Consequently, the integrity of harmony is expressed not in the mere existence of features, but in their mutual support. These relationships make it possible to see together how the student used various knowledge, what conclusions they came to based on them, and to what extent they were able to justify their conclusion.

ISSN: 2181-3337 | SCIENTISTS.UZ

REFERENCES

1. Anoshina, O. V., Dudareva, N. V., & Utyumova, E. A. (2024). Formirovanie gotovnosti budushchikh uchiteley matematiki k realizatsii mezhpredmetnoy integratsii matematiki i fiziki [Developing future mathematics teachers' readiness to implement interdisciplinary integration of mathematics and physics]. *Vestnik Shadrinskogo Gosudarstvennogo Pedagogicheskogo Universiteta*, (2), 85–100. https://doi.org/10.52772/25420291_2024_2_85
2. Avdiu, E., & Gollopeni, B. (2026). Integrated teaching in primary education: From planning to results. *Frontiers in Education, 11*, Article 1738852. https://doi.org/10.3389/feduc.2026.1738852
3. Beane, J. A. (1995). Curriculum integration and the disciplines of knowledge. *Phi Delta Kappan, 76*(8), 616–622.
4. Drake, S. M., & Reid, J. L. (2020). 21st century competencies in light of the history of integrated curriculum. *Frontiers in Education, 5*, Article 122. https://doi.org/10.3389/feduc.2020.00122
5. Klein, J. T. (2017). Typologies of interdisciplinarity: The boundary work of definition. In R. Frodeman, J. T. Klein, & R. C. S. Pacheco (Eds.), *The Oxford handbook of interdisciplinarity* (2nd ed., pp. 21–34). Oxford University Press. https://doi.org/10.1093/oxfordhb/9780198733522.013.3
6. Likhareva, O. A., & Pletneva, D. Y. (2021). Mezhdistsiplinarnoe obuchenie v shkole: Teoriya i praktika [Interdisciplinary learning at school: Theory and practice]. *Nauchno-metodicheskiy elektronnyy zhurnal "Kontsept"*, (5), 42–55. https://doi.org/10.24412/2304-120X-2021-11030
7. Narushevich, V. N. (2018). Podgotovka budushchego uchitelya biologii i khimii na integrativnoy osnove [Preparing future biology and chemistry teachers on an integrative basis]. In T. I. Rudneva (Ed.), *Obrazovanie v sovremennom mire: Professional'naya podgotovka kadrovogo potentsiala s uchetom peredovykh tekhnologiy* (pp. 105–113). Vash Vzglyad.
8. Nikitina, S. (2006). Three strategies for interdisciplinary teaching: Contextualizing, conceptualizing, and problem-centring. *Journal of Curriculum Studies, 38*(3), 251–271. https://doi.org/10.1080/00220270500422632
9. Organisation for Economic Co-operation and Development. (1972). *Interdisciplinarity: Problems of teaching and research in universities*.
10. Spelt, E. J. H., Biemans, H. J. A., Tobi, H., Luning, P. A., & Mulder, M. (2009). Teaching and learning in interdisciplinary higher education: A systematic review. *Educational Psychology Review, 21*(4), 365–378. https://doi.org/10.1007/s10648-009-9113-z
11. Stember, M. (1991). Advancing the social sciences through the interdisciplinary enterprise. *The Social Science Journal, 28*(1), 1–14. https://doi.org/10.1016/0362-3319(91)90040-B
12. UNESCO International Bureau of Education. (2013). *Glossary of curriculum terminology*. https://unesdoc.unesco.org/ark:/48223/pf0000223059

ISSN: 2181-3337 | SCIENTISTS.UZ