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ГОТОВНОСТЬ ПЕДАГОГОВ К ИНФОРМАТИЗАЦИИ
ICT SKILLS AND COMPETENCIES AMONG TEACHERS

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Integration of assignments for students of a pedagogical university on the usage of information technologies in teaching schoolchildren

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Abstract. *Problem statement.* The authors describe approaches to the integration of assignments for students of a pedagogical university on the usage of information and telecommunication technologies in the professional activity of a teacher. This study is a continuation of the authors' recent research of issues related to modeling approaches to the integration of methodical systems for the training of future teachers based on cloud technologies (on the example of International Baccalaureate schools). The purpose of the study is to obtain a practical confirmation of the effectiveness of the proposed approaches to the integration of the content of academic disciplines through practical tasks. *Methodology.* A pilot study consisting of several stages was conducted. The goals, objectives and content of practical works offered to students of a pedagogical university within the framework of studying a number of disciplines were analyzed, opportunities for their integration were identified. Control and experimental groups (16 people each) of pedagogical university students were formed. The participants of the experimental group were offered to perform specially designed practical assignments, which required knowledge and skills of disciplines integrated into the content. *Results.* The study found that the integration of assignments for students of a pedagogical university on the usage of information and telecommunication technologies in teaching schoolchildren contributes to the effectiveness of the formation of professional competence of such teachers. *Conclusion.* The effectiveness of the integration of assignments for students of a pedagogical university on the usage of information and telecommunication technologies in the professional activity of a teacher has been experimentally proved, positive aspects of such integration have been identified.

Keywords: informatization of education, information technologies, telecommunication technologies, methodical system, education, integration, teacher training, International Baccalaureate

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Интеграция заданий для студентов педагогического вуза по применению информационных технологий в обучении школьников

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Аннотация. *Постановка проблемы.* Описываются подходы к интеграции заданий для студентов педагогического вуза по применению информационных и телекоммуникационных технологий в профессиональной деятельности учителя. Исследование является продолжением изучения авторами вопросов, связанных с моделированием подходов к интеграции методических систем подготовки будущих учителей (на примере школ Международного бакалавриата) на основе облачных технологий. Цель исследования – практическое подтверждение эффективности предложенных подходов к интеграции содержания учебных дисциплин через практические задания. *Методология.* Проведено опытно-экспериментальное исследование, состоящее из нескольких этапов. Проанализированы цели, задачи и содержание практических работ, предлагаемых студентам педагогического вуза в рамках изучения ряда дисциплин, выявлены возможности для их интеграции. Сформированы контрольная и экспериментальная группы (по 16 человек каждая) студентов педагогического вуза. Участникам экспериментальной группы предложено выполнение специально разработанных практических заданий, для чего требуются знания и навыки дисциплин, интегрированных в содержание. *Результаты.* В ходе исследования установлено, что интеграция заданий для студентов педагогического вуза по применению информационных и телекоммуникационных технологий в обучении школьников способствует эффективности формирования профессиональной компетенции таких учителей. *Заключение.* Экспериментально доказана эффективность интеграции заданий для студентов педагогического вуза по применению информационных и телекоммуникационных технологий в профессиональной деятельности учителя, выявлены положительные аспекты такой интеграции.

Ключевые слова: информатизация образования, информационные технологии, телекоммуникационные технологии, методическая система обучения, интеграция, подготовка педагогов, Международный бакалавриат

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Problem statement. A modern stable trend in science and education is the strengthening of integrative processes. Usually, such an increase is observed during periods of technological order change in the economy. New economic needs create prerequisites for integration in science, production and education. Integration does not just unite the fields of knowledge, it allows you to get new objects of reality with new properties and goals of functioning, which is relevant during the construction of the digital economy of the country [1]. Information and telecommunication technologies have also greatly strengthened various integration processes, allowing various spheres of life and work of a person and society to interact more efficiently. However, for the successful process of such integration, future personnel must be trained in a special way for the usage of information and telecommunication technologies.

With regard to the field of "pedagogy," the integrative approach is understood as the position of research, according to which education is considered as a process and result of pedagogical integration (interdisciplinary, intradisciplinary, interpersonal, intrapersonal) [2]. Several authors whose research is devoted to the potatoes (V.S. Bezrukova, A.S. Belkin, A.Ya. Danilyuk, N.K. Chapaeva and others [3–6]), distinguish the following components of the integrative approach: organizational-methodical, activity-practical and theoretical-content. At the same time, in the definition of pedagogical integration proposed by I.D. Zverev and V.N. Maksimova, it is noted that: "Integration is the process and result of creating something inextricably coherent, unified, integral. In teaching, it is carried out by merging elements of different academic subjects in one synthesized course (topic, program section), by merging scientific concepts and methods of different disciplines into general scientific concepts and methods of cognition, by combining and summing up the foundations of sciences in the disclosure of interdisciplinary educational problems" [7].

Today, education and training of students who are the future teachers at a pedagogical university is carried out using both traditional and innovative forms of presentation of educational material. Among the most popular forms of training are binary lectures-seminars, group discussions, business games, workshops, field trips (excursions), classes with elements of socio-psychological trainings and many others. However, despite all the variety of implemented forms, methods and means of organizing the educational process, the student does not always have the opportunity to apply the acquired scientific knowledge and skills in new conditions, which in turn entails the formation of an incomplete understanding of the subject under study, the causal dependence of events, phenomena, processes. Besides, modern training is inextricably linked with the usage of information technologies, which make it possible to implement an integrative approach at a significantly higher level than training that uses only classical tools.

In view of the above, interdisciplinary integration with the usage of information and telecommunication technologies can be called the most promising approach to improving the effectiveness of training future teachers at the university.

The task of using interdisciplinary connections in the educational process in different periods was put forward by Ya.A. Komensky, I.G. Pestalozzi, J.-J. Russo, L.N. Tolstoy, K.D. Ushinsky.

Three levels of integration of the content of educational material are distinguished:

– intrasubject – integration of concepts, knowledge, skills, etc. within individual subjects;

– interdisciplinary – synthesis of facts, concepts, principles, etc. of two or more disciplines;

– trans-subject – synthesis of the components of the main and additional content of education.

In the context of the development of the digital economy and the inclusion of the task of forming digital competencies in federal education standards, one of the forms of organizing this type of integration is to conduct interdisciplinary practical work using information and telecommunication technologies.

Thus, the problem of this research is that the modern education system at this stage of its development can no longer be perceived holistically without the usage of information and telecommunication technologies in its various fields, which are ubiquitous and, as a rule, complex. The main function of informatization of education is to ensure the achievement of two fundamental goals through the usage of information technology: improving the efficiency of all types of educational activities and improving the quality of training of specialists with a set of skills necessary for the full realization of their potential in the modern information society. Without a doubt, every modern teacher should have knowledge in the field of computer science, should know the basics and prospects for the development of new digital technologies, should have practical skills in the usage of modern information and telecommunication technologies and the usage of information tools and resources for making professional decisions. In this case, the purpose of this research is to form basic approaches to the integration of tasks for future teaching staff on the use of information and telecommunication technologies in teaching schoolchildren.

Methodology. A pilot study consisting of several stages was conducted. The goals, objectives and content of practical works offered to students of a pedagogical university within the framework of studying a number of disciplines were analyzed, opportunities for their integration were identified. Two study groups of students were formed: control and experimental, 16 people each, from students of the Institute of Digital Education of the Moscow City University. The participants of the experimental group were offered to perform specially designed practical assignments, which required knowledge and skills of disciplines integrated into the content. According to the results of the assignments, the performance of students of the two groups in the discipline as a whole and for each practical work in particular was compared.

Results and discussion. In an earlier research, a model of approaches to the integration of methodical systems for training future teachers for International Baccalaureate schools based on cloud technologies was proposed [8; 9]. Then the focus was on the issue of eliminating the disunity of the content of the selected disciplines. The interim results of the current research presented in this publication should be considered its continuation.

Let's consider a variant of integrating assignments for students of a pedagogical university on the usage of information and telecommunication technologies in teaching schoolchildren by the example of organizing work with students studying at the master's program “International Baccalaureate: theory and technology” (training direction 44.04.01 “Pedagogical Education”).

Table 1

Matrix of integration of the content of academic disciplines through practical assignments

Block	Disciplines	Module									
		Practical assignments									
		P.A. 1	P.A. 2	P.A. 3	P.A. 4	P.A. 5	P.A. 6	P.A. 7	P.A. 8	P.A. 9	P.A. 10
General professional training”	Information technologies in professional activity	+	+		+	+	+	+	+	+	+
	Methodology and methods of scientific research						+				
	Modern problems of science and education	+	+								
	Innovative processes in education							+		+	+
	International Baccalaureate programs and technologies	+									
	Foreign language in the professional sphere		+	+		+		+		+	
	Meta-subject education and technologies of its implementation			+	+		+				
Special issues of the International Baccalaureate system	Trends in the development of international education		+								
	Theory of culture and globalization		+								
Educational process in International Baccalaureate programs	Foreign language for special purposes				+		+				
	Educational resources in the International Baccalaureate system			+		+	+			+	+
	Modern learning technologies			+		+		+	+		+
	Project activity in the educational practice of the International Baccalaureate system						+	+	+		
Disciplines (modules) by choice	Assessment in the PYP/MYP system of the International Baccalaureate				+						
	Training in the preparation of curricula in the PYP/MYP system of the International Baccalaureate						+				
	Professional development of PYP/MYP teachers					+			+		

It was noted above that the usage of informatization of education leads to the enrichment of the pedagogical and organizational activities of the educational institution as a whole, and the teacher in particular. The authors who study the organization of the educational process, including the usage of information and telecommunication technologies, in schools operating under International Baccalaureate programs [8; 10–16], note that for such teachers, professional training in the field of informatization of education should include the development of skills of effective application of information and telecommunication technologies. The following skills are named among such:

– the usage of information and telecommunication technologies (including multimedia technology, immersive technologies, artificial intelligence) to support various types of professional activities;

– the usage of the opportunities of professional network communities in order to improve their professional level;

– the usage of electronic educational publications and resources in their subject area;

– the ability to work in various digital educational environments.

The curriculum of the Master's program "International Baccalaureate: Theory and Technology" has a modular structure. Each module includes disciplines for the presentation of the content of which both traditional and innovative forms of presentation of educational material are used (binary lectures-seminars, group discussions, business games, workshops, classes with elements of socio-psychological trainings, etc.). It is obvious that the organization of such classes requires consistency in the content and methodical approaches used by professors of these disciplines.

At this stage, the emphasis is placed on integrating the content of a larger number of disciplines from various training modules through assignments of relevant thematic practical works offered to students. The Table 1 shows the matrix of such integration for 16 disciplines for 10 assignments of practical work. For clarity, the disciplines are grouped by the names of the modules to which they relate.

Here is an example of one of these practical tasks, as well as an example of the work performed by a student during an experimental approbation.

Practical work "Development of a thematic website"

Possible integrated disciplines: "Information technologies in professional activity," "Modern teaching technologies", "Foreign language in the professional sphere," "Educational resources in the International Baccalaureate system," "Professional development of PYP/MYP teachers."

Purpose: to determine possible options for presenting the professional activity of a teacher on the Internet; to develop an electronic educational resource.

Tasks:

– to develop a website structure (using information visualization services);

– to explore the possibilities of modern builders for creating websites;

– to develop an educational and methodical or personal website, according to the structure that meets the purposes and objectives.

Assignment: develop an hour-long walking excursion for schoolchildren (city district, park, exhibition center, museum and surrounding area, etc.) with a visit to at least six points of the route. It is necessary to take into account the average speed of movement of schoolchildren and the length of the route; calculate the total time and time of visiting thematic points; overlay the developed route on the map. Create a web page for a thematic excursion with the following information: an interactive map with a developed route, a brief description of the route, a form for registering for the excursion, a feedback form.

Recommendations for completing the assignment: when performing the first part of the assignment, it is possible to use the following plan.

1. Check out the theoretical material on the topic of the lesson.
2. Determine the place and purpose of the planned excursion.
3. Develop a route taking into account the requirements specified in the task.

When performing the second part of the assignment, it is possible to use the following plan:

1. Based on the theoretical material proposed by the professor, choose a website builder that meets your requirements.
2. Prepare the content for filling the site, taking into account the technical requirements.
3. Carry out the development and content of the site of a thematic excursion.

Report form. Publish the developed website on the Internet and send the URL to the professor. If the publication of the site on the Web is not possible, then it is necessary to provide the professor with access to the pages of the site in the mode of joint viewing or editing.

Methodical recommendations. The Google Sites service can be used as an example of a constructor for creating a website. In this case, when performing the second part of the task, you can use the pre-prepared instructions for working in the environment of this constructor. It is advisable to provide this instruction with illustrations and hints on interface elements. It is also necessary to inform students in advance of the evaluation criteria for this assignment.

One of the variants of the criteria may look like Table 2.

Table 2

Approximate criteria for evaluating the website of a thematic excursion

Criteria	Number of points
The placed object according to the condition of the task (interactive map with the route, a brief description, forms for registration and feedback)	1 point per object
Additional interactive object	1 point per object, but no more than 3 points
Additional description of objects on the interactive map	1 point
The question in the feedback form, which lists all the thematic points of the tour	1 point
Link to an electronic educational resource corresponding to the topic of the excursion	1 point, but no more than 3
Sustained overall design of all elements	1 point

An example of the work performed. The examples of students performing the task are Figures 1 and 2.

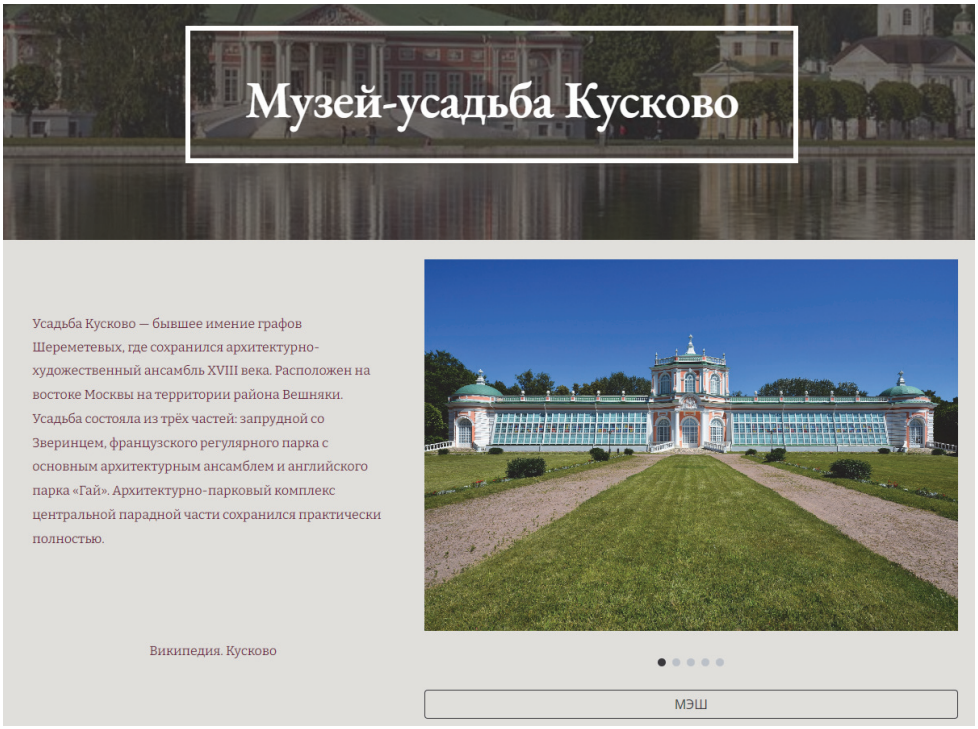

Figure 1. Fragment of the developed website of a thematic tour of the territory of the Kuskovo Estate Museum

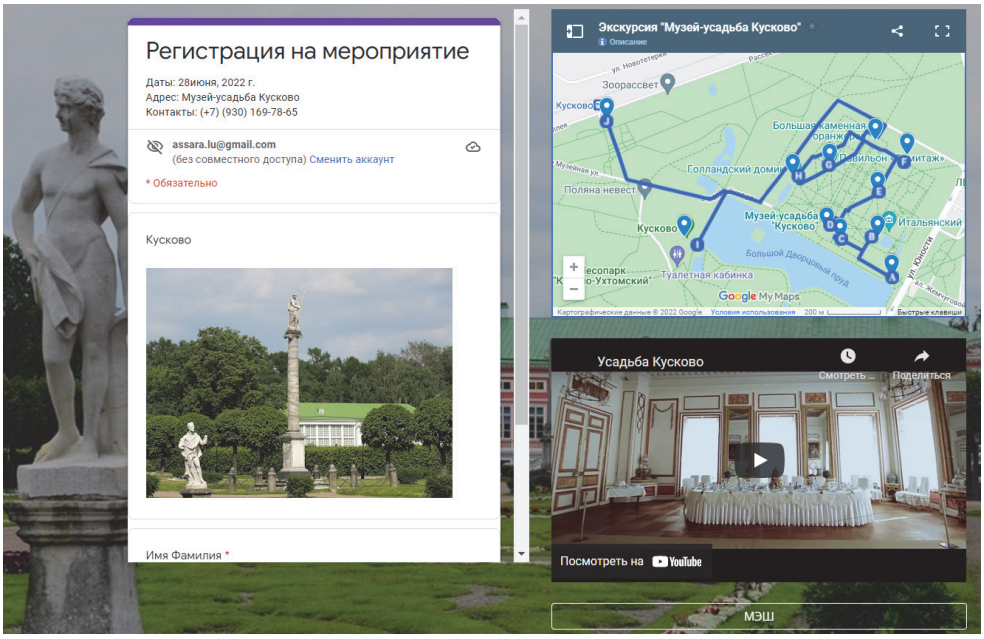

Figure 2. A fragment of the developed website of a thematic excursion with a registration form and an interactive route map

Results and discussion. Most of the developed assignments form the basis of the practical part of the discipline "Information technologies in professional activity." The evaluation of the effectiveness of the integrated assignments on the usage of information and telecommunication technologies in teaching school-

children when working with students of a pedagogical university was carried out on the basis of the results obtained while

– collecting feedback from students of the experimental group; and

– comparing the marks obtained by students of the control and experimental groups.

To collect feedback, students were asked to fill in a questionnaire. Thus, 100% of respondents responded positively about the content and practical orientation of the proposed assignments. More than half of the students rated the proposed assignments as moderately difficult and stated the sufficiency of the accompanying reference and illustrative material. Recommendations on changing the sequence of the assignments in order to increase the consistency of the theoretical content of integrated disciplines and practical development of the acquired knowledge are highlighted among the comments and suggestions made by some students.

For the second part of the experiment, two study groups of students were identified: control (POM MB-201m, 16 people) and experimental (POM MB-211m, 16 people). The control group was offered assignments to work out the skills of using information technology in various fields of professional activity of a teacher, without relying on theoretical material studied in other disciplines. The experimental group carried out the designed assignments, that required knowledge and skills of disciplines integrated into the content. The number, volume of assignments and their sequence were equal.

At the end of the semester, the performance of students of the two groups was compared in the discipline as a whole and for each work in particular. The values of the average final score and average scores for the works are shown in Table 3.

Table 3

Average values of points received by students for carrying out the practical assignments

Group	Assignment № 1	Assignment № 2	Assignment № 3	Assignment № 4	Assignment № 5	Final score
Control	6.6	5.3	6.5	4.5	4.9	27.8
Experimental	7.9	8.1	7.7	7.8	7.8	39.2

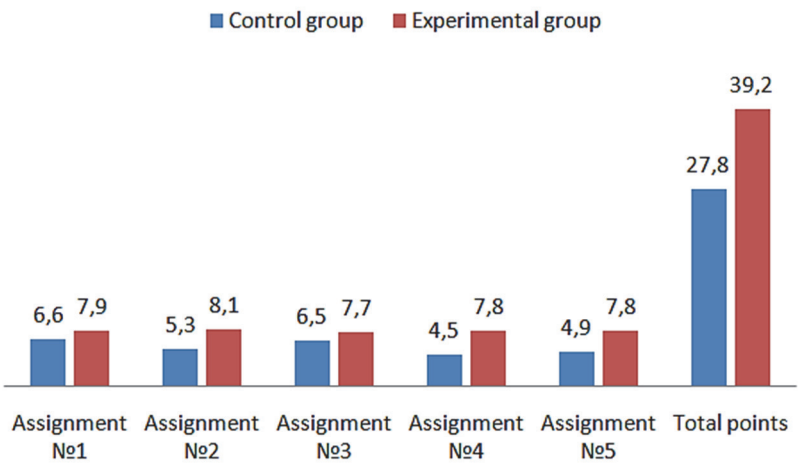

Figure 3. Academic performance of students of experimental and control groups

Based on the data in the table, a diagram is constructed that clearly demonstrates the higher indicators of the experimental group (Figure 3).

The small number of people in the control and experimental groups does not allow us to talk about the regularity of the results obtained. However, the combined result of the two parts of the approbation reflects a positive prerequisite for continuing research in this area.

Conclusion. The usage of integrated interdisciplinary assignments for the training of masters – future teachers of International Baccalaureate schools has the following positive aspects:

– creating conditions for the implementation of the principle of systematic learning;

– maintaining optimal conditions for the development of critical and creative thinking;

– contributing to the development of a systematic worldview, harmonization of the personality of students;

– expanding and deepening the interdisciplinary relations;

– activation of cognitive activity of students.

Therefore, it can be argued that information and telecommunication technologies make it possible for future teachers to develop assignments for schoolchildren with a high integrative degree. However, for the successful implementation of approaches to the integration of assignments for students of a pedagogical university on the usage of information and telecommunication technologies in teaching schoolchildren, additional work may be required to harmonize the methodical systems of disciplines that form the basis of such training.

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