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Retraction

Retracted: Machine Learning-Based Aesthetic Music Education Informatics Assessment Method

Wireless Communications and Mobile Computing

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This article has been retracted by Hindawi following an investigation undertaken by the publisher [1]. This investigation has uncovered evidence of one or more of the following indicators of systematic manipulation of the publication process:

(1) Discrepancies in scope
(2) Discrepancies in the description of the research reported
(3) Discrepancies between the availability of data and the research described
(4) Inappropriate citations
(5) Incoherent, meaningless and/or irrelevant content included in the article
(6) Peer-review manipulation

The presence of these indicators undermines our confidence in the integrity of the article's content and we cannot, therefore, vouch for its reliability. Please note that this notice is intended solely to alert readers that the content of this article is unreliable. We have not investigated whether authors were aware of or involved in the systematic manipulation of the publication process.

Wiley and Hindawi regrets that the usual quality checks did not identify these issues before publication and have since put additional measures in place to safeguard research integrity.

We wish to credit our own Research Integrity and Research Publishing teams and anonymous and named external researchers and research integrity experts for contributing to this investigation.

The corresponding author, as the representative of all authors, has been given the opportunity to register their agreement or disagreement to this retraction. We have kept a record of any response received.

References

[1] Y. Li, "Machine Learning-Based Aesthetic Music Education Informatics Assessment Method," *Wireless Communications and Mobile Computing*, vol. 2022, Article ID 4301761, 10 pages, 2022.

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Research Article

Machine Learning-Based Aesthetic Music Education Informatics Assessment Method

Yanjing Li

Department of Music, Langfang Normal University, Langfang 065000, China

Correspondence should be addressed to Yanjing Li; 19402439@masu.edu.cn

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Purpose. An instrumental mechanism for the identification, theoretical substantiation, and introduction of didactic conditions is a dynamic functional-structural model that performs orientation, managerial, formative, and analytical functions in the optimal organization of students' independent educational activity with the use of information and communication technologies. *Method*. During the research, a comprehensive target program of research and experimental work was developed, which was based on the step-by-step implementation of the didactic model, and its effectiveness was proved. *Findings*. The integration of traditional and electronic learning technologies within the framework of research and experimental work ensured systematic, planned, optimized organization, and enhanced control and diagnostic procedures of students' autonomous skills due to the requirements of manufacturability, adaptability, and control laid down in the tried-and-tested models of blended learning. Following the completion of the experimental work, quantitative, qualitative, and statistical analyses revealed positive dynamics in the levels of organization of independent educational activity of students of technological and pedagogical specialties with the use of information and communication technologies in motivational, content, operational, and productive criteria in the experimental group. *Implications for Research and Practice*. According to the results of experimental work in the experimental groups, statistically significant positive dynamics were recorded: 10% more students became with a high level of organization of independent educational activity, 13.3% ones were with a sufficient level, thus a number of students with indicators of critical and insufficient levels decreased on 23.3%.

1. Introduction

Music is one of the most complicated and difficult topics for people to understand. Music can evoke different emotions and memories. Music is important in many parts of life, such as dancing, parties, and for teaching language or math skills. However, there were no systematic evaluation methods for music aesthetics education information which was based on machine learning before this study. This study systematically evaluated music aesthetics education information which was based on machine learning with four criteria: content validity, comprehensiveness level of relevant content coverage, information accuracy, and precision rate of related data sources. Based on those criteria, this study conducted evaluation experiments with the evaluation plan to systematically evaluate music aesthetics education information.

As artificial intelligence technology has advanced, music instruction has incorporated a variety of intelligent features. Software, such as suggestions for musical practice, intelligent music level classification, the intelligent software, and interact with an electronic violin and appreciate how software and hardware, in the opinion of experts intelligent mistake correction for violin keys, intelligent span, and significantly increase students' motivation for studying and effectiveness.

The term "music appreciation" is typically used to describe the process of developing an individual's ability to appreciate music and have an understanding of different musical styles. Many people recommend that people should start listening to music at a younger age. Generally, children typically start listening to classical music and later develop their interests in other genres such as jazz, country, or metal. This article will

evaluate the aesthetic evaluation method for machine learning in order to help people understand their taste in music.

2. Literature Review

The problem of organizing independent educational activity and the leading forms of its organization—independent and research work, as well as a variety of consultations—has long history, and it is considered in numerous scientific publications by leading scientists of the past and present [1–3].

The organization of independent learning activities is positioned by researchers as a managed, unmanaged (spontaneously organized), and self-organized process, which has its specificity depending on the direction and conditions of study.

Most studies of this system educational phenomenon are based on the fact that students' independent learning activity can be at different levels (reproductive, productive, or creative), occur in the classroom and extra-curricular time, but necessarily with the indirect guidance of this process by the teacher [4–6].

This circumstance directs the efforts of the researchers to study the features of planning, norm-time costs, the logic of introducing organizational forms and methods of activation of independent learning activities, and development of didactic tools and criteria for evaluating its effectiveness, taking into account the specific training of students of technological and pedagogical specialties [7].

At the same time, a nominal increase in students' independent learning activity without introducing changes to the educational process's structure and content does not contribute to its optimal organization. Researchers see new broad perspectives in the introduction of cutting-edge information and network technologies, computer technology, and information transmission and exchange methods [2, 8].

Others have confirmed the utility of using information and communication technologies (ICT) to organize independent educational activities for students of technological and pedagogical specialties [9].

However, the emergence of new computer-centric technology, electronic communications, and expansion of their hardware and software base prompts researchers to find fundamentally different ways of intensifying and optimizing students' independent learning activities.

The analysis of the state of the organization problem of independent educational activity of students of technological and pedagogical specialties, as well as the level of application of ICT in the educational process, allows for the identification of the following fundamental contradictions:

(i) In a higher education institution, there is a high priority level of holistic formation of socially active, independent, and creative self-realized specialists, as well as the actual role and importance of students' independent educational activity [10]

(ii) The implementation of a new structure, the use of cutting-edge ICT tools in the management and self-management of students' technological and pedagogical specialties, and the elimination of stereotypes that stymie innovative processes in the higher education system [11, 12]

(iii) Accumulated in science and practice an arsenal of didactic findings, forms, methods, and types of students' independent learning activity and the degree of substantiation and experimental verification of didactic conditions of its organization with the use of modern ICT [13]

3. Methods

The implementation of the stated purpose and solution of the set tasks were carried out through the application of the following research methods: theoretical: retrospective, comparative, system analysis, generalization, classification, extrapolation of theoretical and research data, modeling to determine the essence of the key concepts of the study, substantiation of didactic conditions, design of an independent educational activity model for students of technological and pedagogical specialties using ICT; empirical: included and systematic observation, self-observation, peer review, self-assessment, conversations, interviews, testing and questioning of teachers and students, fixing, scaling, ranking, posing problematic questions, diagnostic control papers, pedagogical experiment for checking the effectiveness of the developed means of organizing students' independent educational activity; methods of mathematical statistics [14, 15].

3.1. Data. The experimental work was carried out in three stages during 2014-2017 academic years on the basis of the academy named after Jan Długosz in Czestochowa. 210 students of technological and pedagogical specialties and 36 teachers were involved in the experiment.

The participants' consent in the pedagogical experiment is obtained. Human rights were not violated during the experiment.

The observational experiment's goal was to investigate and analyze the state of the problem of using ICT in the organization of independent educational activities for students of technological and pedagogical specialties.

During the statement experiment (2014-2017) we tried

(i) to discover the goals and content of students' educational activities in technological and pedagogical specialties through the study and development of leading regulations and curricula

(ii) to identify the attitude of subjects of educational activity to the introduction of ICT in the system of professional education of students of technological and pedagogical specialties based on the results of surveys, testing, expert assessment and self-assessment, and analysis of documentation

(iii) to determine aspects and features, the level of organization of independent educational activities by means of ICT on the basis of questionnaires, testing, diagnostic tests, scaling and ranking, and observations of the organization of their educational activities

(iv) to single out difficulties and contradictions as a result of the analysis and generalization of studying of a condition of a problem of application of ICT in the organization of students' independent educational activities. First and foremost, we discovered the student's position on the organization of independent learning activities, as well as the methods for doing so, through questionnaires and interviews. For this purpose, the content of two questionnaires was developed: Questionnaire 1 "Attitudes to independent learning activities" and Questionnaire 2 "Features of the organization of independent learning activities of students" and task-situations (the appendix)

The survey revealed difficulties in the understanding by the majority of students of the essence of independent educational activity in its organizational and content-procedural aspects. In particular, 54.2% of 1-2-year students and 45.7% of 3-4-year students experience constant stress during their educational activities. Among the factors that cause this condition, in the context of our study, we focus on the following: (1) little time is devoted to the proper consolidation of knowledge (47.6% of all respondents); (2) inconsistency of the proposed educational tasks with the level of knowledge of students (76.1% of 1-2-year students and 61.7% of 3-4-year students); (3) unsystematic organization of extracurricular independent work (85.7% of all respondents); (4) too much material for self-study (76.1% of 1-2-year students and 38% of 3-4-year students); (5) uniformity and routine of tasks for extracurricular activities (83.3% of students); and (6) the formal nature of counseling by teachers (47.6%).

Among the respondents, only 21.9% of 1-2-year students and 28.7% of 3-4-year students consider it necessary to have a formed and conscious idea of the essence and content of independent educational activity as a guarantee of their future competitiveness. It is assumed that 60% and 66.8% of 1-2-year and 3-4-year students have it, respectively. However, for 71.4% of all respondents, the independent educational activity is a learning outside the educational institution, and the rest (28.6%) identify it with independent work.

The study showed that the vast majority of students do not have established internal motives in the organization of independent educational activity: 83.4% perform only those tasks that can affect the final grade in the discipline; 11.9% are those who are interested in them, and only 4.7% perform all types of work in full.

4. Results and Discussions

Our investigation and analysis of the situation revealed that the existing system of independent educational activity of students of technological and pedagogical specialties does not fully meet the tendencies of higher pedagogical education modernization. The need to resolve the identified contradictions and the reasons for difficulty removal resulted in the expediency of the experimental study of the didactic conditions effectiveness for the use of ICT in organizing students' independent learning activities were discussed. According to the results of the analysis of theoretical provisions, as well as experience of organizing students' independent educational activity, a research and experimental program was created and tested through program-targeted activity-productive and evaluative-reflexive stages.

Developing a program for organizing students' independent learning activities using ICT, we proceeded from theoretical developments that investigate the essence of this process, results of scientific and experimental studies of teachers and psychologists, analysis of existing practice, own experience, and the notion that improving the efficiency of students' independent learning activities and introducing ICT tools are managed processes.

Due to the fact that the status of students' independent learning activity depends on many factors and conditions, the purpose of the developed program is to systematize and coordinate the actions of the subjects (teachers and students) in its organization, to create learning environment that allows to successfully implement didactic conditions application of ICT in the organization of students' independent learning activities in technological and pedagogical specialties. Awareness of the system nature of the students' independent learning activity has led us to define a research and experimental program for its organization with the use of ICT as a comprehensive and targeted one. The program is presented as a set of thematic lines, which focuses on the solution of urgent issues: organization of students' independent learning activities in technological and pedagogical specialties in the process of classroom independent work, extracurricular independent work, research work, and information training.

In addition, competency, information and technology approaches have ensured the selection of ICTs and relevant technological models that can be applied in the planning of self-directed learning activities (Table 1).

The criteria for their selection were such as the following:

(i) general pedantic giving logical, proficient direction, efficient, reliable, association of hypothesis with training, PC and "traditional" perception of instructive data, mindfulness, movement, and freedom of understudies in dominating information

(ii) general mental—cordial discourse interface, nature of screen configuration (variety, contrast, clearness, size, speed of progress of data, and so on), considering understudies' age and individual qualities, presentation of method for inspiration of their free instructive action, academic, and PC support in independent learning

(iii) methodical—regularity, algorithm, step-by-step and consistency in assimilation of educational information, feedback between lecturer and student, the only approach to the organization of independent educational activity in any educational environments

Table 1: ICTs used in the organization of independent learning activity of students of technological and pedagogical specialties.

IC technology	Technological models of ICT application in organization of independent scientific and research work	
Multimedia technologies	Presentations	Multimedia lectures
	Flash clips	Electronic lectures
	Video snippets	Lecture-visualization
	Multimedia collections	Video tutorials
	Portfolio	Service projects
	Video feeds	Presentation portfolio
	Virtual museum	Project portfolio
	Multimedia case	
Interactive technologies	Videoconferences	Training and control programs
	Chat	Online consultations
	Gamification	Correspondence
	VoIP	Webinars;
	Training simulators	
	Interactive consultations	
Hypertext technologies	Useful resources	Working with the electronic library catalog
	Digital library	Working in the list of links
	E-book	Electronic educational resource
	Web quest	Sharable content object reference model (SCORM)
	Educational project	
	Specialized site	
	"Treasure hunt"	
Internet technologies	Virtual tours	Online consultations
	Web quest	Lecturer's website
	Cases	Multiprojecting
	Custom course	Distance learning
	Thematic web-site	Blog
	Correspondence	Virtual University
Virtual information space technologies	Emulator programs	Computer and engineering graphics
	Graphic editors	Virtual laboratory work
	Office packages	Digital modeling
	Simulator programs	CAD
	Digital library	Electronic message boards
	Systems for automatic control of objects and models	CASE method
	Digital labs	
Cloudy technology	Knowledge bases	Custom course
	Databases (templates, tools, structural elements)	Training on online platforms
	Information processing programs on-line	Project management systems
	Administration and management as a service	Data warehouses
		Online analytical processing (OLAP)
Web technologies	Specialized web site	Web programming
	Online posts	Wiki-projects
	Communications on the network	Phenomena and processes modeling
	Infographics	Virtual museum
Telecommunication technologies	Webinars;	Video feeds
	Web conferences	Thematic block
		Chat

Table 1: Continued.

IC technology	Technological models of ICT application in organization of independent scientific and research work	
	Web quest	VoIP
	Distance education	Mobile learning
Automated library information systems	Online catalog	Useful educational resources
	Thematic databases	Thematic library collections
	Digital library	Virtual museums
	Repository	"Treasure hunt"
SMART-technologies	Multimedia presentations as an online resource	Sympodium interactive displays
	SMART Board interactive board with SMART Notebook software	Learning center for small groups as an interactive table SMART

Source: constructed by the author.

Table 2: Levels of students' self-study organization with application of ICT by motivational criterion (in %).

Levels	Steps of work					
	Starting		Intermediate		Final	
	CG	EG	CG	EG	CG	EG
Insufficient	18.3	20.0	15.1	15.0	15.1	8.4
Critical	33.3	33.3	33.3	36.7	33.3	23.3
Sufficient	33.3	33.3	34.9	33.3	36.5	45.0
High	15.1	13.4	16.7	15.0	15.1	23.3
Coefficient of organization	24.2	23.3	25.5	24.7	25.3	30.5

Notes: CG: control group; EG: experimental group.

(iv) technical—compliance of the hardware with the requirements of the software and the operating documentation, ability to create a remote learning environment, create synchronous and asynchronous modes of educational communication, and ensure software stability in the face of incorrect user actions

(v) ergonomic—functional comfort at work, aesthetic design of certain objects that conforms to their functional purpose

To put to the test the assumption that organizing independent learning activities for students of technological and pedagogical specialties using ICT will be effective if done on a theoretically justified didactic model, which is a system of interrelated theoretical, methodological, organizational and managerial, content and activity, and control and diagnostic components (blocks), each of which performs a specific function (respectively, orientate, managerial, formative, and analytical) and provides creation in the educational process of certain didactic conditions according to which the experimental work was organized.

The most developed among students are such indicators of the motivational criterion, as "interest in using ICT" and "interest in communication with learning goals." The group of motives to the research work is the least developed in students. This is due to the fact that most of them do not consider such activities as useful and important prospects for themselves.

However, the activities of the comprehensive target program, including the involvement of students of experimental groups in finding relevant information on the network, in collaboration on specialized websites, in blogging, in conducting web forums and webinars, in carrying out tasks and training projects using ICT, tools, and built on the principle of gamification, in general, to work in the informational learning environment made it possible to achieve some qualitative changes in the structure of their educational and cognitive motivation (Table 2 and illustrative diagrams in Figure 1).

The traditional system of organizing the learning activities prevailed in the control groups. ICT tools were used in the experimental group.

Quantitative analysis of the Table 2 shows that the development of the motivational aspect of organizing students' independent learning activities with the use of ICT was occurred unevenly, but most clearly for the students of the experimental group. In Figure 1, dynamics of indicators of the coefficient of organization of students' independent learning activity by the motivational criterion were shown.

Such outcomes were made possible by the inclusion of didactic conditions such as motivational conditioning in the educational process and equality of subjective positions of teachers and students in the management of students' independent learning activity through computer-oriented means. It should be noted that as subjects of independent learning activity students within the framework of scientific and experimental work had the opportunity to show the highest level of

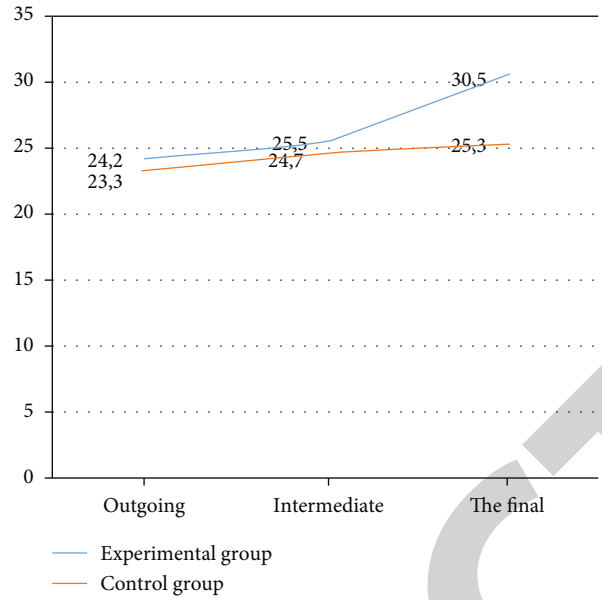

Figure 1: Dynamics of indicators of the coefficient of organization of students' independent learning activity by the motivational criterion.

Table 3: Comparative dynamics of the levels of students' independent learning activity organization with application of ICT by motivational criterion (in %).

Levels	Experimental group		Control group	
	Starting stage	Final stage	Starting stage	Final stage
Insufficient	20.0	8.4	18.3	15.1
Critical	33.3	23.3	33.3	33.3
Sufficient	33.3	45.0	33.3	36.5
High	13.4	23.3	15.1	15.1
Coefficient of organization	*23.3*	30.5	*24.2*	*25.3*
χ^2 % criteria	21.1 > 11.3, $\rho = 0.01$		0.86 < 11.3, $\rho = 0.01$	

Notes: χ^2 % criterion: Pearson test, ρ: probability of error.

independence and activity, to make free choice of ICT tools and types of educational tasks, to build their own educational trajectory by indirect guidance of the lecturer.

Qualitative shifts in experimental results are presented in Table 3.

Quantitative analysis of the data in Table 3 shows that not significant changes occurred in the motivational and needy area of students of technological and pedagogical specialties according to the results of the experiment in the control group. The dynamics of students in the experimental group, on the other hand, are more pronounced: the number of students with a high level score increased by 9.9%, the number of students with a sufficient level score increased by 11.7 percent, and the number of students with a critical and insufficient level of organization decreased by 21.6 percent. The validity and noncoincidence of the obtained results was confirmed by the 2% Pearson test with probability of error of 1%.

Diagnosis of organizational levels of independent learning activity of students of technological and pedagogical specialties using ICT by content criterion provided determination of the didactic and methodical knowledge available to students about the essence and content of independent learning activity, its forms and methods, types of ICT, laws and principles of their use in the educational process, particularly during teaching school courses of work training, drawing, and technology; as well as ways of organizing and conducting independent learning activities using ICT in different settings.

To this purpose, we developed a diagnostic methodology that consisted of problematic questions to identify students' awareness of the types, forms, methods, and techniques of independent learning activities and their organization with the use of ICT. In the end, a diagnostic technique was developed that included: performing tasks-situations by students. The content of the tasks was formulated in the light of the principle of complex differentiation for the three topological groups of students, and covered indicators of formation the students' self-study, information and organizational skills, and the method of their implementation required students to use ICT widely.

The results obtained at each of the stages of experimental work are summarized in Table 4.

From the data of Table 4, we make sure that if there was uneven development of the system of skills of independent learning activity organization with the use of ICT in students

Table 4: Features of organization of independent learning activity of students with application of ICT by operating criterion (in %).

Skills formation levels	Stages of work					
	Starting		Intermediate		Final	
	CG	EG	CG	EG	CG	EG
Self-learning ability						
Insufficient	40.0	41.7	33.3	33.3	30.0	21.7
Critical	43.4	41.7	41.7	41.7	33.3	30.0
Sufficient	11.7	11.7	18.3	20.1	25.0	33.3
High	4.9	4.9	6.7	4 9	11.7	15.0
Coefficient of organization	*13.5*	*13.3*	*16.4*	*16.1*	*19.7*	*23.6*
Organizational skills						
Insufficient	31.7	33.3	30.0	25.0	25.0	21.7
Critical	35.0	35.0	36.7	41.7	36.7	26.7
Sufficient	25.0	25.0	25.0	25.0	28.3	33.3
High	8.3	6.7	8.3	8.3	10.0	18.3
Coefficient of organization	*18.3*	*17.5*	*18.6*	*19.4*	*20.6*	*24.7*
Information skills						
Insufficient	21.6	23.3	16.7	15.0	15.0	8.3
Critical	35.0	33.3	36.7	33.3	33.3	25.0
Sufficient	26.7	26.7	29.9	35.0	35.0	46.7
High	16.7	16.7	16.7	16.7	16.7	20.0
Coefficient of organization	*23.1*	*22.8*	*24.4*	*25.6*	*25.6*	*29.7*

Table 5: Efficiency coefficient of application of IK technologies in the organization of independent educational activity of students of technological and pedagogical specialties.

Task types	Coefficient	
	Before experiment	After experiment
Educational communication organization in the "student-teacher" system	1.5	1.8
Information searching	1.2	1.8
Performing graphical, computational, and practical tasks	0.7	1.2
Execution of educational projects	0.8	1.3
Plan preparation-synopsis of labor training and technology lessons	0.6	1.1
Performing laboratory and experimental studies	0.6	1.5
Preparation of a portfolio of technical work objects	0.5	1.1
Creation of diagrams, technological cards, summary tables, construction of graphs and diagrams	0.7	1.5
Self-control, test control	0.9	2.0
Solution of problems in technical creativity	0.6	1.1
Using the library catalogue	0.7	1.5
Participation in the quest	0.7	1.1
Coefficient of manufacturability	*0.79*	*1.42*

of both groups at the beginning of the experiment; then, the final slice showed, apart from significant dynamics in levels, the proportional development of all types of studied skills in experimental group students. This was made possible by organizing independent educational activities for students of technological and pedagogical specialties using ICT in accordance with the provisions of the dynamic system-structural model.

Take note of the changes in the degree of adaptability of students' independent educational activities organization in technological and pedagogical specialties (Table 5).

As can be seen, there has been a significant increase in the use of IC technologies by students in experimental groups to solve educational tasks. Such results were made possible by the introduction of ICTs and their technological models into the educational process, which enabled integrating traditional and electronic tools in combined and blended learning systems. Comparing the results of the experiment's ascertaining and formative stages, we have determined that theoretically grounded and implemented in the educational process didactic conditions are sufficiently effective, and they serve tendencies for positive changes in the composition,

content and structure of self-study activities of students of technological and pedagogical specialties, foster to optimality, efficiency, and controllability of its organization with the use of ICT.

5. Conclusion

According to the findings of the theoretical provisions analysis, as well as experience of organizing students' independent learning activity, a research and experimental program was created and tested through program-targeted activity-productive and evaluative-reflexive stages.

According to the results of testing in the educational process for the training students of technological and pedagogical specialties, the following were introduced: a comprehensive target program of gradual organization of independent educational activity of students with the use of ICT in the process of classroom and extracurricular independent and research work, informal training; didactic conditions and means of indirect and direct management of students' independent learning activities; technological models of application of ICT tools.

Following the completion of the experimental work, quantitative, qualitative, and statistical analyses revealed a tendency for positive changes in the levels of organization of independent educational activity of students of technological and pedagogical specialties, both by individual criteria and in general. Positive and statistically significant changes were achieved in the system of investigated activity by motivational (+7.2 units), content (+6.8 units), operational (+9 units), and productive (+7.9 units) criteria. No significant changes occurred in the control groups.

The results of the study can be used in practice of organizing the educational process at the technological-pedagogical faculties, which was reflected in the testing of work in institutions of higher pedagogical education.

The study does not address all aspects of the issue of using ICT to organize the educational process. The content of students' independent learning activities in the distance, dual, and e-learning systems, the development problem of educational mobility and educational autonomy of students, creation of a holistic educational environment that provides self-actualization and self-realization of personality, forms the capacity for self-learning and self-improvement during the life need further development.

6. Recommendations

According to the concept developed, students can get started with the resource in two ways:

(1) To select a course from the general list of subjects contained in the appropriate tab; the link redirects it to a page listing all modules and discipline sections broken down by semester (according to the program). If the same discipline is studied under different programs in the same specialties (areas), the student is offered to choose his specialty (area)

(2) The student chooses his course and semester. The following link redirects it only to the relevant sections or modules of this semester's discipline. If the same discipline is studied under different programs in the same specialties (areas), the student is offered to choose his specialty (area).

When going to a page of a discipline, the student can get acquainted with the amount of educational content presented. The tab of a discipline indicates the purpose of the discipline, a list of sections and titles of topics that are taught in this semester, with the number of lectures, laboratory, and practical classes. Each type of lesson (lecture, practical, and laboratory) is numbered, and the title, except the number, contains the subject of the lesson, and it is designed as an active link to an electronic resource with the option to view and download content. Each topic is completed with a system of tasks for independent work, didactic tools (hyperlinks to information resources, textbooks, manuals, reference books, guidelines and samples of completed independent work, etc.).

Students are offered test tasks of varying levels of difficulty for each topic, indicative tasks for control papers. Depending on the needs of the discipline, the tab may contain multimedia materials for student viewing (instructional video, video lectures, video lessons, models of phenomena or processes, presentations), requirements, recommendations, and examples of educational projects, as well as a set of hyperlinks to educational resources or cloud services.

Appendix

A.1. Questionnaires to Identify the Features of Independent Educational Activity of Students of Technological and Pedagogical Specialties

A.1.1. Questionnaire 1: Attitude to Independent Educational Activity

(1) What is the purpose in the educational activity of a student of technological and pedagogical specialties?

(2) Do you have a goal of studying at the pedagogical university?

☐ Yes. ☐ No. ☐ It is difficult to answer

(3) Please formulate the main purpose of your studies at the pedagogical university

(4) Do you study without much effort?

☐ Yes. ☐ No. ☐ It is difficult to answer

(5) Please indicate up to 5 factors that cause you to be tense in the learning process

(6) Do you think that the formed and conscious idea of the essence and content of independent learning is

the key to your successful learning and future competitiveness?

☐ Yes. ☐ Partially ☐ No. ☐ It is difficult to answer

(7) Do you have an idea of the student's independent educational activity, its content, and ways of organization?

☐ Yes. ☐ Partially. ☐ No. ☐ It is difficult to answer

(8) Independent educational activity of the student is:

☐ Independent work. ☐ Self-education. ☐ Scientific work. ☐ Learning outside the educational institution (courses, electives, online education). ☐ It is difficult to answer

(9) What place do you give to independent work?

☐ I perform on time in full. ☐ I perform only those tasks that will be checked. ☐ I perform only those tasks that interest me. ☐ I perform those tasks that may affect the final grade in the discipline. ☐ I do not perform most of the tasks. ☐ Other (specify).

(10) Do you need to do research? ☐ From time to time. ☐ No. ☐ It is difficult to answer

(11) Do you feel the need to study further in order to obtain another specialty or specialization?

☐ Yes. ☐ From time to time ☐ No. ☐ It is difficult to answer

(12) Do you study somewhere other than at the Pedagogical University? If so, tell me exactly where

(13) Do you have distance learning experience?

☐ Yes. ☐ No

(14) If you were offered to study or get an additional specialization remotely, would you agree?

☐ Yes. ☐ Probably. ☐ No. ☐ It is difficult to answer

(15) What, in your opinion, should be done in a higher education institution in order to promote the formation of students' conscious attitude to learning and performing independent work

Thank you for participating in our study!

A.1.2. Questionnaire 2: Features of the Organization of Students' Independent Learning

(1) Are you satisfied with the organization of your studies and independent educational activity?

☐ Yes. ☐ No. ☐ It is difficult to answer

(2) Do you get help from the teacher in organizing independent educational activity?

☐ Yes. ☐ From time to time ☐ No. ☐ I do not need such help.

(3) Do you need help in organizing independent educational activity?

☐ Yes. ☐ From time to time ☐ No. ☐ I do not need such help

(4) When you start studying a discipline, section, topic, the goals in your independent educational activity ...

☐ The teacher must put in front of you. ☐ The student must formulate his (her) own goal on his (her) own. ☐ You have to formulate your own goal of studying the subject together with the teacher. ☐ Goal setting is not always required..

(5) Please indicate how often you think about the goals, tasks that you face when doing independent work?

☐ Often. ☐ Інколи. ☐ Never.

(6) Please indicate how you organize the implementation of your independent educational activity:

☐ At your own discretion. ☐ According to the developed plan. ☐ Based on consultations with teachers. ☐ Based on self-analysis of my own experience. ☐ I do not think and just do the task. ☐ In another way (specify which).

(7) When solving the problem, do you think about the need for self-examination of your own actions?

☐ Often ☐ Rarely. ☐ Never

(8) After completing the task, do you perform self-control and self-correction?

☐ Often. ☐ Rarely. ☐ Never.

(9) Usually, after completion of independent types of work, the check and assessment.

☐ The teacher performs and informs me of the result. ☐ I practice on my own and consult with a teacher. ☐ I do it on my own and, if necessary, discuss the results with other students and get advice from the teacher. ☐ No one does, leaving this procedure to the control work.

(10) Do you ever feel the time lag while completing learning tasks?

☐ Yes. ☐ No. ☐ It is difficult to answer

(11) Do you think about the reasons that prevent you from successfully and timely performing independent work?

☐ Yes. ☐ No. ☐ It is difficult to answer

(12) What is more prevalent in the organization of your independent educational activity?

☐ Supervision by teachers. ☐ Self-control. ☐ Complete freedom of action

(13) Please indicate what types of learning tasks you are offered to perform in independent learning activities (several answers).

☐ Calculation and graphic tasks. ☐ Practical work
☐ Laboratory work. ☐ Experimental tasks. ☐ Research tasks. ☐ Project tasks. ☐ Problems solving. ☐ What else? (specify).

(14) Are modern ICTs used in the organization of independent educational activity?

☐ Yes. ☐ From time to time ☐ No

(15) Please name those ICTs that are commonly used in the organization of independent educational activity of students in your institution

(16) Please name from 5 and more positive factors that provide ICT in the organization of independent educational activity of students

(17) What skills, in your opinion, do you lack when organizing independent educational activity with the use of ICT?

☐ Organizational skills. ☐ Ability of independent learning activities
☐ Information skills. ☐ Other skills (specify which

(18) Do you purposefully develop such skills?

☐ Yes, through self-education. ☐ Yes, by trial and error. ☐ No, I think that they will be formed by themselves someday. ☐ No, I do not feel the need for it. ☐ It is difficult to answer.

(19) Please name the factors that constrain the use of ICT in the organization of students' independent educational activity

Thank you for participating in our study!

Data Availability

The data used to support the findings of this study are included within the article.

Conflicts of Interest

The author declares that he/she has no conflicts of interest.

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