Conceptual approach to the development of technology for virtual mobility modeling of distance learning students

Tatyana Pyatkova[1*] *Natalya* Kolyeva[2], and *Marina* Panova[2]

[1]M. Kozybayev North Kazakhstan University, Ulitsa 86, 150000, Petropavlovsk, Republic of Kazakhstan
[2]Ural State University of Economics, Ulitsa 8 Marta, 62/45, 620144, Yekaterinburg, Russian Federation

Abstract. The article deals with the issues of distance learning for students. The technology of managing the formation of virtual mobility of students of distance learning is presented. Value-volitional, normative, resource, procedural-functional, managerial-diagnostic and resulting blocks are identified in the technology. Mobile learning technology includes a purposeful and ordered set and sequence of actions of a teacher and a student through joint or individual study of structured learning resources, work and educational communities. The article presents a knowledge map (structured interpretation of the concept under study) of virtual mobility of distance learning students. The mind map is considered, on the one hand, as a logical and semantic verbal-like model of educational material, reflecting its content and structure, on the other hand, as a model of students' individual knowledge.

1 Introduction

The conceptual approach to the development and application of technology for modeling virtual mobility of students is based on ideas, principles, requirements and provisions that reflect current trends in the distance educational process, labor market requirements, regulatory legislation, potential and theoretical basis of a set of scientific disciplines, etc.

Let us describe the ideas that underlie the virtual mobility model of distance learning students:

- the idea of increasing the role and status of students' independent work;
- the idea of combining and complementing program-targeted and synergetic approaches to the formation of virtual mobility with distance learning;
- the idea of effective use of the material-spatial and information environment of the university, the creation of optimal conditions for the development of virtual mobility of students;
- the idea of using qualimetric monitoring procedures as a mechanism for providing feedback with the effectiveness of the development of virtual mobility of students in the

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[*] Corresponding author: tanya.pyatkova@mail.ru

educational process;

• the idea of highlighting the design, analytical, implementation, and expert-reflective stages of development of virtual mobility;

• the idea of using various types of educational activities as a procedural basis for the development of virtual mobility of students [1,2,3].

From the point of view of the conceptual approach, it is important to understand the mechanism for controlling the formation of virtual mobility of students of distance learning. On the one hand, distance learning is a strictly regulated process. The educational process is carried out on the basis of the Charter of the university, the educational program, on the basis of the curriculum, the plan of the faculty and the department, class schedules and other regulatory documents. If you look at the problem from the other side, where the participants in the educational process are people with their individual characteristics, abilities and inclinations, obeying the laws and principles of synergetics, according to which there are situations of multivariance and uncertain choice, spontaneity of trajectories, and managerial decisions.

In this regard, in relation to the management of the formation of virtual mobility of students of distance learning, we are talking about a synergistic approach. The conceptual conclusion and installation are taken into account during the design, planning, control and monitoring, analysis of the educational process.

2 Research results

Thus, based on the above conceptual provisions for the development of virtual mobility of students of distance learning, we will present a technology in which value-volitional, normative, resource, process-functional, managerial-diagnostic and resulting blocks are distinguished [4;5;6].

The value-targeted block of technology of virtual mobility of students of distance learning is presented in the form of target settings.

Let us highlight the priority targets:

1) effective formation and use of high-quality human resources necessary for a modern highly competitive innovative economy;

2) the fullest fulfillment by the university as a social system of its mission to reproduce qualified specialists [3].

Highlighted priority targets complement a number of values of virtual mobility, including the technical profile: values of orientation to professional standards; values of the fullest disclosure of the potential of the personality of the future specialist.

The normative block is connected to and supplements the value-targeted block of the technology of virtual mobility of students and is more formalized, official and mandatory. This technology unit sets a certain general framework, rules for the interaction of all subjects of the process, ensures the protection of the rights of students, and guarantees the transparency of the relationship.

The resource block of the technology of virtual mobility of students can be represented in the form of tangible and intangible resources. We classify material resources into material, technical, financial, personnel, and also partnership resources. Intangible resources are informational (including network), intellectual, innovative resources and potentials. The real purpose of this unit of technology of virtual mobility of students is to ensure the functioning of the distance learning system, the conversion of "input" characteristics to "output". The introduction of virtual mobile learning technology is based on a systematic approach with four essential elements. These are human factors; mobile learning management process; content (content); technological capabilities of modern ICT.

The social effectiveness of technology implementation determines the requirements,

wishes, and expectations of various categories of consumers and customers of educational services, employers, and stakeholders with regard to the development of virtual mobility of distance learning students.

The pedagogical effectiveness of technology implementation shows the completeness of the achievement of pedagogical tasks that are set at various stages of higher education [7;8].

The managerial and organizational effectiveness of the implementation of this technology shows the quality of management of the remote educational process, the quality of program-targeted management of the development of virtual mobility of students of distance learning.

The process-functional block of the technology for the development of virtual mobility contains a complex of sub-processes during which individual interconnected pedagogical tasks can be solved. These subprocesses include: conducting competitive events; organization of information, joint activities with employers, etc. The effectiveness of the selected sub-processes is regulated by the plans and instructions of the university.

The management and diagnostic unit of the technology is a list of management tools in the form of functions, methods, and technologies for ensuring stability, controllability, measurability, and adjustment of the process under study in various situations and conditions. The process of developing virtual mobility of students is managed using functions interconnected and sequentially performed during the full cycle: studying needs - designing a process and pedagogical situations - planning a process - ensuring a process - implementing a process - monitoring, analyzing a process - evaluating results - conducting corrective actions.

The resulting block of technology for the development of virtual mobility of students puts forward the cumulative pedagogical effects in the form of certain qualities and properties necessary for the manifestation of virtual mobility of students

Given the above classification of the results and effects of the process of developing virtual mobility of students, the authors carried out work on the formation of certain situations of development of virtual mobility of students of distance learning. Based on the analysis of scientific and methodological literature, we present a complex of technologies characterizing virtual mobile learning: technology of phases of mobile learning; mobile learning technology.

In the technology of phases of mobile learning, the following stages are distinguished:

1) activation (at this stage, the student's previous knowledge and cognitive strategies are activated);

2) reproduction (there is a reproduction of previous knowledge and intellectual models);

3) concentration (concentration of students' perception and cognitive processing of educational information);

4) interpretation (an explicit interpretation is performed by the student, based on perception and previous knowledge);

5) reflection (there is a reflection of their own interpretations and situational factors);

6) information processing (information is processed based on cognitive processes, problem solving, classification, comparison, development, etc.) [9;10;11].

Mobile learning technology includes a focused and ordered set and sequence of actions of a teacher and student through a joint or individual study of structured learning resources through work and educational communities.

Thus, based on the foregoing, we will present a map of knowledge of virtual mobility of students of distance learning (i.e., a structured interpretation of the concept under study, generalized in graphical and textual form).

The focus of this study is on the proposed virtual mobility technology for distance learning students, taking into account its transformation in open distance education. Changes made to the technology of virtual mobility of students are concentrated around the content of

virtual mobile learning, tools, methods and forms of the technological subsystem.

The proposed technology of virtual mobility of students includes a focused, ordered set and sequence of actions of the teacher and students of distance learning through a joint or individual study of structured learning resources, work in educational communities. In the process of virtual mobile learning, an indirect interaction between the teacher and students is carried out, information and communication technologies based on wireless access to learning resources are actively used, students are transitioning to self-education and self-realization.

The technology of mind maps contributes to the formation of:

- to fix difficulties in their own activities, to search for the necessary information.

- compare, analyze, draw conclusions, formulate one's opinion and position, coordinate various positions in cooperation.

- generalize concepts - to carry out a logical operation of transition from specific features to a generic concept, from a concept with a smaller volume to a concept with a large volume

- build logical reasoning

- structure texts, including the ability to highlight the main and secondary, the main idea of the text, build a sequence of events described;

- create mind maps.

To support the cognitive activity of students and the evaluation activity of the teacher V.E. Steinberg suggested using multidimensional didactic tools that allow present various logical connections between the elements of knowledge, condense and collapse information, "move from non-algorithmic operations to algorithm-like structures of thinking and activity." The advantages of the proposed tools include the fact that they are based on the patterns of thinking and representation of knowledge and "serve to adequate explication and representation knowledge, operating with them, giving them materialized nature, programming and control of their processing and assimilation. Multidimensionality is considered as a special property of the visual display of knowledge, realized by combining the significant properties of the object or phenomenon under study, on the one hand, and, on the other hand, is consistent with the morphological features of the human brain. Multidimensional didactic tools are "universal figurative-conceptual models for multidimensional representation and analysis of knowledge in natural language in external and internal plans for educational activities.

Mind maps can be used to create and use such tools for the purpose of teaching and assessing students' knowledge at the subject content level. mind map is a representation of information in a graphical form, reflecting the relationships (semantic, associative, causal and others) between concepts, parts of the studied subject area. Representation of knowledge using mind maps allows you to move from the linear structures of educational material with their characteristic small portions, the study of which is spaced in time and space and hinders the development of a systemic representation and analysis of knowledge, to compaction and enlargement of the content of educational material, the presentation of its relationships using multidimensional nonlinear structures.

The possibilities of using the method of mind maps in the educational process are considered in numerous works. Mind maps are used to solve various problems: structuring educational material, creating flexible personal information educational environments, developing block-module training programs. At the same time, the problem of assessing the knowledge that is being formed in students with the help of mind maps in the practical activities of a teacher, teacher has not been fully resolved. The reason lies, on the one hand, in the complexity of the object of assessment itself, formed by students during the assimilation of the knowledge system. On the other hand, the models and methods for assessing knowledge using mind maps proposed by various authors are either quite complex and require specialized computer programs, which is currently inaccessible to most teachers,

or simple methods are proposed that use a visual assessment of the structure and content of a mind map without using formalized procedures, which does not allow to use the full potential of this tool. The paper proposes to consider the mind map as a means of assessing the quality of students' knowledge from the standpoint of the structural-informational approach. This approach, in our opinion, allows, on the one hand, to formalize the procedure for assessing the structure and information content of the mind map, on the other hand, to correlate (compare) the structural and informational characteristics of individual mind maps and the "reference" map and meaningfully interpret the results of their mismatch.

The knowledge map concentrates information on the technology of modeling virtual mobility of students and is presented in accordance with Fig. 1.
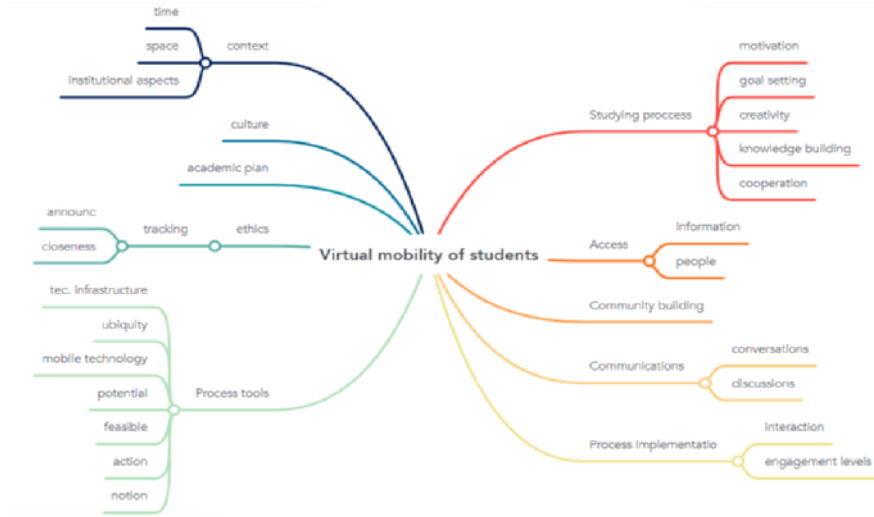

Fig. 1. Map of knowledge of virtual mobility of students.

A.M. Sohor, author of the work "The logical structure of educational material. Issues of didactic analysis" [12], proposes to consider educational material from two sides inextricably linked in the educational process – psychological and logical. The psychological side reflects the motivation of learning, the degree of independence of the student in educational activities, the personal meaning and value of the material being studied. On the other hand, for the formation of a knowledge system in students that meets the requirements of the program of the academic discipline, the sequence of presentation of the educational material, the presentation of the interconnections of its elements, its logical structure is important. The concept of "educational material" is interpreted as "a structural whole, determined, first of all, by the connections between the logical elements included in this material" [12; 13]. Thus, "the content of the educational material is characterized, first of all, by a certain system of internal links between the concepts included in a given segment of the material, that is, the local structure of the educational material". The main elements of the educational material include concepts and judgments. Between concepts and judgments, from the point of view of logic, there can be relations of subordination or relations of equivalence. The term "logical structure of educational material", introduced by A. M. Sohor, is conditional and denotes a wider range of connections and relationships between concepts and judgments and is not limited to formal logical connections and relationships. In the structure of the educational material, elements (concepts and judgments) and the links between them are distinguished, which makes it possible to analyze such structures from both qualitative and quantitative sides. A mind map with a hierarchical tree structure allows you to display the logical structure of educational material at different levels with varying degrees of detail and completeness -

from the local level to the global one. The structural elements of the mind map correspond to the elements and connections of the educational material. The language of graphs can be used to model and analyze the logical structure of educational material, presented in the form of a mind map.

3 Conclusion

Thus, the technology of virtual mobility of students of distance learning is aimed at integrating the educational, scientific and managerial activities of the educational institution for the preparation of competitive specialists who are proficient in the main specialty based on modern information and communication technologies. The development of mobile learning tools provides an opportunity to take a fresh look at the technologies for the implementation virtual mobility of students of distance learning.

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