



INDIVIDUALISED PATHS OF MASTERING AN ELECTRONIC COURSE CONTENT

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Abstract: *The purpose of the article is to describe and analyse a practical experience in creating and testing an electronic course for first-year bachelor students with the possibility of designing individual educational paths. The article presents a model of the electronic course, provides a detailed description, and formulates the features of its practical implementation. The course is based on the idea of variability, in particular the use of diversified tasks. Experimental work showed that the learners' biggest difficulties were related to the tasks of analysing and extracting information from authentic, non-adapted sources. However, these tasks are associated with the important competencies of the 21st century. As a result, a general algorithm for designing an individual educational path for a student in the framework of an electronic course is described; several options for individualised content acquisition are highlighted.*

Keywords: individual educational path, individualisation, electronic course, learner, competencies, network communication, educational opportunities.

INTRODUCTION

In the conditions of an open, universally accessible information, the abilities to formulate search queries and quickly extract the necessary knowledge become a priority. For that, it is necessary to acquire generalised search strategies and determine the effective ways in which to implement them: correct information requests, focused communication, interactions, and reflection. Among key competencies which are reflected in the recent research and existing educational and professional standards, several should be particularly highlighted (Lin, Shadieva, Hwang and Shen, 2020; Silber-Varod, Eshet-Alkalai, and Geri, 2020). These competencies are reflected as fundamental in the majority of competency frameworks for citizens in general as well as for representatives of specific professions (for example, teachers). In the Europass in-

initiative, we see a category of “information processing”. In the Russian Federal State Educational Standards of “Pedagogical Education”, such ideas are presented in the corresponding category of “systemic and critical thinking”. In the Digital Competence Framework for Educators – DigCompEdu, the category of “digital resources” appears (Redecker, 2017). It is associated with identifying, assessing, and selecting digital resources for teaching and learning. The report “Future Work Skills 2020” presented a map of professional skills of the future (Future Work Skills 2020 Summary Map). The map also highlighted information competences – transdisciplinarity, project thinking, literacy in the new media environment, cognitive loading management, intercultural competence, virtual collaboration, computational thinking, innovative adaptive thinking, and social intelligence. In the study “Competence Foresight 2030” (Skolkovo), a list of transprofessional skills and abilities was presented (Atlas of Emerging Jobs, 2015). This list contains competences of an informational nature – systemic thinking, programming of IT solutions, project management, and readiness to work in the mode of high uncertainty and a quick change of conditions. The formation of competency maps for specific areas of training and profession (educational and career paths), which should become a model for students in compiling their educational paths, becomes relevant. As an output, individualised educational products are offered that meet the needs of students and employers (Chirtsov, Sychov, and Mylnikov, 2017).

The purpose of this paper is to describe and analyse the practical experience of designing an electronic course for first-year bachelor students in an attempt to implement the ideas of individualised educational paths, the variability of tasks, information redundancy, project-based learning, and reflection.

1. AN INDIVIDUALISED WAY OF MASTERING AN ELECTRONIC COURSE CONTENT

1.1. Individualisation as an educational trend

Among current educational trends, the student-centered educational process, with the conditions for the individual development, educational choice, personal interests, and needs, is increasingly emphasised. The key idea in this context is the individualisation of learning. “Individualisation of learning is the organisation of educational conditions for the maximum realisation of the learner’s subjective position in the learning process, that is, his awareness of the goals and objectives of learning, the possibility of choosing educational material, forms and methods of solving educational problems” (Samsonova, 2014, 182). “Individualisation of training is carried out by selecting content that can be adjusted, synthesised into individual programmes and elective academic disciplines, as well as by the development of students’ research activities” (Yurlovskaya, 2014, 109). “An individualised organisation of training is a different content of academic work and different (if necessary) ways of presenting it (differentiation), as well as a different pace of academic work, which are used for different students taking into account their individual characteristics” (Uvarov, Van and Kahn, 2019, 87).

As a rule, teachers are responsible for the individualisation of learning, they organise the learning process, take into account the individual characteristics and needs of students, and create optimal conditions for revealing the potential of each learner (Konnova et al, 2019; Cleynen, Santa-Maria, Magdowski and Thevenin, 2020). The individualised learning preferences of a student can be reflected in the preferred formats of knowledge assessment and types of mastery materials (Simonova and Poulouva, 2015). One of the options for the individualisation of learning is an individual educational path. This term has a broad meaning; however, it is most often defined as a purposefully designed differentiated educational programme that provides students with choice, development, where teachers provide pedagogical support for self-determination and self-realisation (Tryapitsyna, 2002). An individual educational path is a sequence of mastering the components of the educational content selected for a particular student (Fedotova, Valeeva, and Ahmetzyanova, 2014). When designing an individual educational path, the student is allowed to choose the content of training, its forms and methods, and types of educational activities (Kurilovas, 2019).

1.2. Features of an electronic course for individualised learning

In the study, we hypothesise that the design of individualised paths of mastering an electronic course content will support an active cognitive position of students and contribute to the development of competencies demanded by modern society (ICT competences and generalised information strategies – search, extraction, and re-coding; learning autonomy, initiative, self-organisation, increased attention to research and creative activities, self-development and reflection). The focus of attention within the designed course is to ensure that students analyse their educational needs and requirements, independently determine the goals of their educational activities, and learn to consciously and responsibly approach the solution of educational problems. The main objective of the experimental work was to develop and test a new model of the electronic course “Information Culture of a Personality”. This course is implemented as part of the educational programme “Pedagogical education”, profile “Computer science and information technology in education” for the first-year bachelor students of the Herzen University. The course involved 9 lectures and 17 practical classes. The methodological basis was the interdisciplinary connection of pedagogy, psychology, computer science, and sociology. The course was based on the idea of variability, in particular the use of variative tasks. As a part of the practical work, in each class, students were offered a matrix of tasks (Table 1).

All three tasks had to be completed. In-class assignments are tasks that a student selects and performs during a practical class. Invariant and variative assignments are tasks that a student selects and performs as part of the autonomous work on the course. Each student could choose the level of difficulty for each task – basic, intermediate, or advanced. Invariant tasks differed among themselves only in terms of complexity (all had a common idea). Variative tasks differed in the degree of complexity, in the form of presentation, and in the mode of assessment. These were mostly tasks that complemented, expanded knowledge and ideas of students, on a particular topic of the course; they allowed going beyond the educational programme.

Table 1

Matrix of tasks for one practical class (example)

Levels of tasks	In-class assignment	Autonomous work		
		Invariant assignment	Variative assignment	
<i>Basic</i>	List briefly how to search for information on the Internet.	Gather information on the topic of the study. Use various methods of information retrieval on the Internet.	Discover the importance of information literacy for the modern man. Give examples.	In the thesis form.
				In the graphical form (using ICT tools).
<i>Intermediate</i>	Perform a comparative analysis of methods to search for information on the Internet.	Gather information on the topic of the study. Using different methods of information retrieval on the Internet, select different types of resources: text, multimedia.	Gather information resources on the topic of “media literacy” and discover the importance of media literacy for a modern person. Give examples.	In the thesis form.
				In the graphical form (using ICT tools).
<i>Advanced</i>	Suggest an algorithm for efficient information retrieval on the Internet. Specify the resources that you used.	Gather information on the topic of the study. Using different methods of information retrieval on the Internet, select different types of resources: text, multimedia.	Formulate detailed recommendations for working with information search results. How to evaluate, save, and use the information found?	In-text form.
				In the graphical form (using ICT tools).

Source: Own work

For the entire course, students were offered 153 (17×9) tasks. Each student selected and completed 51 (17×3) tasks for the course. Choosing the level of difficulty of the task, students built their individual path to mastering the discipline. In this way, three “paths” could be built: yellow, blue, and green.

The “yellow path” is a way of mastering the discipline at the basic level. Tasks were offered here in the context of the subject matter being studied, they were directly related to the lecture material and were mostly reproductive, with elements of systematisation and generalisation; all tasks were within the requirements of the educational programme. “Step-by-step” activity algorithms, strict assessment criteria, and their detailed description, including work assessment parameters, are proposed. The “green path” is an intermediate level. Active tasks of the activity plan were proposed here, aimed at analysing the problem and synthesising, comparing and comparing phenom-

ena, completing tasks at this level required additional search and analysis, summarising the results. Descriptive methodological recommendations and general assessment criteria were offered. The “blue path” is an advanced level characterised by research and creative activity associated with a broad statement of personally significant goals and objectives, understanding the importance of self-knowledge and self-development. The assessment system is flexible (peer and self-management).

The identification of patterns and features of the individual educational paths construction by students made it possible to determine how students interact with the content of the course, how active they are. Besides, it helped to reveal the degree of initiative, critical thinking, and learning autonomy, together with the nature of mastering the course material (planned, organised or chaotic, uniform or uneven).

2. ANALYSIS OF THE EXPERIMENTAL WORK RESULTS

The experimental study comprised three stages: analytical, research, and interpretational.

At the first (analytical) stage, the results of a previous study devoted to students’ education activity strategies in the e-learning environment were explored (Noskova, Pavlova and Yakovleva, 2018). Diagnostic results helped to highlight three groups of learners, distinguished in terms of potential preferences when choosing tasks: students with low motivation, giving preference to the basic tasks, students with increased motivation, and students with a high level of motivation, ready to perform advanced assignments.

At the second stage of the study, on the basis of the previously obtained data analysis, the course materials were selected, a series of variable tasks was developed, and variations in the choice of forms methods and approaches for implementing educational activities were proposed. As a result, an electronic course “Information Culture of a Personality” was designed and implemented with individualised educational paths for students. In the electronic course, the conditions of the educational process were specially designed, allowing to adapt the content to the interests, characteristics, and needs of each student and to implement a personality-oriented learning approach. At the third stage of the experimental work, a study of a focus group (20 students) within the developed electronic course was conducted.

The analysis of students’ activity in the electronic course revealed several strategies for choosing tasks:

1. A constant selection of advanced tasks and their performance at a high level – highly motivated students with outstanding academic achievements within the educational programme (2 students);
2. A preferential selection of advanced tasks and their performance at a high level (2 students);
3. A variable selection of intermediate and advanced tasks and their implementation at the sufficient average level (13 students);
4. A constant selection of basic and intermediate tasks and their performance at the minimum passing score – low-motivated students with poor academic achievements within the educational programme (3 students).

The maximum number of points that a student could score for the entire course was 306 (18 points – a maximum for one topic 6×3 ; total – 17 topics). The lowest average score was obtained on the topic 9 – “Information resources in the life of a modern person” (8 points). The tasks within this topic were related to the search, analysis, and annotation of information resources: a bibliographic list of full-text articles, an annotated catalogue of scientific articles, and a digest of scientific publications. Difficulties in completing tasks of this type are not surprising for first-year bachelor students since they are at the initial stage of developing competencies in systemic and critical thinking and related skills in searching, analysing, and generalising information. The distribution of average scores for the remaining topics was fairly even, in the range from 13 to 15 points.

To study the relationships between successes in completing assignments on different topics of the course in more detail, the data were analysed in-depth: normalised indices for completing assignments for each student were calculated, and then correlations between them were established, and a cluster analysis was performed to further visualise the data. For this, the statistical package “Statistica” v. 12.0 (StatSoft. Inc., Tulsa, Oklahoma, USA) was used. The relationship between the survey questions was analysed with the Spearman’s rank correlation coefficient. All results were considered significant at $p < 0.05$.

It was found that tasks on all proposed topics could be grouped into 3 agglomerations. The first group includes tasks that are substantively related to the development of search and information analysis skills – this is the semantic core of this group. The variables combined at the closest distance are the “use of foreign-language information resources” and the “acquaintance and analysis of popular electronic libraries” ($r = 0.98$). This same thematic group is merged with the variables related to the results of the tasks “work with bibliographic lists and annotated catalogues”, “analysis of an open course on learning a foreign language”, “making links to information sources on a personal portfolio website”, “developing interactive elements of a web portfolio”, “creating of a web portfolio”. Thus, the tasks of the information (content or resource) block are included in this group.

The second group of tasks includes two subgroups. The core of the first subgroup is represented by variables related to the systematisation and visualisation of information. For example, such tasks as “visualisation – collage, infographics”, “development of online surveys and questionnaires” (these variables are merged at the closest distance, with a correlation coefficient $r = 0.98$), they are joined by the variables – tasks “formulating a system of questions for the project”, “work with mind maps”. The second subgroup is related to the interaction in the digital environment – “online discussion”, “presentation of the project results – digital tools and an oral presentation” ($r = 0.94$), “joint activities in the network”. Thus, the tasks of the communication block are included in this group.

The third group is the presentation of the process and the result of project activities. The results of the tasks “annotating the project”, “creating a motivational booklet on the topic of the project” ($r = 0.89$), “final presentation of the project” are most closely related. Thus, the tasks of the management block are included in this group.

At the end of the course, students were offered a reflective questionnaire. In general, all students noted the benefit of the studied course. In particular, the mastered digital tools for working with information would be required by them in their further educational activities, as well as in their future profession. The greatest value of the course for students was the choice of the complexity of the tasks, the possibility of self-expression in the process of performing an individual project, and group work. At the same time, students saw difficulties in a variety of tasks. Half of the students tried to cope with the difficulties on their own, and the second half preferred alternately to seek help from a teacher and peers.

Depending on the individual educational paths of students, there are several options for individualised mastering the course content:

- For motivated “successful learners”, personal paths are associated with the choice of complex tasks aimed at active research and creative activity. This option of mastering the course particularly contributes to the development of such competencies as innovative thinking and creativity;
- For “average learners”, with reduced working capacity and insufficient willingness to work independently and proactively, with weakly expressed motives and activity goals, personal paths mostly start with the basic level of tasks and might gradually move forward to the intermediate and advanced tasks. This option of mastering the discipline particularly contributes to the development of reflection and self-development.
- For “weak learners”, lagging, unmotivated students personal paths reflect the minimal sufficient level of mastering the content. This option of mastering the discipline particularly contributes to the development of basic information strategies and self-management.

CONCLUSION

The study presented in the paper showed that at the initial stage of university education students were insufficiently ready to choose individualised educational paths; they perceived these features of learning as an additional challenge. Variability and redundancy of tasks caused them difficulties. Particularly, tasks related to working with authentic (non-adapted) sources of information were complicated. This area is important, so it should be given extra attention while working with students. At the same time, didactically untransformed information occupies the largest part of the information sources in the life of a modern person. Competencies related to productive informational behaviour in the digital environment are important competencies of the 21st century. Obviously, for the development of these new professional competencies, it is necessary to facilitate students’ productive actions in the digital environment. It is necessary to expand the goals and objectives of educational activities, create conditions of information redundancy and variety of communication links, provide remote access to complex (scientific) educational materials, and stimulate independent instrumental and intellectual transformation of information. Future research directions are associated with the learning analytics methods implementation

for a more detailed identification of students' individualised paths of mastering an electronic course content.

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