Analysis of the Project Activity of University Students Using Digital Footprint Technology

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Abstract: Federal state educational standards of higher education presuppose a qualitative change in the organization of education in all its types and forms, including in the conditions of an electronic information and educational environment. They also reflect the recommendations of quality assurance of higher education, achieving the effectiveness and quality of education is the most important task of any educational institution. The purpose of the article is to determine the possibilities of using a digital footprint when evaluating students' project activities. In addition to standard methods of assessing the quality of training, we used methods of educational data engineering, which are aimed at measuring, collecting, analyzing and presenting data about students and contexts using their digital footprint in order to understand and optimize learning and the environment in which it occurs, determining the role of the student in teamwork, his contribution, usefulness, functional, etc. Using the digital footprint of the student as an assessment method allows you to differentiate the marks of students depending on the volume and quality of the work performed on the project.

1 INTRODUCTION

Federal state educational standards of higher education presuppose a qualitative change in the organization of education in all its types and forms, including in the conditions of an electronic information and educational environment.

2 MANUSCRIPT PREPARATION

The Federal State Education Standards of Higher Education also reflect international trends in the development of higher education, established by the Standards and Guidelines for Quality Assurance in the European Higher Education Area ESG, which are adopted by the European Association for Quality Assurance in Higher Education ENQA. ESGs relate to the entire field of higher education implemented in the European area, regardless of the type of training, place or method.

2.1 Project Preparation of Students

According to this document, quality is understood as the result of interaction between teachers, students and the educational environment of the university. At the same time, the quality assurance should provide an educational environment in which the content of programs, opportunities and means will meet the necessary educational goals. In the context of ENQA, the quality system at the university is a combination of three subsystems: quality assurance, quality monitoring and quality management.

In particular, in relation to the subject area we study, the quality of students' project preparation is understood by us as a certain level of achievement of the goals of project activity and the degree of compliance of the process and result of students' project preparation with personal expectations and demands of society in accordance with such indicators as the formation of internal motivation to receive and use educational information (including the means and technologies of its presentation); the

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volume, completeness and consistency of knowledge in the field of project activities, skills and abilities; the ability of students to independently search and process information necessary for the implementation of the project .

The process of implementing project activities by students is aimed at forming their project competence and is the result of mastering the basic educational program and is considered by us through a set of components:

- knowledge – characterizes direct knowledge and understanding of theoretical and practical material, which can be expressed through the following concept of "know" – the ability to reproduce and explain educational material with the required degree of scientific accuracy and completeness;
- value – determines the value orientations of the student, his motivation to solve professional tasks;
- activity – characterizes the ability to apply the acquired knowledge to a specific situation by means of "be able" – the ability to solve typical tasks based on the reproduction of standard algorithms; "own" – the ability to solve complicated, non-standard tasks based on the totality of acquired knowledge and skills.

2.2 Measuring Learning Outcomes Taking into Account Different Approaches

Undoubtedly, the most important aspect of assessing the quality of training is the choice of assessment methods for measuring learning outcomes at various stages, taking into account competence, taxonomic and qualimetric approaches.

The competence approach is based on the multidimensional and multistructural characteristics of the quality of training of students, focused on the level of formation of competencies defined in the Federal State Educational Standard of Higher Education. Evaluation of learning outcomes in terms of competencies determines what a student should know, be able to understand and own upon completion of training, for which special funds of evaluation funds are created. For a more complete picture, a full-fledged competence passport is being developed, consisting of a list of competencies that must be formed during training from the first year to graduation. At the same time, in order to increase the effectiveness of training, it is necessary to establish the achievements of the student at each stage, monitor the level of formation of his competencies, collect data and analyze at quantitative and qualitative levels (Bloom, 1967).

The next approach, which must be taken into account along with the competence – taxonomic approach, allows you to determine the levels of educational goals and learning outcomes, and structure a system of assessment tasks. For all taxonomic descriptions that determine the effectiveness and quality of training, a gradual complication of the cognitive activity of students is characteristic. For example, B. Bloom (Kosinski, Stillwell, Graepel, 2013) describes the levels of learning or sequential cognitive categories and the degree of assimilation of information.

Yu.G. Tatur (Fomin, 2013), developing the ideas of the taxonomic approach, offers a methodology for assessing the level of competence formation, consisting of three components: gnostic (characterizing the quality of knowledge as the basis of competence); functional (identifying and defining skills); value-ethical (determining the attitude to activity). Technology of implementation of the methodology of Yu.G. Tatur includes: 1) the choice of the competence to be evaluated; 2) the development of tasks corresponding to the levels of gnostic or functional components; 3) the procedure for completing tasks; 4) determining the level of formation of each component of competence according to the descriptions in the taxonomic tables given by the author; 5) determining the total score according to a special table characterizing the level of formation of the student's competence.

The qualimetric approach is aimed at increasing the objectivity of assessing the level of knowledge of students, allows for statistical analysis of the results achieved and adjusting the learning process (Mantulenko, 2020). In accordance with it, the organization of assessment is based on the methodology of qualimetry (the direction associated with the quantitative description of the quality of subjects or processes); where the goals and results of training (including the level of competence formation) are presented in measurable values. Each indicator characterizing the level of competence formation is given a numerical value. The results are measured by points, scaled and analyzed by means of statistical and mathematical analysis.

3 DIGITAL FOOTPRINT IN EDUCATION

In addition to standard methods of assessing the quality of training, we used methods of educational data engineering, which are aimed at measuring, collecting, analyzing and presenting data about students and contexts using their digital footprint in order to understand and optimize learning and the environment in which it occurs, determining the role of the student in teamwork, his contribution, usefulness, functional, etc.

In the field of education, a digital footprint is a student's digital work, notes that he leaves in his digital profile, the results of online courses, etc. (SHamsutdinova, 2020). They are completely based on Internet technologies: thanks to the digital footprint of messengers, it is possible to determine activity in chats, groups, project channels, to obtain statistical information about communications within the project team; the digital footprint of video conferencing services provides information about user inputs and outputs, chat activity, etc.; the digital footprint of services for collaboration on documents stores information about document edits, time spent on this process, etc.; the digital footprint of services for organizing collaboration on a project allows you to view information about tasks, their status, deadlines and those responsible for their implementation, data on task completion confirmation, comments left on tasks, etc.

There are two main types of digital footprints: passive and active. A passive digital footprint is data collected without the owner's knowledge. The passive digital footprint is also called exhaust data (Madden, Fox, Smith, Vitak, 2007). An active digital footprint appears when a user intentionally publishes their personal data in order to tell about themselves on websites and social media. The user may leave information intentionally or unknowingly; interested parties passively or actively collect this information. Depending on the amount of this information, you can effortlessly collect a lot of data about the user using simple search engines.

Social networks record user actions. This allows you to study the interests, social groups, behavior and location of users. Many social networks, such as Facebook, collect a large amount of information that can be used to recreate a user's identity. For example, knowing the number of friends on a social network, you can predict whether he is an extrovert or an introvert. A digital footprint can be used without the knowledge of its owner to find out his demographic characteristics, religious and political views, character and mental abilities (Toktarova, Semenova, 2020). Digital prints made up of publications and comments on social networks give an idea of the interlocutor on the other side of the screen and make communication on the Internet safer.

The pedagogical approach is based on the fact that the communicative interaction of network users with each other or with information bases implies the exchange of knowledge. The usefulness, neutrality or harmfulness of information from the point of view of intellectual, cultural, moral development of a person is analyzed.

In the field of education, a digital footprint is a student's written work, notes, tests, online courses, photographs, etc. Modern technologies allow you to recognize faces, voice, translate speech into text and vice versa – and all this in a matter of seconds. Based on the analysis and special processing of this trace, we can give some advice to students, guide them and make professional training more individually oriented. The digital footprint can allow educational institutions to better understand the behavior of students, provide them with the necessary assistance, and provide mentoring in the direction of discovering and developing the abilities of the student audience.

One of the directions of using the digital footprint in the organization of the educational process is educational analytics ("learning analytics" or "education based on big data") – it is the fixation, processing and analysis of the digital footprint in order to understand and optimize the educational process and the educational environment (Semenova, Toktarova, 2020). It is used to create individual educational trajectories, improve teaching and learning at the university, and improve educational outcomes.

4 DIGITAL FOOTPRINT COMPONENTS

It is possible to distinguish such components of the digital footprint as:

- the technical and technological component – a reflection of human activity on the Internet and other digital space from the point of view of the use of fixation technologies: log files, IP addresses, access point identifiers, addresses of requested web pages, entered biometric data, parameters of information exchange protocols, etc.;
- the personal-psychological component – a reflection of a person's social profile and his personal virtual world in the media space – social media accounts, posts, photos, comments, reposts, likes, etc.;

- behavioral component – actions that a person takes based on a system of ideas about himself, his social attitudes towards himself and others (for example, queries in search engines, ordered electronic services, views and orders in online stores, registration of accounts in online games, geometrics and geolocation data about movements, etc.);
- activity component – includes data on digital media (files) with actual results of activities or their confirmation (products of activities, artifacts, electronic portfolio), for example, reports on completed works, computer presentations, projects, computer models, including developed program code, designed databases, video results, photos, audio recording of activities, test protocols, etc.;
- a competence component reflecting the level of availability of a set of knowledge and skills that contribute to understanding the essence and specifics of professional activity (for example, grades received for assignments, reports and reviews of completed work, fixing feedback from the course teacher, electronic certificates, diplomas, certificates of achievement);
- a communicative component associated with the communication system in the educational and professional environment (messages from forums, open chats, general mail, bulletin boards, etc.);
- the reflexive component is reflection, introspection of the results of educational and professional activities as an assessment by a person of himself, his capabilities, qualities and place among other people. Examples of presentation are the results of questionnaire surveys, sociological studies, etc. (Girardin, Calabrese, Fiore, Ratti, Blat, 2008).

5 CONCLUSIONS

The organization of digital footprint collection was carried out by us using the LMS Moodle platform. The digital footprint is fixed with mandatory binding to the student's ID, the time of fixing the digital footprint, as well as to a specific educational activity. The educational and methodological data necessarily contain a description of the event, the marking of its educational results and the associated digital footprint for all students (individual or group). The integrity of the digital footprint (the presence of a digital footprint for all students/ all elements of the lesson), the consistency of the structure of the lesson and educational results/facts of activity, the presence of additional data types affects the quality metrics of the digital footprint for both the lesson and the students.

The task that opens up the possibility of using a digital footprint is to learn how to fix the connection between a specific act of learning (in all its complexity, taking into account the entire context in which it occurred) and the result of learning for the student.

In order for the interpretation of the digital footprint to become possible, it was necessary to build a procedure for fixing it directly in the educational process. More than 250 students of the Mari State University took part in the study, the digital footprint was collected as part of the course "Fundamentals of Project Activity".

Like many similar resources, the system allows you to view a list of course users and the date of their last login. The system collects as a digital trace the number of attempts and the time spent on studying the educational material, and also records whether the study of the material is completed or not (Fig. 1). When forming the work program of the discipline, this information will help to determine the complexity of the material and adjust the time allotted for studying a particular topic. The digital footprint of accessing the course elements (forum, chat, etc.) as a whole is also recorded.

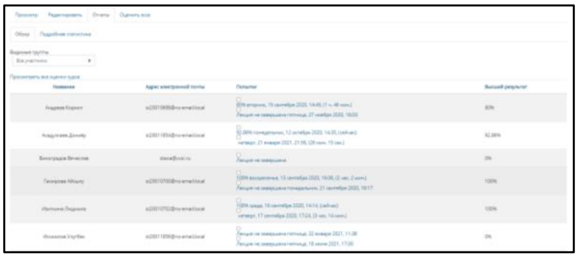

Figure 1: A list of students with the results of reading lecture material.

One of the most significant digital traces left by students in the system are the traces extracted from the passage of competency assessment activities. Thanks to this information, we can determine whether the test questions are composed correctly. If students give an incorrect answer to a question in most cases, then it may be worth reviewing its wording or the theoretical material on which the test is based. And on the other hand, if more than 90% of students give correct answers to the test, then perhaps the questions in it are too trivial (Fig. 2).

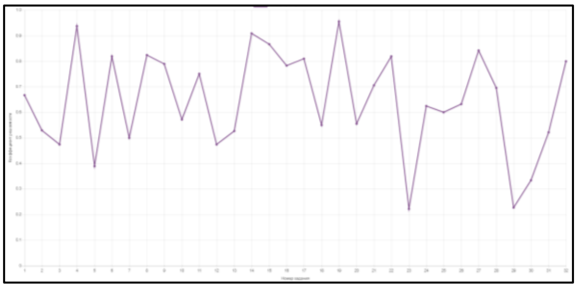

Figure 2: Solvability of test questions in test No. 3 of the course.

You can also view digital traces of students based on the results of practical work (Fig. 3).

Figure 3: Summary table of the results of the practical task.

Digital traces of students left by them in the process of communicative activity can also be consolidated and investigated (Fig. 4)

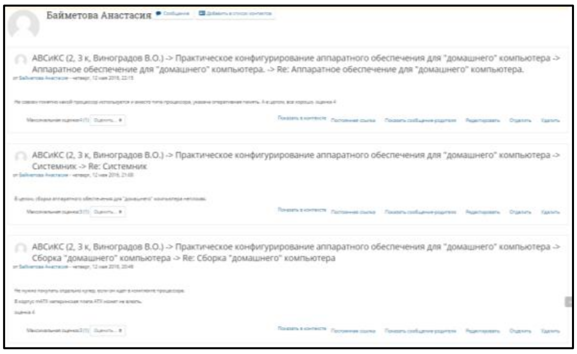

Figure 4: A report on a single student about the messages in the course forum.

As part of the project work, the students' activities do not end with work in LMS Moodle. They also work on the project during extracurricular time as part of a joint activity. In the process of this work, they use a large number of Internet services, in which they also leave their digital traces.

Many Internet services for collaboration are implemented by Google. Working in a team or a mini-group of authorized users in Google Docs, you can view exactly what a particular user has posted in this document. In addition, even the time when the changes occurred is displayed.

Another possibility of Google Docs is to leave comments and edits to the owner of the document, which are displayed to the rest of the students in a separate dialog box. There is a chat for students to discuss any issues, in real time you can see what a team member is doing, ask for help or help yourself with advice.

With the help of a digital trace, we determined which student recorded what, issued, and which did nothing. In addition, it allowed us to see how students distribute responsibilities and communicate in mini-groups without the actual presence of a teacher and total control. Features of the evaluation of project work on the Google service using the analysis of the digital footprint of the student gives a more detailed analysis of both the project and the personality of the student who is in the project team.

6 CONCLUSIONS

Thus, achieving the effectiveness and quality of education is the most important task of any educational institution. At the same time, the evaluation of effectiveness should meet such universal principles as concreteness (a clear definition of the criteria and evaluation base of evaluation, approaches to its measurement); integrity (ensuring the full scope of requirements for learning outcomes); manufacturability (validity of methodological and technological means for obtaining evaluation information and performing the necessary calculations).

The use of digital footprint technology in evaluating students' project activities contributes to the expansion of opportunities for each person to implement personal development trajectories; provides conditions for the implementation of adaptive learning; offers a variety of options for the development of trainees, taking into account their personal qualities and educational results and requests; allows for constant monitoring of actions and the level of competence of students. And the use of big data and analytics in the field of project activities allows you to lay the foundations for effective teamwork and serve as the basis for a personalized curriculum.

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