MONITORING SYSTEM OF THE QUALITY OF FUTURE TEACHERS' TRAINING WITH HELP OF GOOGLE CLOUD SERVICES

Tetiana BONDARENKO, Associate Professor,
Iryna KHOTCHENKO, Associate Professor,
Ukrainian Engineering-Pedagogics Academy
Universytetska street, no 16, Kharkiv city, Ukraine, zip code; 61003
bondarenko_tc@uipa.edu.ua
irina.khotchenko@gmail.com
Olha AHIEIEVA, Director
Lubotyn Professional Lyceum of Railway Transport
Shevchenka street, no 130, Lubotyn city, Kharkiv region, Ukraine, zip code; 62433
lplztd@gmail.com

Abstract: *In this article offered the technology of using Google search engine cloud services to build a system for monitoring the quality of future teachers' training in sphere of higher education. The possibility of using the BYOD concept to test students' academic achievements is considered. The advantages of the proposed approach for monitoring the quality of future teachers' training in sphere of higher education are presented, in particular, it is noted that the use of Google search cloud services expands the scope of research in space and time, makes the monitoring procedure more flexible and systematic.*

Keywords: *monitoring of quality; future teachers' training; sphere of higher education; cloud services.*

Introduction

As evidenced by many years of experience, the achievement of required level of future teachers' training in the sphere of higher education is possible only under constant and systematic monitoring of all components that affect the quality of education. In this regard, monitoring can provide invaluable assistance in ensuring the quality of vocational training, as a process of continuous monitoring in order to form an information base that focuses on assessing status, development forecast and management of the object of monitoring.

Analysis of the peculiarities of future teachers' training (Protsenko, 2015) showed that the specifics teachers' training in higher education is characterized by extreme complexity and large amount of general and professional knowledge, duration of training and multilevel nature of training. To ensure the proper quality of future teachers' training in the sphere of higher education, it is necessary to coordinate many components.

Continuous improvement of information and communication technologies opens new ways to solve theoretical and especially practical issues of forming systems for monitoring the quality of training. In this regard, fundamentally new opportunities in the scale and depth of research appear with the introduction of cloud technologies to monitoring the quality of future teachers' training in the sphere higher education.

Analysis of recent research and publications

Monitoring is increasingly used in educational systems. Pedagogical aspects of the problem of conducting monitoring research and assessing the quality of education are presented in the works of Ukrainian and foreign scientists (Galitsin, 2000; Mayorov, 2005; Prikhodko, 2007; Bilyk, 2007; Ndungu, Beatrice W., 2015). Analysis of the experience of using information technology, for example, for monitoring and environmental protection shows a significant impact on the effectiveness of monitoring research. However, in the works of scientists in the field of education much less attention is paid to the technology of monitoring research, which provides the ability to obtain, process, analyze and disseminate a variety of information needed for effective management in educational institutions.

Scientist M. G. Farrel in his research describes the information technology for monitoring the quality of educational institutions and proposes an automated system for its implementation (Farell, 2009). Unfortunately, the usage of the latest information and communication technologies in monitoring research of the quality of education and, in particular, the usage of cloud technologies have left out of the attention teachers in the sphere of higher education.

The origin of the problem

At the beginning of the emergence of monitoring as a method of scientific study of phenomena and processes, to organize observations with purpose to predict possible scenario of further development, such as ecological systems in the future (observation of natural phenomena and weather forecasting) to establish a fact or compare with normative or desirable indicators.

The effectiveness of monitoring, as a process of continuous supervision in order to form an information base that focuses on assessing

the status, development forecast and management of the monitored object, largely depends on the technologies used to collect data. Continuous improvement of information and communication technologies opens new ways to solve theoretical and especially practical issues of forming systems for monitoring the quality of training.

As for monitoring the quality of future teachers' training, as mentioned above, it is multidimensional and distributed in space and time. To proceed the training we need tools that will allow to cover a large scope and ensure controllability of the process. Today, cloud technology fully meets such requirements.

The main idea of cloud technologies (access to cloud resources anywhere and anytime) covers as well as possible the needs of monitoring in the field of education, because work of collecting information (questionnaires, surveys, diagnostics, control, collaboration with documents, etc.), its storage, processing and provision to the subjects of monitoring can be effectively performed by using cloud services.

Cloud technology, as evidenced by real facts (Ray J. Rafaels, 2015), is a challenge of time. According to the research of well-known consulting company, almost 700 million companies in the world will use cloud technologies in the nearest future.

The purpose of the article is to describe the system of monitoring the quality of the quality of future teachers' training in sphere of higher education, which was developed at the Ukrainian Engineering–Pedagogics Academy (UEPA) based on the use of cloud services of the Google search engine.

Presentation of the main material and substantiation of the obtained results.

The structure of the system of monitoring the quality of future teachers' training in sphere of higher education, which was developed at UEPA, is presented at Figure 1.

Let's have a look at the main stages of operation of this system. The study of monitoring is presented in a number of stages. Each of the stages of monitoring research has its own tasks, which are often solved sequentially, and sometimes simultaneously. In scientific resources (Borovkova, 2004; Galitsin, 2000) is considered the possibility of carrying out monitoring researches in three stages. However, the most common approach to monitoring research consist of four stages: preparation for research; collection of information; processing of the received data; quantitative and qualitative analysis of information.

Figure 1. The structure of the monitoring system of quality of future teachers' training in sphere of higher education
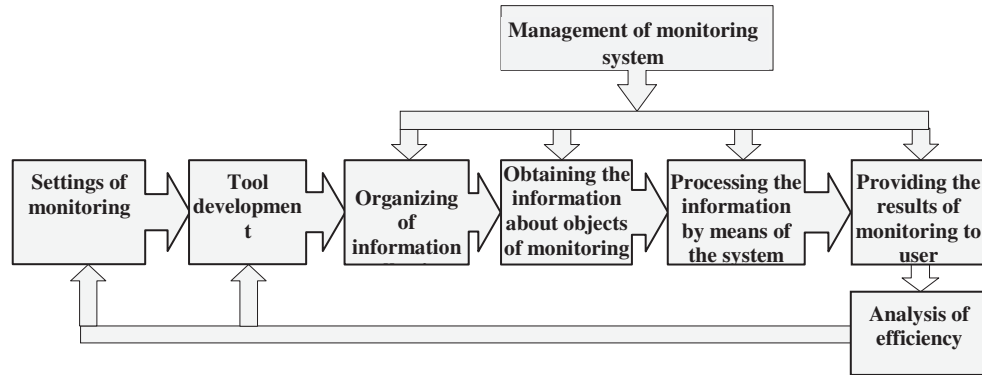
The organization and monitoring of the quality of future teachers' training in sphere of higher education, has specific features, which, as noted above, are related to the scale of research and technology of implementation. The proposed scheme of organization and conduct of monitoring research (Figure 1) has a number of specific features, which we will consider below.

First of all, due to the significant amount of work, the stage of preparation of the study should be divided into two stages: the actual stage of preparation and the stage of development of tools. Most researchers consider the initial stage of monitoring research as a stage of preparation, while tacitly assuming its one-time implementation (Galitsin, 2000).

In our opinion, this stage is more appropriate to describe as a stage of adjusting the parameters of research, which involves its periodic implementation based on the results of fixed periods of system operation. At this stage, the goals and objectives of research, areas of research and functions of the system, evaluation criteria and indicators, research methods, deadlines for submission of information, responsible performers are determined.

The allocation of tool development as a separate stage is explained by the fact that the usage of quality tools largely determines the success of monitoring research. The quality of the tools is a factor that is controlled during the research in a fairly wide range. During the monitoring of the quality of future teachers' training in sphere of higher education, the main methods of data collection are observation, survey, testing and the method of expert evaluations, the requirements for particular tool are formulated by taking into account the characteristics of a particular form of survey. At the same time, the general methodological requirements for the tools, such as validity, reliability, usability, compliance with target settings, correctness of

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statistical procedures, standardization, approbation, etc. (Mayorov, 2005), remain unchanged.

A system of visual monitoring of the quality of classes, which uses a method of data collection such as observation, is described in collection of articles "Problems of Engineering and Pedagogics Education" (Bondarenko, 2015).

It is important to study the data collection, testing, and expert's assessment technology using Google's cloud services.

In the process of developing the system, we have to consider the fact that monitoring is one of the ways to improve the efficiency and quality of the functioning of the educational institution. The monitoring system should assist in solving this problem, and should not create problems with collection, processing and analysis of information about the object of monitoring. The organizing of the monitoring system and the technologies that determine the process of its functioning directly affect its efficiency.

In this regard, in the process of developing the structure of the information collection system, to solve monitoring problems were chosen such technologies, which on the one hand, minimize financial and time costs, and on the other hand, ensure usability of the system and quality of its operation.

In our opinion, the best solution for the implementation of the phase of operation of the system (organizing of information collection, obtaining the information about objects of monitoring, processing the information by means of the system) and the phase of supporting of its application (management of monitoring system) is the use of Google cloud services. The following arguments can be used in order to support this choice: a comprehensive integrated solution to the problem of creating, operating and supporting the application of the monitoring system through the usage of various interconnected services of the Google search engine.

The system for visual monitoring of the quality of classes, which uses such data collection method as observation, is described in research work (Bondarenko, 2015). We will consider data collection, testing, and expert analysis technology using Google cloud services.

Upon development of the system, it should be kept in mind that monitoring is one of the ways to improve the efficiency and quality of the functioning of the educational institution. The monitoring system should assist in solving this task rather than create problems in collection, processing, and analysis of information about the object of monitoring. The organization of the monitoring system and the technologies that determine the process of its functioning directly affect its efficiency.

Therefore, when developing the structure of the information collection system, technologies were chosen to solve monitoring problems,

which on the one hand minimize financial and time costs, and on the other hand ensure the easy and high-quality operation.

We consider that the use of Google cloud service is the best solution for the implementation of the system operation stage (organization of information collection, obtaining information about objects of monitoring, processing of information by the system) and the stage of supporting its application (monitoring system management). This choice has the following advantages:

• a comprehensive integrated solution to the problem of creating, operating, and supporting the application of the monitoring system through the use of various interconnected services of Google search engine;

• all Google services allow to perform the necessary operations from any mobile device in any place where the Internet is accessible.

• additional benefits of Google include stability and ease of use of services. Google users work in the same familiar interface on any device in all operating systems and browsers. Google also supports offline mode. Gmail, Calendar, and Docs are accessible even without an Internet connection. Users can view, edit, and create content offline. All edits are synchronized upon re-connection to the Internet;

• an important advantage of Google is the free use of most services.

The authors of work (Bondarenko, 2015) consider that minimum hardware requirements, support for all operating systems and client programs used by students and educational institutions, work with services using any mobile device that supports Internet interaction are the major advantages of Google cloud services. In this term, all services meet the basic requirements of the international standard of software quality model ISO/IEC 9126: functionality, reliability, usability, efficiency, maintainability, portability (ISO/IEC 25010:2011).

Given that the main part of the information in the system of monitoring the quality of professional training of future teachers is collected in the form of questionnaires, test results, and interviews, it is advisable to use the DocsGoogle service form to solve problems of mailing, filling, and collecting completed documents. This form is a series of questions with different answers. Its construction includes entering a question, selecting, and determining the appropriate type of answer, saving the completed form in the results database in the Google Drive cloud storage.

You can place up to eight types of different questions in the form (one from the list, several from the list, etc.). The experience in the use of Google forms has shown that this set of question types is sufficient to create a variety of forms, questionnaires, and achievement tests for monitoring of training quality.

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To send the form to the respondent, use the option *Send this form by e-mail*. In the advanced settings, you can choose the *Embed* option, which provides the code for embedding the form in the site of the monitoring system. The *edit Confirmation* option allows you to enter a message that is issued to the user when the *Send* button is clicked. The publication of the *Summary of Answers* will give the respondent the opportunity to see the main results at the current time.

Monitoring data are stored and processed in the so-called cloud, which is, from the user's point of view, one large virtual server. A significant advantage of cloud storage for creating a monitoring system is the ability to share user access to files stored there. The data are stored on a remote network resource that can be accessed from any computer or mobile device connected to the Internet. This preserves the ability for access authorization and control over data editing or viewing. This allows the manager of the network monitoring system to distribute access rights among individual resources of the system and monitor the activities of system users. Let's consider the use of cloud services for each functional stage of the system.

At the stage of information processing by means of the monitoring system, the data are transferred to Google Spreadsheet after sending the form. The table appears in the DocsGoogle file manager; its name is taken from the name of the form plus the word "response". *Timestamp of each entry* column of each record is added to the table, which is also the "index" of the data set. By default, the information is sorted by this field, so we get a chronological list of all records. When processing data, the spreadsheet allows easy sorting information by any column without breaking the entries.

Using the *Show Summary of Answers* tool, we will get a tab with a chart for each question form. In addition, next to the diagram, the results will be presented in numbers and percentages. The table includes a set of functions (similar to an Excel table) for statistical data processing. If desired, the table can be exported for processing in MS Excel.

At the stage of presenting the monitoring results, shared user access to files stored on Google Drive is used for mailing monitoring results to respondents.
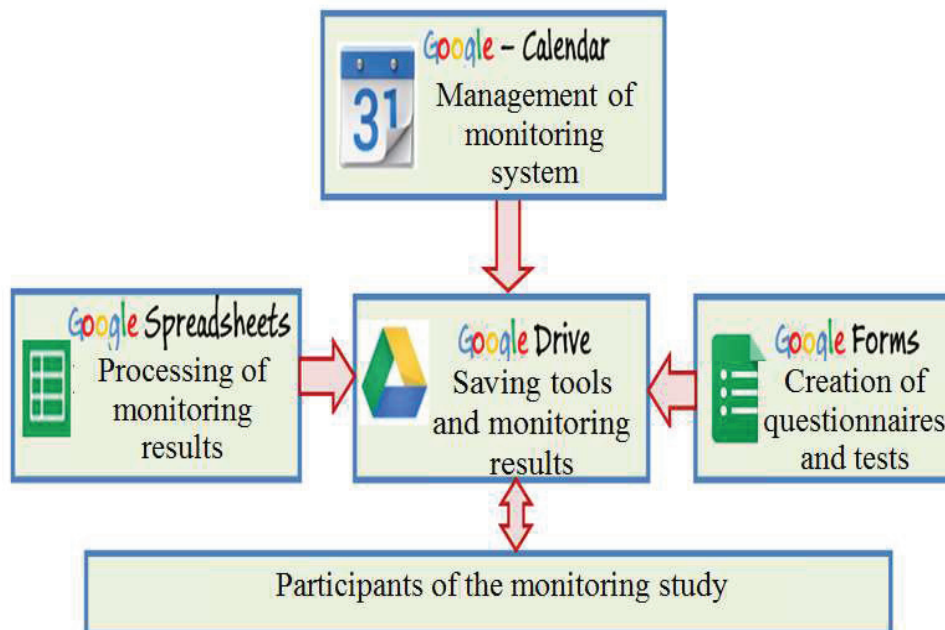
Another component of the monitoring system, which is critical in the effective operation of the system, is the management subsystem. Given that monitoring is *continuous* observation over the condition of the object, the management of the monitoring system is necessary for planning and coordination of all work related to monitoring.

The management subsystem of the monitoring system is organized using the Google Calendar cloud service. It helps to make the schedule of the works associated with the solution of monitoring problems. Using the calendar, you can send reminders about events via SMS and e-mail.

GoogleSites cloud service is used to combine all the considered elements into a single system. With its help you can organize chat rooms (discussion of monitoring results and related issues); place forms, questionnaires, and tests for collection of information; organize joint work on data collection and processing; keep records of filling the information base of the monitoring system, conduct online surveys and online questionnaires, set time for an online discussion of monitoring results.

Figure 2 shows the cloud services of the Google search engine in the structure of the system of monitoring the quality of future teachers' training in the sphere of higher education.

Figure 2. Cloud services of the Google search engine in the structure of the system for monitoring the quality of professional training of future university teachers

Another option for using Google search cloud services in the structure of the monitoring system is computer testing of students' academic achievements based on BYOD (Bring Your Own Device) concept (Heshmaty, 2016) using the own mobile devices of the participants of the monitoring study.

The process of testing academic achievements based on Google search engine services using the BYOD concept includes the following steps:
• taking tests;
• development of a test in the form of a Google form;
• registration of test participants;

- creating a Google Calendar with test management events and providing test participants with access to the created calendar;
- connection of mobile devices of test participants to the created Google-Calendar;
- passing the test by participants;
- processing of test results in the Google spreadsheets.

The development of the test in the form of a Google form allows using eight possible types of questions that provide verification of knowledge of almost all learned material.

If you have a significant number of tests in the discipline, it is convenient to manage test events using the Google Calendar cloud service. You can use Google Calendar on your computer, phone, or tablet. All new events and changes are automatically synchronized in all versions of Google Calendar. Reminders are sent by email or SMS.

The received link on the mobile device opens the created form and the test participant consistently answers the test questions contained in it. After filling out the form, the student saves the test result in the cloud storage in a Google spreadsheet by clicking the *Send* button. The answers received through the form can be viewed in four ways:

- in the form of summary;
- in the form of answers from individual users;
- in table form;
- in CSV-file (in English: Comma – Separated Values – values separated by commas) – a text format designed to represent tabular data.

Only if the proposed cloud technologies are used, monitoring study of the quality of professional training of future university teachers allows covering vocational education institutions, secondary education institutions as well as higher education institutions. These technologies allow sending questionnaires of experts to participants of the monitoring study, holding various surveys, presentation of study results, etc.

Conclusion

Peculiarities of future teachers' training in sphere of higher education require the creation of a branched and well spreaded system of monitoring research. The experience of the Ukrainian of Engineering-Pedagogics Academy has shown that in solving this problem it is advisable to use cloud technologies to monitor the quality of future teachers' training in based on Google search engine services.

This approach in creating a system for monitoring the quality of future teachers' training in sphere of higher education has a number of advantages:

- first, it is a comprehensive support of the monitoring system from the moment of creation of appropriate survey forms and storage of results in the cloud storage till processing the results of monitoring and management of the system based on the usage of Google-Calendar;

- secondly, the ability to combine all the elements into a single system based on the usage of the GoogleSites cloud service; the use of the BYOD concept in the field of cloud technologies allows to remove the issue of providing research participants with computer equipment and to conduct expert surveys and testing of student's achievement at any time and in any place where an Internet connection is available;

- expanding the boundaries of research, involving different educational institutions and a significant number of experts based on the use of cloud technologies allows to improve the efficiency and quality of monitoring the level of training of future teachers' in sphere of higher education, monitoring with this approach becomes more flexible and systematic;

Another significant advantage of the proposed approach is the ability to create a budget monitoring system through the free usage of free of charge Google services.

Prospects for further research. In the future, it is planned to expand the list of Google search engine's cloud services for purpose of monitoring research of the quality of training of future teachers' in sphere of higher education. For example, it is planned to use the Google Meet service to conduct focus groups and discuss the results of monitoring research.

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