

The Development of Information Educational Environment

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Abstract—Within the framework of the research, the information-educational environment "Practice" has been developed: functional requirements have been identified, software and development tools have been selected, a database has been designed, a client-server web-application for its access has been implemented. The created information educational environment will effectively organize the process of students' practical training in terms of increasing the level of formation of the most important "XXI century skills": bachelors' ICT-competence, communicative reflection, critical thinking.

Keywords—*information-educational environment, professional practice, ICT-competence, communicative reflection, critical thinking, functional analysis, database, design, web-application*

I. INTRODUCTION

The rapid development of information and communication technologies (ICT) in all spheres of activities, including education, imposes new requirements on the organization of the educational process for the training of competitive, competent professionals possessing "XXI century skills". The "XXI century skills" include such important skills as critical thinking, communicative reflection, media literacy and others. A special role in improving the quality of the educational process of future specialists' training is attached to the design and development of information and educational environment (IEE) which is a prerequisite for the implementation of the new Federal State Education Standards of Higher Education (FSES HE 3++) taking into account professional standards recommended by the Ministry of Labor and Social Protection of the Russian Federation [1, 2].

II. PROBLEM STATEMENT

The information and educational environment is understood as an integrated development environment consisting of information and educational resources, software and telecommunications, pedagogical technologies, which provides unified technological tools for support and organization of educational process and scientific research and aimed at competence formation (reflexive, communicative, ICT etc.) of participants of the educational

process in solving cognitive and professional problems [3, 4, 5].

It should be noted that in terms of formation of students' reflexive abilities IEE might be considered as both immersive and reflexive educational environment [6, 7].

III. PURPOSE OF THE STUDY

One of the main practical components of qualified specialists' training process who will be able to work successfully in conditions of high level of automation and informatization of production is professional training practice. Therefore, the design and implementation of information and educational environment into the process of organizing and conducting professional training practice of technician bachelors is urgent.

IV. RESEARCH QUESTIONS

The basis for the development of any information system is the development of requirements. Based upon our own extensive experience in managing students' professional training practice, T.A. Lavina, A.A. Vysotsky, S.V. Zenkina, V.A. Yasvin's scientific research in the field of IEE, on the results of the authors' research in the field of technician bachelors' preparation in the aspect of formation of their reflective abilities [6], ICT-competence and the peculiarities and principles of the organization and conduct of professional training practice [8, 9] the requirements for IEE of professional training practice have been formulated:

1. Availability of the trainees' information support module to provide them with the necessary training materials (work programs, guidelines, funds of evaluation tools, manuals, presentations, forms of reporting documentation, samples of its design, etc.).

2. Availability of means of monitoring the implementation of the program of students' practice (the process of keeping a diary of practice).

3. Availability of means of maintenance, formation, coordination of documentation of practice (individual assignment, internship journal, the trainee's characteristic performance appraisal by an enterprise supervisor).

4. Availability of means of interaction between all the participants of the practice: the enterprise supervisor of the practice, the University supervisor of the practice, the trainee

(coordination of documents, communication via text messages).

5. Availability of diagnostic tools of the formation of trainees' ICT competence, reflective, communicative and analytical skills (communicative reflection) in the process of professional practical training. On the basis of the identified requirements and the analysis of the subject area, functional requirements for the system were developed for each user group - the University practice supervisor, the student and the enterprise practice supervisor. As a tool for their visual presentation, diagrams of user cases [10] are presented in Figures 1-3.

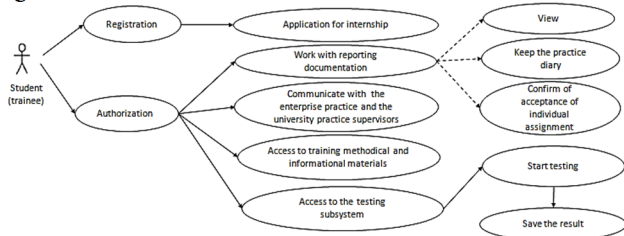


Fig. 1. The student user case diagram

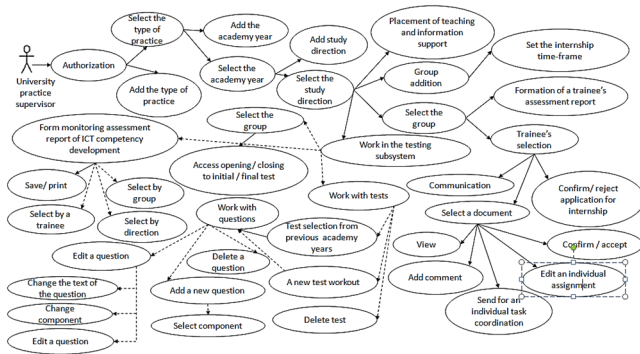


Fig. 2. The University Practice Supervisor user case diagram

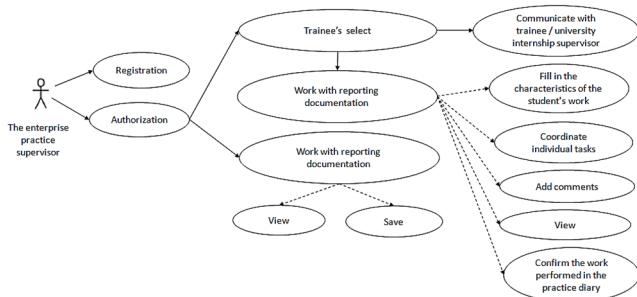


Fig. 3. The Enterprise Practice Supervisor user case diagram

V. METHODS OF RESEARCH AND RESULTS

To implement the identified requirements it is necessary to:

- design and implement a database (DB);
- develop a client-server web application.

A centralized repository of information is, in fact, the most important part of automating any process [11]. When creating a unified database, it becomes possible to automate routine work related to personal data of both students and faculty staff. As a means of implementing the designed database IEE "Practice" the scheme of which is shown in Fig. 4, database MySQL has been chosen.

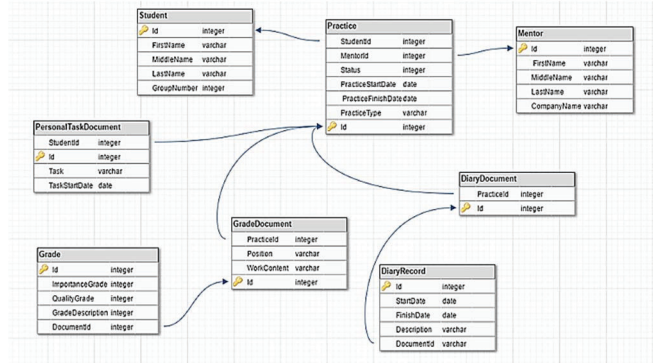


Fig. 4. The database schema

The developed web application of IEE "Practice" consists of:

- a client's part – graphical user's interface where interaction with IEE has been organized by means of hyperlinks, buttons and other controlling elements;
- the server part of the IEE is an application that processes HTTP requests and is an intermediate layer between the database and the graphical interface. It also contains the business logic of the application that generates documents, ensures data integrity, authorization and authentication of users of the system.

A cross-platform, highly productive environment ASP.NET Core with an open source code has been chosen as a software-tool environment for development of the web application as it is the most suitable for the implementation of tasks.

A new architectural solution to deploy the developed system on a remote server has been developed [12]. This architecture of automation of the continuous system of the deployment process allows reducing the impact of human errors and time.

Implemented with the help of these technologies IEE "Practice" meets all the above listed functional requirements, which allows organize the process of professional practical training effectively. Having registered in the IEE, each participant of the professional training practice – the University work practice supervisor, the enterprise practice supervisor and the student (trainee), are becoming members of a unified single system. The system consists of three main subsystems:

- control access subsystem;
- subsystem of organizing and holding practice;
- testing subsystem.

The control access subsystem has been designed for registration, authentication and authorization of three groups of users: the University training practice supervisor, the enterprise (practice base) practice supervisor and the student (trainee). Besides, this subsystem allows you to monitor the interrelationship of the subjects (participants) of professional training practice "enterprise practice supervisor (mentor) – the University practice supervisor – trainee": while registering (signing in) for the first time a student is obliged to apply for an internship indicating the supposed enterprise practice supervisor. Until the University practice supervisor checks the application neither the trainee nor the enterprise practice supervisor (in relation to this student) will not be able to take further actions (Fig. 5).

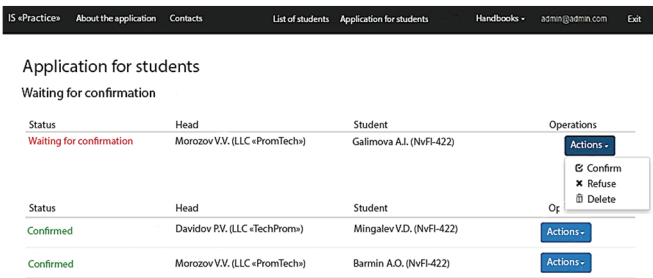


Fig. 5. The University practice supervisor's personal account. Window "Students applications"

The subsystem for organizing and managing the internship has been designed to automate the workflow related to the internship, remote monitoring the implementation of the work practice program, information support and interaction of practice participants in the process of its organizing and managing. The subsystem provides:

In the University practice supervisor's personal account:

- the possibility of placement of educational and information materials;
- the possibility of editing groups and trainees' education areas (deleting, modifying or adding new ones);
- work practice control – viewing the students-trainees list and their documents (Fig. 6);
- setup of a student-trainee's documents: the operations "add", "delete", "view", "save to disk", "add comment", "confirm (accept)" are available for all documents. As for individual tasks additional operations like "edit", "send for approval" are available; after confirming the document only the operations "view" and "save to disk" are available for all user groups;

– the possibility of obtaining a report on the trainees' performance assessment by the enterprise practice supervisors according to the academy group;

– the possibility of processing work practice documentation:

– the possibility of communication with work practice participants via messages.

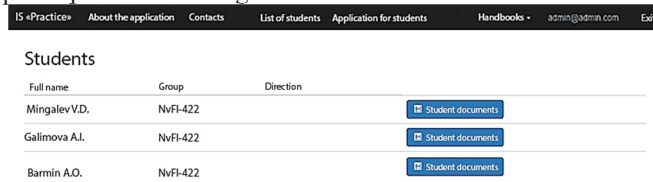


Fig. 6. The University practice supervisor's personal account. Window "Students documents"

In the trainee's personal account:

– the access provision to educational and methodological and other information materials including work practice programs, practice guidelines, assessment funds, report documentation forms and samples of their preparation;

– the possibility of processing the work practice report documentation: the confirmation of an individual task acceptance; overview and keeping a practice diary during the entire period of work practice, as well as the title page of the practice report; saving to a disk or download accompanying forms; overviewing the a trainee's performance assessment completed by the enterprise work practice supervisor;

– the possibility of communication with practice supervisors via messages.

- In the enterprise practice supervisor's personal account:
- the possibility of overviewing the list of trainees undergoing practical training at the enterprise and assigned to a certain supervisor, and their documents;
 - monitoring a trainee's internship – overview and confirmation of the performed work in the practice diary, as well as adding a comment if necessary;
 - editing, adding comments, an individual task coordination;
 - access to educational and methodical materials on work practice;
 - the possibility of communication with practice participants via messages;
 - filling in the characteristics – a trainee's performance assessment and self-assessment in the process of undergoing work experience.

The testing subsystem has been designed to automate the assessment of the level of development of the motivational and cognitive components of students' ICT competence, communicative, reflexive and analytical skills (in particular, communicative reflection) in the course of work practice.

The focus on learning outcomes, organization of assessment and self-assessment of results has been taken into account. The capabilities of the subsystem are shown in Fig. 7 in the notation of the business process modeling "Procedure" [10].

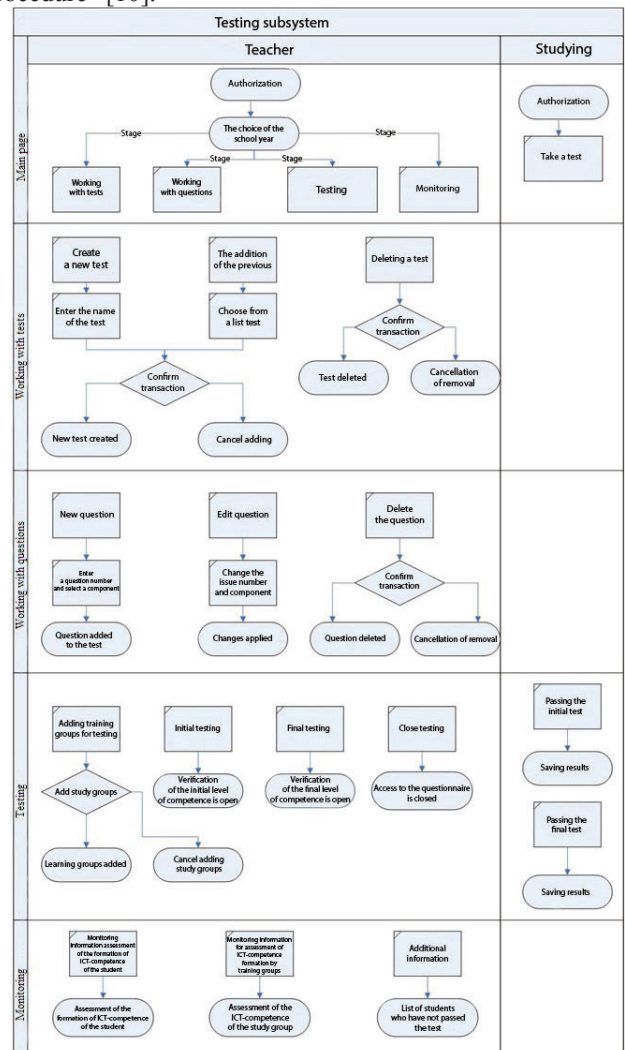


Fig. 7. The testing subsystem in the "Procedure" notation

VI. CONCLUSION

Modern software development tools allowed creating the information and educational environment “Practice” interconnected with the reflexive educational environment of the educational process. The allocated functional requirements are implemented in the system, namely the availability of information support module for trainees; the availability of means of monitoring the implementation of the program of students’ work practice; the availability of means of management, formation, coordination of practice documentation; the availability of means of practice participants’ interaction; the availability of diagnostic tools for obtaining monitoring information on the level of formation of students’ ICT competence, media literacy, their communication, reflexive and analytical skills in the process of undergoing work practice. Therefore, the use of the IEE in the process of organizing and conducting work practices will contribute to increasing the level of formation of ICT-competence and the communicative reflection of bachelors-instrument engineers while undergoing work practice. The practical significance of the developed IEE has been confirmed by the results of the authors’ experimental studies carried out in South Ural State University (NRU) Branch in Nizhnevartovsk.

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