Using Information Communication Technologies in Professional Training of Future Civil Aviation Pilots

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Abstract: The present study underlines the importance of developing self-study skills for future aviation specialists aimed at embracing the concept of life long education. The article states that self-study skills should be formed in an effective self study environment which enhances acquiring professional competences and improves professional training. The analysis of the scientific literature has defined the term 'self-study'. The application of ICT into educational process is based on social constructivism engaging students' collaboration, active learning, and development self-study and self-control reflexive skills. The main principles (adaptability, longevity, accessibility, and cost efficiency) and methodological approaches (differential and system ones) of ICT implementation are described. The study shows that teachers' collaboration plays a significant role in the organization of learning process in higher education. The results of the experiment at the Flight Academy of National Aviation University demonstrate that using the MOODLE Web-oriented platform improves the future pilots' self-study and has a mutual positive effect for teachers and students.

Keywords: *future aviation specialists; institutions of higher education in the field of aviation; MOODLE Web-oriented platform; self-study, ITC, civil aviation pilot.*

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1. Introduction

The organization of the educational process in institutions of higher learning must be examined in light of the 50% increase in the time students spend in self-study. The main task for teachers of working in universities in the field of aviation is to develop the ability of students to study independently and embrace the concept of life long education. Intense competition in the workplace demands that creative approaches to problem solving, self analysis and independent learning skills be employed in all professional activities.

Aviation technologies are constantly improving; as a result, aviation specialists need to update their skills including of focus on updating self-study skills. These skills should be formed in an effective self study environment while enrolled in institutes of higher education in the field of aviation. These skills would enable aviation specialists to be highly competent and competitive in the market place. As students use their devices everywhere, we suggest using Information and Communication Technologies (ICT) for the effective organization of self study process. This stimulates students to master the material online via their own electronic devices (smartphones, tablets, laptops, etc.).

2. Literature Review

The global introduction of computer technology to all areas of modern life has resulted in a focus on the transformation of traditional education and was the first step towards the creation of an information society (Parshukov & Parshukova, 2011). The application of ICT has expended the opportunities for teachers to organize the self-study process and for students to benefit from self-study education (Koval, Sysoieva & Suschenko, 2009).

According to V. Bykov (2010), the innovative character of development in education has been advantageously impacted by IT penetration into the field, introduction of information communication pedagogical and educational technologies, new teaching approaches, the creation and application of a modern computer-oriented educational environment, the gradual formation and development of computer technological platform, and the use of collections of digital educational resources and network services, for its content and procedural support.

I. Bloshchinsky (2017) highlights the importance of ICT application for self-study of future frontier guards. He suggests using the *Anki* application to improve the acquisition of lexical items, phrases, and

sentences by setting time intervals and repeating the material on flashcards. He states that the use of this app leads to information space transformation; it changes approaches to learning, self education and learning process. Among the key factors for utilizing ICT for self-study are easy access and availability of learning content.

S. Tabinska (2016) suggested “technological tools expansion of teaching professional subjects by means of network information communication environment” as the pedagogical condition modifying the professional training of Physical Education students. It provides the usage of the cloud oriented component on the virtual MOODLE platform containing educational-methodical complex of subjects. The experiment verified the efficacy of the suggested pedagogical condition.

A number of scientists (Olkhovy, Petrenko, Temchenko, & Timchenko, 2015) researched the use of ICT for university physical education courses, which enhance students’ success by increasing their involvement and motivation in physical activities and the adoption of a healthy life style. The scientists introduced the structural model of students’ sport-oriented physical education with the application of information technologies. The study demonstrated the efficacy of this model for improving students’ general fitness by enabling them to visualize the training process.

S. Amelina and R. Tarasenko (2018) emphasize the continued development of information technologies to meet the needs of professionals in all fields. They suggest ICT application in the professional training of interpreters by setting up a set of translation tasks individually for each student throughout the entire period of study.

N. Maiier and O. Ustymenko (2018) state that the necessity of introducing modern methods and technologies into professional training is preconditioned by the contemporary needs of our society for efficient specialists. They suggest using tests, research, games and project methods on the bases of ICT for professional foreign language teacher training.

Creating a reflexive environment is also important for professional training (Domunco, 2018; Stănescu, 2017). C. Domunco (2018) investigated the informal university communication networks which have reflexive environments for teachers and enable them to understand their professional growth. D. Stănescu (2017) emphasizes that the number of “non-traditional students” significantly increased during the last decade. By the term “non-traditional” he meant, for example, “students whose family has not been to university before, students from low-income families, students from minority ethnic groups, living in what have traditionally been low

participation areas, as well as mature age students and students with disabilities”. This situation clearly demonstrates the importance of creating a reflexive educational environment to better enable non-traditional students to flourish at university level.

Despite the above-mentioned studies, there seems to be a paucity of research as to applying ICT for the professional training of future civil aviation specialists. The present study aims to partially fill this gap.

The purpose of the article is to establish the necessity of using ICT in institutions of higher education in the field of aviation and demonstrate the efficacy of applying the MOODLE platform at the Flight Academy of National Aviation University (Ukraine) to improve the training of future civil aviation specialists.

Aviation needs highly qualified specialists; any deficiency in professional training can be a potential hazard and lead to air crashes. Therefore, aviation specialists must comply with the requirements of the International Civil Aviation Organization, the European Organisation for the Safety of Air Navigation and local agencies responsible for civil aviation.

The specific character of teaching in institutions of higher education in the field of aviation is impacted by the complexity of developing professional reliability both in standard and extreme conditions. Future aviation specialists’ professional training is conducted in different dimensions: theoretical knowledge acquisition, competence formation in the process of simulator training and real professional activity, etc. However, nowadays the hours for self-study take up approximately 60% of the curriculum of the Ukrainian institutions of higher education, so the self-study process has become the driving force in education. We consider self-study to be a special form of learning activity where future specialists perform creative, active, tense cognitive activities aimed at mastering any subject both on the teacher’s instructions and on their own will. It is one of the activity that forms readiness for self education, lays the groundwork for lifelong learning, and helps to upgrade one’s qualification.

The key term of our research is “self study”, which has been defined differently by scientists. “Self-study is a specific way of organizing and controlling student self-study activities in the context of the learning process which allows to enhance and gain knowledge” (Pidkasisty, 2004: 7). According to L. Hritsyuk and M. Siruk (2011, p. 10) students’ self-study is a planned, organizationally and methodologically guided cognitive students’ activity aimed at achieving the definite learning goal under the supervision of the teacher. O. Hurska (2014) supports this opinion, but she emphasizes that self-study is conducted without direct involvement of the teacher; it requires

a detailed planning and the creation of efficient learning organization and methodological support. Students' success in study and future profession depend heavily on the organization of their self-study.

Having analyzed the scientific studies, we define "self-study of future pilots" as self-education that is the motivator for the self-improvement and professional growth of future civil aviation pilots, which starts from the student's first year of study and continues for the period of study and continues throughout the student's professional career. Self-study facilitates the constant acquisition of knowledge which is necessary for the scientific and technological development of the society (Nedilko, Chumak, & Plachynda, 2017).

The main task of the organization of self-study is the step-by-step process focused on the development of efficient self study for those studying in various professional fields meeting European and world standards. Therefore, ICT implementation into the self-study learning process in the institutions of higher education is an obligatory part of the improvement of the educational process, particularly in the professional training of future pilots.

Total ICT implementation into all spheres of modern life has become the basis of the transformation of the traditional education system and the first step to the creation of the digital society. The use of ICT has brought many changes into the organization and management of the learning process. For example, at the Flight Academy of National Aviation University the teachers use a number of information technologies: *Bring Your Own Devices* (the method when where the students' own laptops, tablets, smartphones, etc. are actively used during the classes), the *Plickers* (the application for creating multiple choice quizzes and assessing students' answers), cloud computing technologies (the platform for information storage), the *Edmodo* (an educational technology company offering a communication, collaboration, and coaching platform), the Web-oriented MOODLE platform (a free and open-source learning management system used for online courses for students), etc.

3. Methodology

This research was conducted using a mixed methodology, an option that was considered appropriate because we were faced with complex processes. In the next paragraphs the context of the study will be introduced as well as the instrumentation, data collection and analysis.

The first stage of the research was the students' questionnaire which was focused on the use of the MOODLE Web-oriented platform as a way of ICT implementation in higher educational institutions. During the questionnaire the students were asked the question: "What challenges do you face when you work independently?" 48 % of the students answered that they lack materials for self-study, especially in professionally oriented subjects; 35 % stated that they do not want to search for the necessary literature in the libraries; only 17% were satisfied with everything.

The second stage was conducting the pedagogical experiment aimed at the verification of the efficacy of the MOODLE Web-oriented platform in institutions of higher education in the field of aviation. 538 people (the students 1-4 years of study) participated in the experiment. The control group (CG) and the experimental group (EG) were formed: CG – 265 students, EG – 273 students. The Wilcoxon signed-rank test was used to determine homogeneity of the two groups. The critical values have been calculated for the significance point $\alpha=0.05$ and sample sizes $n_1=265$, $n_2=273$ (table 1).

Table 1. Critical values for the Wilcoxon signed-rank test ($\alpha=0.05$; $n_1=265$; $n_2=273$)

Critical values	CG – EG $n_1=265, n_2=273$	CG – CG $n_1= n_2=265$	EG – EG $n_1= n_2=273$
Low	67882	66901	71055
Upper	74953	73814	78276

The first task of the experiment was to determine the level of cognition at the stage of the entrance control, namely: mastering and operating the basic concepts and theoretical facts related to aviation professional activity; the need to improve professional knowledge, etc.

The results of the pre-test demonstrated that 9.3% of the students had a high level of cognition, of which 50.0% - in EG, and 50.0% - in CG (Fig.1). 59.7% of the students had the medium level of cognition, 51.1% of them in EG and 48.9% in KG. Cognition was formed at low level in 46.6% of the participants in the experiment, among them 50.3% - in EG and 49.7% - in CG.

The implementation of the innovative technologies, such as the MOODLE platform, into the self-study process for higher education is a necessary part of future aviation specialists' training. This platform must be designed on the basis of social constructivism which includes students'

collaborative work and active learning aimed at developing the reflexive skills of self-study and self-control.

Scientists T. Koval, S. Sysoieva, L. Sushchenko (Koval, Sysoieva, & Sushchenko, 2009) state that the MOODLE training platform should be based on the following principles:

- adaptability: MOODLE contains the tools that are continuously improved without modifying the system, and methods that provide individualization of learning;
- longevity: the training platform meets the standards for information learning systems and provides the opportunity to make changes to educational materials without reprogramming;
- accessibility: it allows students to work remotely from any computer connected to the Internet;
- cost efficiency: it is distributed free of charge.

Figure 1. Pre-test results of levels of cognition within the participants in the experiment

During the organization of self-study for future pilots of civil aviation, the following methodological approaches for using the MOODLE training platform are suggested:

- the differential approach, which expands the accessibility in education for students, improves the quality of education, enables the implementation of innovative technologies, and the ability to use additional educational resources;
- the system approach, which is characterized by the active use of information technologies as effective methods of providing consistency and structural-functional integrity of learning materials.

Teachers' collaboration plays a significant role in the organization of the learning process in higher education, especially in self-study. Its aim is to ensure high level professional training. The teachers provide the students with the academic and methodological package, which is necessary for studying. This package includes textbooks, guidebooks, compendiums of lectures, teachers' recommendations, assignments, recommended sources, etc. The future pilots know that they can find all the necessary materials in the MOODLE Web-oriented platform using their electronic devices. In such a way they will be more motivated and interested in studying and therefore the efficiency in higher education increases.

While using the MOODLE platform, it may be recommended to that students to do the following assignments for the definite module of the syllabus: to read or watch lections; to make up glossaries of terms; to make a report or a presentation on the recommended topic; to do tasks assigned by the syllabus, etc.

The described platform is user-friendly. It is convenient to edit, to add, to correct, to update teaching and methodological material. The students of the whole group and individual students may be added to the subject course.

The MOODLE platform provides assessing students' progress. The assignments are created on the bases of proposed templates. For students these are the following tasks: alternative choice (choosing true or false answers); multiple choice (choose the right answer from several suggested ones, where one is correct); short answer (writing a word, phrase or sentence, where one answer is correct); matching (the choice of the correct answer to the question, the choice of adequate translation of words, phrases, etc.); text (correction of mistakes in the text, writing a letter and sending it to the teacher to check), etc. For a teacher there are different types of tests and questionnaires aimed at data gathering about students' progress in course study.

Such evaluation avoids the subject-subject interaction during the survey. Being more objective, it eliminates conflict situations between the teacher and students, and it stimulates the qualitative study of the material.

4. Results and Discussion

During the years 2016-2018 at the Flight Academy of National Aviation University (Ukraine, Kropyvnytskyi), we conducted the formation stage of the experiment, with the aim of introducing ICT into the educational process of future civil aviation pilots. Using the MOODLE Web-oriented platform into the training process of the Flight Academy of National Aviation University caused a positive dynamics of the cognition level of future civil aviation pilots (Fig.2).

Post-test diagnostics demonstrates the following results: the high level of the cognition is revealed in 20,8% of the participants, among them 61,6% (EG), and 38,4% (CG); the medium level is shown by 62,8% of the participants, among them 52,4% (EG), and 47,6% (CG); the low level is present in 16,4% of the participants, among them 30,7% (EG), and 69,3% (CG).

Figure 2. Pre-test and post-test results of levels of cognition within the participants in the experiment

At the post-test stage the control and the experimental groups are not homogeneous; their indicators differ significantly in the experimental group.

During the conducted experiment we were able to define positive and negative aspects of the MOODLE platform implementation into the institutions of higher education. The positive aspects were:

- the use of common IT habits of students;
- access to information 24/7;
- advantageous structuring of the material;
- convenience in grading;

- ease in updating material and in editing;
- ease in scheduling assignments;
- using audio and video materials;
- automated system of students' rating;
- self-testing;
- psychological and physiological comfort
- objective assessment (without human error), etc.

The negative sides of the MOODLE Web-oriented platform implementation are the following:

- time-consuming technology for the placement of teaching materials;
- impossibility of checking the identity of the person performing the task (the ability to perform tasks for a friend);
- lack of self-discipline in students;
- temporary lack of access to the resource due to technical problems;
- loss of communication;
- non-socialization and lack of public speaking skills;
- complexity in teachers training for using the MOODLE Web-oriented platform, etc.

5. Conclusions

ICTs help to organize the self-study of future pilots efficiently in the context of societal development. The MOODLE system gives convenient tools of content management and various forms of class organization. It provides the opportunity to design, create, and manage teaching materials. This training platform is a flexible system: the teacher can create and monitor the learning at his own discretion, use time limits, create his own assessment system, check assignments done by students, trace late assignments, allow the students to retake the tests, etc.

The experiment demonstrated that after the implementation of the MOODLE Web-oriented platform into the educational process of Flight Academy of National Aviation University there has been a significant improvement in the future pilots' success in the experimental group (pretest results: the high level – 9,1%; middle – 60,1%; low – 30,8%; post-test results: the high level – 15,8%; middle – 64,2%; low – 20,00%). In this regard, the ICT implementation, namely MOODLE Web-oriented platform, improves the future pilots' self-study skills and has a mutual positive effect on teachers and students.

Prospects for further scientific research include studying the ways of improving the future aviation specialists' training in the context of European integration.

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