Undergraduate Students Perception of Improvement of Teachers Competencies Based on using Information System

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Abstract: *The paper presents the analysis of the Information System (IS) impact on the improvement of the teachers' skills and competences. This research is based only on students' perceptions and survey methodology. According to the data of the research described in the paper, it is possible to investigate the correlation between students' perception of teachers' IT competencies and assessment of their effects on students' achievement or teaching effectiveness. Besides, we are particularly interested in investigating the degree to which IS impacts the undergraduate students' motivation and satisfaction in the teaching process. The impact of e-communication on gaining knowledge, monitoring, evaluation and reporting on the undergraduate students' improvement is analysed. The paper also presents the analysis of the research results on the application of IS and its impact on gaining knowledge as well as the undergraduate students' motivation and satisfaction increase. The model of the IS impact on the improvement of the teaching process has been presented as an important factor for directing learners towards IS application.*

Key words: *Information System (IS); knowledge; competences; skills; teaching process.*

1. INTRODUCTION

In order to become the members of the Information Technology community, both experts in different fields and undergraduate students should develop necessary knowledge and skills in this domain. The research analysis of the degree of knowledge innovativeness in different fields proves that there have been a number of activities for finding solutions for the problems that have evolved and affected by contemporary technical inventions [1].

This research is based only on students' perceptions and survey methodology. According to the data of the research described in the paper, it is possible to investigate the correlation between students' perception of teachers' IT competencies and assessment of their effects on students' achievement or teaching effectiveness [2].

When the teaching process is concerned, a teacher can implement IS in lectures, exercises, project tasks and seminar papers. The teachers' competences in the teaching process include the ability:

- to define the modes and forms of gaining knowledge (to choose and develop the tools for knowledge transfer);
- to collect and evaluate the results and assess undergraduate students' knowledge according to the previously defined assessment criteria;
- to consider the necessary IS application in teaching clearly and precisely thus enabling the undergraduate students to improve their competences and performances and
- to analyse undergraduate students' improvement.

A curriculum comprises a range of teaching activities. Before the beginning of the term a teacher needs to prepare for the activities that follow. A teacher needs to prepare the necessary documents for the teaching process according the established rules and to enroll the students in the corresponding e-courses. These activities imply preparing lesson plans, lesson timetables, schedules, mid-term exams, finals, etc.

The lesson plan contains a set of teaching activities for each teacher individually. If a group contains a large number of students, the course is realized through several groups. A student can also be taught individually if the group contains only one member. If necessary, the plan is changed in accordance with the obligations of other teachers.

Within the teaching process, professors are in charge of the specific/assigned e-course of the subject they teach. The duties of the teacher in the teaching process at the faculty consist of holding lectures, consultations, pre-examination duties, mid-term exams, final exams, etc. In order to improve the teaching process, a teacher tends to apply new methods, as well as to choose and develop tools for transfering knowledge. The previous activities lead towards establishing a modern educational system which tends to suit the contemporary society.

The most important implications of the paper concern the use of IS in the teaching process which promotes its improvement in academic and vocational studies. The process of finding a solution within IT implementation in the educational process which is based on IS concept is the most influential element.

1.1 Standardized sources of knowledge in the field of information technology

If an organization's information technology (IT) processes are not properly implemented, managed and supported, business will suffer a loss depending on the impact of the unexecuted IT service in business. Nowadays, the teaching process in most higher education institutions also relies on innovative technologies. Regardless of the field in which IT is applied, the use of IT standards is necessary.

Standardization is necessary at both levels, global (International Standards, ISO-International Organization for Standardization) and local (National Standards- SRPS). Standardization refers to the connection of knowledge that would lead to the identification of potential differences and the establishment of the measures for IT improvement [3]. Figure 1 shows 40 hierarchically organized areas of standardization covered by the International Classification for Standards (ICS). ICS is a hierarchical classification consisting of three levels [4].

The first level (ICS1) covers 40 areas of activity in standardization. The field of Information Technology (IT, ICS1=35) has 15 sub-areas of ICS2, one of them is Software Development (35.080). The analysis includes monitoring the frequency of innovativeness in the fields of knowledge and its sources, trends, knowledge of each expert as well as knowledge bases updating [1].
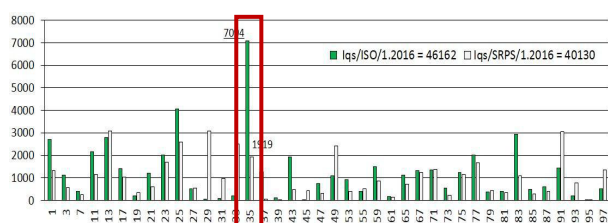
Figure 1. *Comparative overview (ISO-SRPS) of the total amount of knowledge sources on ICS platform, January 2016*

According to the International Classification of Standards (ICS), Information Systems belong to the field of 35 Information Technology which is a very innovative area. Figure 1 shows the results of the access to knowledge sources in ICS1=35 and a comparison with the standardized knowledge sources at the local (national) and international level in all other areas (ICS1=01 to 99). The

significance of the model for improving the basic knowledge system is grounded on the defined degree of innovativeness and the elements in the PDCA (Plan-Do-Check-Act) concept. The time dimension of the quality improvement loop determines the degree of innovativeness of the target fields and subfields and the application of the information system [5].

IS development and application in the teaching process aim at achieving:
- digital educational contents development;
- teacher training for IS use;
- raising the level of knowledge and skills for IT use;
- developing the ability for IS application at work in the manner that helps to raise efficiency, improve working process quality and obtain better jobs;
- implementation of e-learning and distance learning;
- integration of IS into educational programs and
- adjusting educational programmes and teaching processes to suit the needs of the society that uses IT and educating teachers to apply new teaching methods.

1.2 Research Objectives

The main objectives of the research include:
- investigating basic knowledge of the IS application in the teaching process among students in academic and vocational studies at the Faculty of Technical Sciences (FTS) in Čačak, University of Kragujevac;
- identifying the respondents' interest in IS if they do not recognize the IS application;
- recognizing the possibilities of applying IS in the teaching process and their impact on the improvement of teachers' skills and competneces, i.e. on education and improvement of the teaching process and
- activating social groups with specific educational needs, which includes gaining knowledge and the development of lifelong learning and education.

2. METHODOLOGY

The questionnaire is used to collect the data necessary for the research. It was organized to identify the level of knowledge about the application of IS when teaching students of the Information Technology study programme at the academic and vocational studies at FTS in Čačak, the University of Kragujevac.

The research was realised within IT subjects with first-year and second-year students of FTS in Čačak. It was conducted during the summer term of the 2021/2022 school year (May-June 2022) and 72 students participated as the respondents.

The research tends to investigate whether the IS implementation in the teaching process has a positive impact on gaining knowledge and motivation increase.

The results show the teachers' influence on their students' motivation and satisfaction as well as the effects of the IS implementation on the teaching process by the teachers.

The research was conducted from May to June 2022 with 72 academic and vocational undergraduate FTS students as participants. The survey was used as the research instrument. It consisted of 9 questions with close-ended yes/no/maybe answers. The approximate completion time was 7 minutes.

3. INFORMATION SYSTEM IN THE TEACHING PROCESS

Data flow diagrams are used to describe the main processes as well as the data that are made and used. Some specific units are further modelled by BPMN (*Business Process Modelling Notation*) diagrams. During the creation of part of the documentation in the teaching process, some diagrams of the unified modeling language UML (*Unified Modeling Language*) were created:
- case use diagram;
- activities diagram;
- sequence diagram;
- class diagram;
- condition diagram;
- components diagram.

Figure 2 shows the case use diagram (lesson plan preparation) which represents the interaction between all actors in the teaching process.
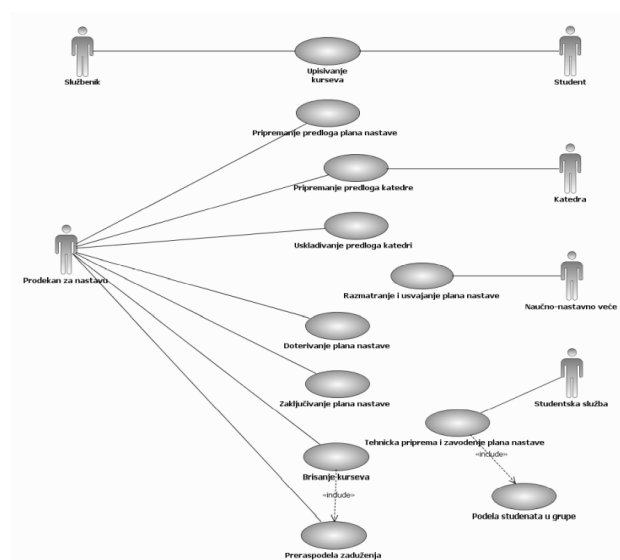
Figure 2. *Case use diagram - Lesson Plan Preparation*

Traditional classrooms are the predominant form of knowledge transfer. Even today, approximately 80% of the teaching process takes place in the classrooms. Printed books are the last universal learning technology. However, new learning technologies are constantly appearing. The experience in using these technologies has revealed the possibilities for improvements of learning quality and efficiency. It is only now that learning through practice is understood to be incorporated into the use of 'blended' combinations of traditional and technology-based methods. Technological development has gathered pace in almost all areas of human life, with a direct impact the education system improvement [6, 7].

The contemporary vision of higher education system with a student as the most important figure in the teaching process implies that teaching and learning methods enable more efficient teacher-student communication, assessment, feedback and the overal interection either among the students themselves or among the stuedents and the teachers. The main principles of such a system are: publicity, avalilability, free flow of information, reciprocity and interaction [8].

3.1 IS Impact on Teachers' skills and competences

For the purpose of the research, the questions were formed in order to obtain the best possible indicators for competences, motivation and the ability to apply IS. Some of the questions were asked as follows:
- The students' motivation, understanding and acquisition are affected by the teachers' motivation to apply the innovative IS in the process of knowledge transfer;
- The capability of the teachers to use IS affects students' understanding and satisfaction;
- Teachers' skills and competences affect students' satisfaction and motivation;
- Teachers' skills and competences affect students' understanding and knowledge acquisition;
- Clearly and accurately presented topics and teachers' requirements affect students' satisfaction and motivation;
- Availability of a teacher for additional help and explanations promotes students' satisfaction and motivation;
- Electronic communication with a teacher (e-mail, text messages, Viber, Forum, Facebook chats, etc.) is more efficient than the traditional one (face to face).

4. RESULTS AND DISCUSSION

The results are presented in Table 1 in Figure 3.

The research shows that the IS application promotes the following:
- more efficient knowledge transfer and acquisition;

- students' satisfaction and motivation in the teaching process;
- improvement of the teachers' competences and motivation as well as the teaching process improvement.

Besides, the majority of students agree that the teachers' skills and competences positively affect:
- students' understanding and knowledge acquisition and
- students' acquisition, gaining knowledge and satisfaction.

Table 1. *Results of the conducted research*

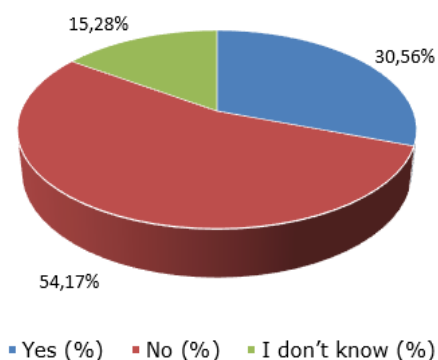| Questions	Answers (%)		
	Yes	**No**	**I don't know**
1. Do you think that the motivation of the teachers to apply the innovative information system (IS) in order to enable more efficient knowledge transfer and its adoption by the students affects their motivation and satisfaction?	79.17	9.72	11.11
2. Does the teacher's ability to apply IS affect the understanding of the material and the students' satisfaction?	83.33	8.33	8.33
3. Do the teachers' skills and competences affect students' motivation and satisfaction towards the teaching process?	86.11	2.78	11.11
4. Teachers' skills and competences affect students' understanding and knowledge acquisition.	93.06	1.39	1.39
5. Using IS for clear and precise presentation of the topics and requirements by the teacher affect students' motivation and satisfaction.	81.94	4.17	13.89
6. IS application intended for additional explanations and help for students promote their motivation and satisfaction.	83.33	11.11	5.56
7. Electronic communication (e-mails, text messages, Viber, forum, Facebook chats, etc.) is more efficient than the traditional one (face to face).	30.56	54.17	15.28
8. Clearly presented topics and requirements by the teacher affect students' motivation and satisfaction.	86.11	9.72	4.17
9. IS application affects the promotion of the teachers' skills and competences as well as the teaching process.	77.78	5.56	16.67

The inferences based on the results in Table 1 show that the greatest majority of students (93.06%) consider that teachers' skills and competences affect students' understanding and knowledge acquisition.
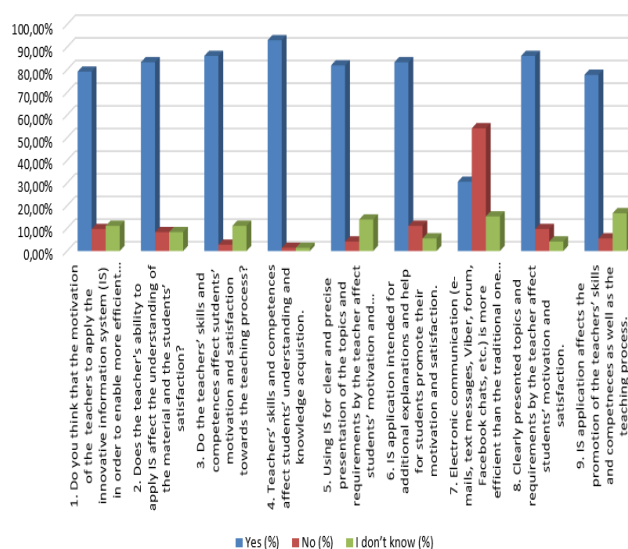
Figure 3. *Graphic presentation of research results - application of IS in the teaching process*

However, the results also show that although the students widely use different forms of electronic communication, more than half of the respondents (54.17%) consider the traditional communication more efficient than the electronic one (Figure 4).

Figure 4. *Graphic presentation of t research results – electronic communication with teachers*

The results point out that 83.33% of the respondents agree that the IS application for providing additional help and explanations can promote their motivation and satisfaction.

The research results prove that there is a clear need for the IS application within the teaching process since it positively affects teachers' skills and competences as well as the studnets' knowledge acquisition and their performance.

5. CONCLUSION

The results of the conducted research show that the IS application substantially promotes teachers' skills and competences. It also supports students' understanding and knowledge acquisition. The application of IS enables the improvement of teachers' skills and competences concerning all the segments of the teaching process (lectures, exercises, seminar papers, mid-term exams, homework, etc.) Students' involvement in the IS application is considered to be the most important element of the teaching process improvement. Precautionary measures are the most important part of the whole process and it takes a lot of time to realize them. The period of realization is different depending on the person who is in charge of realization as well as the means for their implementation. These measures can affect students in great measure and if they are conducted appropriately, they will enable the best possible results.

The environment, which implies the necessary IS application in the teaching process, had a strong impact on new generations of students. Traditional models of education are less motivating. Today, students prefer the application of multimedia content that will capture their attention and provide them with the opportunity to make contact with their teachers using modern communication methods. Practical application of the acquired knowledge is very important for students. Therefore, the teacher is expected to satisfy all their needs and to adapt to the modern environment and generations by continuous improvement of competences and skills, which has been confirmed by the research.

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