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DIGITAL TRANSFORMATION DYNAMICS IN HIGHER EDUCATION[1]

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Abstract: *The paper reviews important E-learning methods in digital environment applied in Machine Science and Machine Elements subjects. The objective of the research is to analyze and specify the dynamics of the digital transformation in Higher education. The interactive model of communication between lecturers and students and the group dynamics of teamwork on creative design case studies are considered. The authors' team analyzes the results of the applied adaptive educational methods in distance learning mode. Conclusions are made concerning the importance and the application options of blended teaching and learning in the area of engineering education and training.*

Keywords: *Digital transformation, Communication models, Adaptive Training Methods, Blended learning.*

INTRODUCTION

During the last several years and especially in 2020, the industry and education institutions have to adapt to an extremely dynamic world, where everything changes within days and even hours. Every day new companies appear that do business in a new and different way. This change is happening due to new digital and information technologies. It is well - known that digital transformation is the integration of new digital technologies in all areas of business and education, leading to a fundamental change in the way organizations work. The digital transformation is a complex process, especially for large and established companies and educational institutions. It must be implemented with special approaches, but when it is done correctly it will lead to high quality in business and education which is corresponding with expectations of students and consumers. Therefore, business enterprises and educational institutions will become much more sustainable in the digital future.

The academic staff of higher institutions pays great attention to the development of electronic education. During the last 20 years, the academic management of the University of Ruse has pursued a consistent policy in the field of quality assurance of distance learning, which is an essential part of the university's strategy. Main conceptual issues of this strategy are treated in (Beloev, H., Pencheva, V. & Kyuchukov, R, 2018) and in (Pencheva V., Beloev, H., Fartunova, M. & Kyuchukov, R., 2017). The quality assurance policy of the distance learning form is based upon important advantages of this education and training:

- Quick and easy access to the course content, from anywhere in the world, through an e-learning portal;
- Opportunities for providing the study material in a new and interesting way (audio and video materials, database);
- Convenient navigation through the E-learning platform;
- Modular principle acquiring new knowledge and skills;

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- Dynamic and continuous development of the electronic system, providing new and more useful functions and options.

Due to concept developed and the applied strategy of the academic management regarding e-learning, following results have been achieved: the University of Ruse has its own e-learning system, developed in 2005, which was further improved in 2013.

In accordance with the initiative of the University of Ruse for the development of e-learning and distance learning, the university is the initiator and coordinator of the National Program for the creation of a virtual educational space in Bulgaria.

At the beginning of the pandemic 2020, the University of Ruse had a fourth level of technological security for distance learning. The training materials and resources for self-preparation are located in an internet-based distance learning system with guaranteed high-speed access. There are university standards for developing educational documentation for the distance education. Guidelines for compiling these materials have been developed for lecturers who create teaching materials for distance and online education. According to these instructions, at the beginning of each section there should be goals of the section and expected learning outcomes.

STATE OF DIGITAL TRANSFORMATION IN MARCH 2020

At the beginning of the spring lock down period in 2020, the online learning at the University of Ruse had a very good basis, but some major differences with face-to-face learning have become particularly important. It was necessary to analyze and evaluate the parameters that characterize online education based upon the professional experience of the authors described in (Dobreva, A. et al, 2017), (Dobreva, A., Wasowicz, A. & Dobrev, V., 2009), (Kamenov, K., Dobreva, A. & Ronkova, V.,2017) and taking into consideration the achievements of Kebritchi, Lipschuetz, & Santiague (Kebritchi, M., Lipschuetz, A. & Santiague, L., 2017).

A new parameter was introduced, which aims to compare distance and online education learning with face to face training and learning. The parameter CE (meaning: Comparative analysis and Evaluation) helps analyzing seven different criteria.

Table 1. Criteria for digital transformation – March 2020

№	Criteria	Description	CE
1	Expectations	challenging & interfering with effectively teaching online courses	60 %
2	Readiness – learning style	attending online courses is not equal to learning and understanding study material	60 %
3	Communication barriers	Insufficient activity in e-mail communication	30 %
4	Readiness – technical skills	Availability of electronic devices, internet and students' skills to work with them	80 %
5	Identity - Isolation	critical to help learners develop a shared sense of belonging, purpose, and norms	60 %
6	Participation	Insufficiently good real participation, in some cases only formal participation	60 %
7	Time management	Lower level of time management compared to face-to-face education	40 %

Based upon the analysis implemented, it is clear that the criteria: communication with students and time management should be significantly improved. The main reason for these circumstances is the lack of face to face contact between lecturers and students.

The learning style of the students and their participation in the online education (analyzed at the level of 60% compared to face to face learning) is an average value, because the level of motivation of the students for learning is different. Besides, there are some technical limitations related to the Internet speeed and the characteristics of the electronic devices used by the students.

ACADEMIC ACTIVITIES CARRIED OUT IN 2020

During the period from March 2020 to November 2020, extremely intensive work was carried out by all groups of the academic community at the University of Ruse.

The support of the University management included:

- Improving lecturers' qualification through organizing and conducting specialized courses and seminars in the area of online teaching and preparation of e-materials according to the approaches described in (Daskalov, P., Asenov, A., Georgieva, T., Beloev, H., Pencheva, V. & Antonova, D., 2018) and (Pencheva, V., Beloev, B., Daskalov, P., Antonova, D., Asenov, A. & Georgieva, T., 2017);
- Purchase of new equipment and electronic devices for some of the university lecturers;
- Providing new and more powerful servers at the University computer centre.

The intensive work of the lecturers done during this period included the following activities:

- Updating the content of the study material in order to make it more suitable for presentation in an electronic environment and to correspond to a greater extent the expectations of students;
- Developing materials for control and feedback during online lectures and tutorials according to the methods suggested in (Haralanova, V., Kamenov, K. & Ronkova, V., 2018), (Haralanova, V. & Ronkova, R., 2012) and (Ronkova, V., 2020);
- Supporting students in improving their communication skills, based on the well-known scientific achievements of Popova, Harakchiyska and Gueorguiev, described in details in (Popova, J., Harakchiyska, T. & Gueorguiev, T. , 2016), (Popova, J., 2011), (Popova, J., 2014).

Important new skills to work in an electronic environment are acquired by students mainly due to:

- Individual work of lecturers with students who have problems with the learning process;
- Intensive work done by students to improve their own skills to study successfully in an electronic environment.

STATE OF DIGITAL TRANSFORMATION IN NOVEMBER 2020

Due to the support of the University management, the intensive work of the lecturers and the newly acquired skills of the students for working in the electronic environment, the state of the digital transformation in November 2020 can be described in the following way:

- The engagement of students has been significantly improved by receiving feedback and during online lectures and tutorials;
- Some communication barriers between teachers and students have been removed, communication options include already mobile phone calls;
- Students' time management has significantly improved compared to March 2020.

The criteria for digital transformation has been evaluated through the indicator CE. They are presented in Table 2.

Table 2. Criteria for digital transformation – November 2020

№	Criteria	Description	CE
1	Expectations	Improved contents of online courses - in accordance with the expectations of the students	85 %
2	Readiness – learning style	Engaging students and receiving feedback during online lectures and tutorials	75 %
3	Communication barriers	improved e-mail communication activity; if necessary – communication through mobile phone calls	70 %
4	Readiness – technical skills	Availability of electronic devices, internet and students' skills to work with them	90 %
5	Identity - Isolation	critical to help learners develop a shared sense of belonging, purpose, and norms	80 %
6	Participation	Improved real participation, in some cases – still formal participation	80 %
7	Time management	Better time management in comparison to March 2020	70 %

During September and October 2020, the education process at the University of Ruse was in a face to face form, but for some students with influenza-like symptoms - remotely. This hybrid form of education and training proved to be particularly successful, as the health problems of students and their relatives did not affect the quality of the learning process. These circumstances imposed the application of adaptive educational methods for these different groups of students participating simultaneously in face-to-face and distance learning.

CONCLUSIONS

Based upon the research done in the area of dynamics of digital transformation, the following conclusions can be deduced:

1. At the beginning of the lock down situation in 2020, online learning at the University of Ruse the online learning at the University of Ruse had a very good basis, but some major differences with face-to-face learning have become particularly important.

2. Due to the support of the University management, the intensive work of the lecturers and the newly acquired skills of the students for working in the electronic environment, the state of the digital transformation in November 2020 has significantly improved.

3. Adaptive educational methods in online mode have been successfully applied.

4. The appplication options of blended teaching and learning proved to be particularly successful, as the health problems of students and their relatives did not affect the quality of the learning process.

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