Hands-on Science

Education Activities

Challenges and Opportunities of Distant and Online Teaching and Learning

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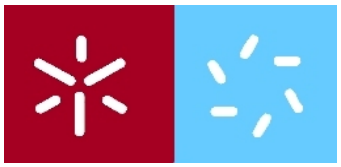

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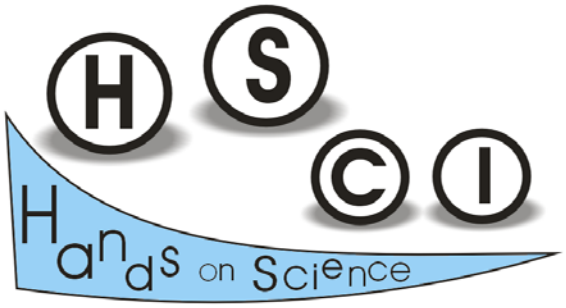

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FOREWORD

CONTENTS

A Year of the COVID-19 Lockdown: Comparative Analysis of Distance Learning Approaches in TNMU

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Abstract. The purpose and history of introduction of distance learning components in educational process at the I. Horbachevsky National Medical University in Ternopil (TNMU) is shown. The key elements of implementation of full-scale distance education workflow at TNMU during the COVID-19 lockdown as well as its changes are presented. The distance education features of teaching of Medical Informatics and Biostatistics course at TNMU are noted. The experience gained during the implementation of full-scale distance education at TNMU within the COVID-19 lockdown is presented. The analysis of students' performance during the full distance educational period in comparison with a blended part of the Medical Informatics and Biostatistics course are presented. A value of real-time online communication as component of distance education process is signed.

Keywords. Distance Education, Comparative Analysis, Learning Management Systems, Moodle, Google Suite for Education, Office 365, Medical Education.

1. Introduction

Conceptual approaches to introduce modern information technologies in the field of medical education have included the application of Learning Management information Systems (LMS) which also often provide services of distance education too - as well as learning material management systems (LMMS or LCMS - learning content management systems) [1-2].

Global pandemics (like COVID-19) has introduced new challenges and demands for organization and providing of the educational process. Higher education institutions should be ready and capable to continuation of the fully online and remote educational model for a long time [2].

2. Organization of distance education process at TNMU during the COVID-19 lockdown

Distance Education (DE) technologies were introduced at Ternopil National Medical University (TNMU) in 2006 when LMS Moodle [3] was used to evaluate the results of students' self-preparation for practical classes. The use of the Moodle LMS was continuously expanded during the following years [2, 4-9].

Important changes took place in 2012. The Microsoft Office 365 [10] and Google Suite for Education [11] services were introduced almost simultaneously at TNMU. Up to now Google Suite platform provides corporate e-mail service for TNMU and being used as a centralized user authentication tool for all TNMU information services.

Since March 12, 2020, when the COVID-19 lockdown in Ukraine was introduced, TNMU has been using all available distance learning services on a full scale [2]. Students have been able to:

- use training materials posted on the LMS Moodle platform web-site [12] for training;
- post their works in electronic form through Moodle activities like "workshop", "assignment", etc. ;
- communicate with teachers through Google services (texting via Gmail / Chat, and having video-conversations via Hangouts / Meet / MS Teams).
- watch educational videos and video-lectures on teachers' YouTube channels (for example [13]).

At the end of spring semester of 2020 LMS Moodle has been used to perform a final control as well. Exams were conducted in form of test assessment. Unlike previous times, more different types of questions and forms of quizzes were used. For example, an "essay" Moodle question type was used to accept students' answers instead of "oral" part of exams.

Further DE adjustments and modifications were arranged in TNMU for 2020-2021 academic years as COVID pandemic lasted

and national lockdown in Ukraine had extended once again. Major changes were focused on maximization of the online communications in real-time between teachers and students:

- each scheduled class were provided in form of online MS Teams meeting;
- same approach were used for implementing an "oral" part of exams.

The problem is to perform comparative analysis and provide assessment of effectiveness of different approaches to providing distance learning in medical education based on data, collected by authors during a year under COVID-19 lockdown.

The aim of paper is to present results of comparative analysis of different approaches to implementation of distance learning technologies into medical education were used in TNMU during COVID-19 pandemic lockdown.

3. Teaching the Medical Informatics and Biostatistics course at TNMU before and during COVID-19 lockdown

The Medical Informatics and Biostatistics (MIB) course at TNMU is offered to 2nd year students at the medical school and now including 14 hours of lectures, 32 hours of practical classes and about 60 hours assigned to self-guided work. Course was re-designed to use "blended" education methodology since LMS Moodle inception at TNMU [14]. Students were obligated to perform some amount of online activities in addition to classroom studies. As a rule, a topic of the MIB course in LMS Moodle includes the following elements (Fig. 1):

1. Required practical classes materials and methodical instructions.
2. List of tasks that must be completed (during class hours or individually).
3. Recommended additional educational materials.
4. Assessment tools. Using "assignment" activity students have to submit results of their practical works. A "quiz" activity has been used to perform assessment of theoretical knowledge.

Such extensive background allowed an easy transition from the "blended" mode to a full scale distance education workflow when the lockdown was introduced in Ukraine on March 12, 2020. Main changes provided in the course to support a full-scale online educational process were aimed on extending its accessibility to students and were presented in previous work [2].

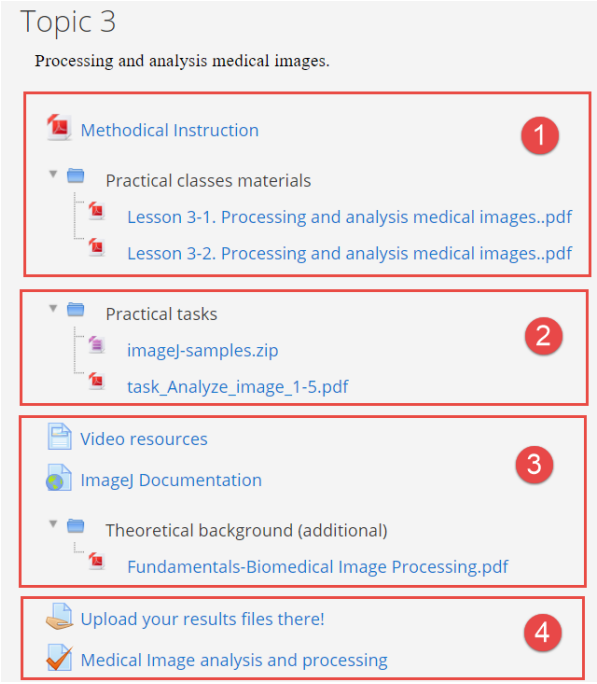

Figure 1. Structure of a topic of the MIB course in LMS Moodle

4. Students' performance of MIB course studding during COVID-19 lockdown

The analysis of results of teaching the Medical Informatics and Biostatistics course to foreign students by the 1st author is used to present practical outcomes of migrating from the blended education model to full scale DE workflow and its further adjustment upon lockdown was extended.

It should be noted that TNMU uses a common Ukrainian academic grading system with 12 levels of students' achievements, where "4" is a minimal positive grade. According to TNMU's rules each student must obtain grades for each practical class. Course average has been calculated as a final grade. During the 2019/20 academic year 184 students in 14 groups were taught. The average scores achieved by students during the blended part (topics 1 to 10) of the MIB course is shown on Fig.2. The next figure (Fig. 3) presents the average scores for the full scale DE part of MIB

course during March / May of 2020 (6 topics). Finally, the total MIB course average scores are shown on pair of charts – as of the end of semester (Fig. 4) and after all committed "reworks" and "adjustments" (Fig. 5).

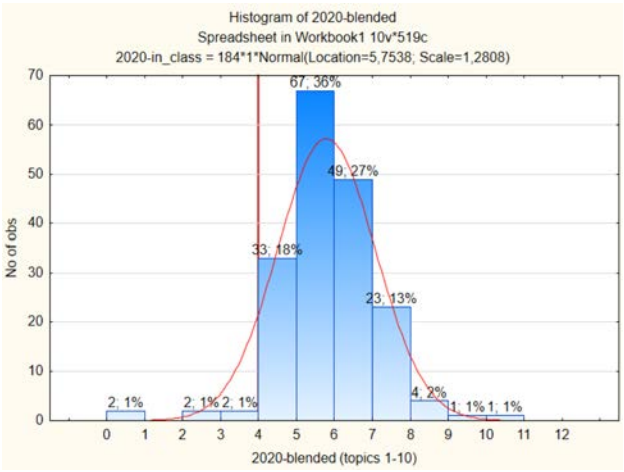

Figure 2. Students' average score for the blended part of the MIB 2019/20 course (topics 1-10)

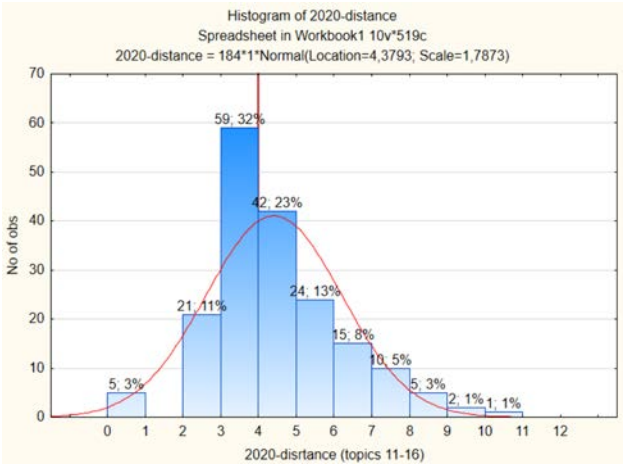

Figure 3. Students' average score for the DE part of the MIB 2019/20 course (topics 11-16)

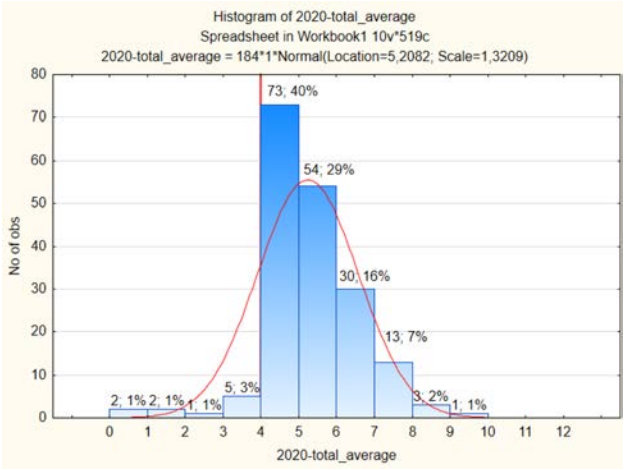

Figure 4. Students' total average score for the total MIB 2019/20 course

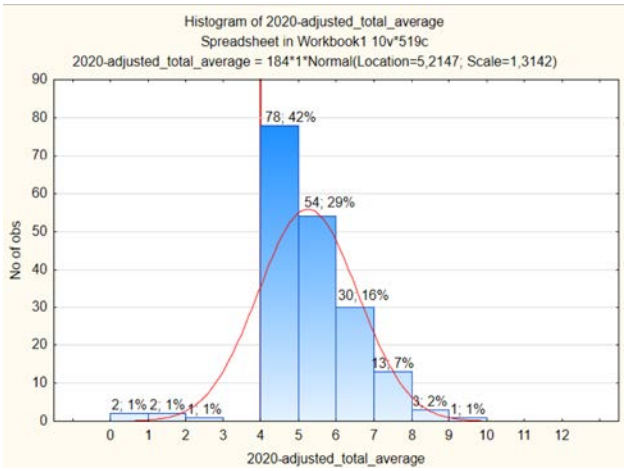

Figure 5. Students' total average score for the total MIB 2019/20 course (adjusted)

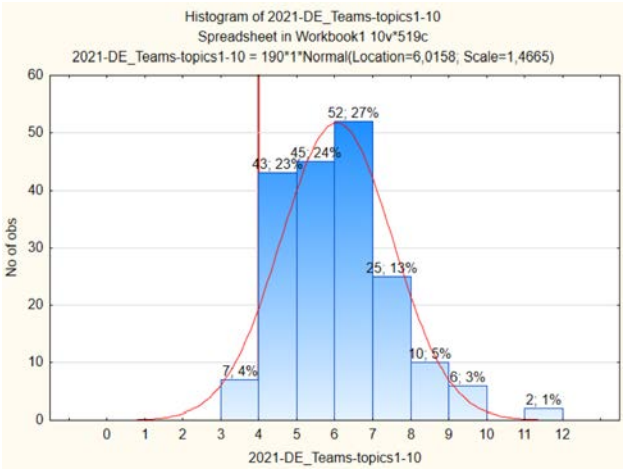

Figure 6. Students' average score for the blended part of the MIB 2020/21 course (topics 1-10)

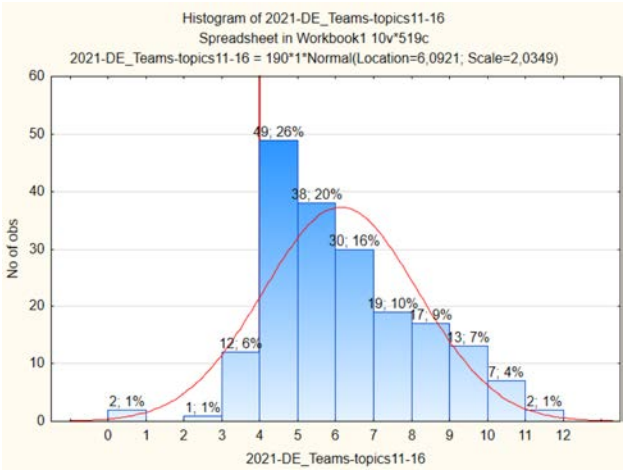

Figure 7. Students' average score for the DE part of the MIB 2020/21 course (topics 11-16)

During the 2020/21 academic year 190 students in 14 groups were taught respectively. Despite uniform education method has been used (full DE with meetings in MS Teams) – the same data alignment has been applied with aim

of comparing to the previous year's results was possible. So, the average scores achieved by students during learning topics 1 to 10 is shown on Fig. 6 and topics 11 to 16 – on Fig. 7 respectively. Same way, the total MIB course average scores are shown on pair of charts – as of the end of semester (Fig. 8) and after all committed "reworks" and "adjustments" (Fig. 9).

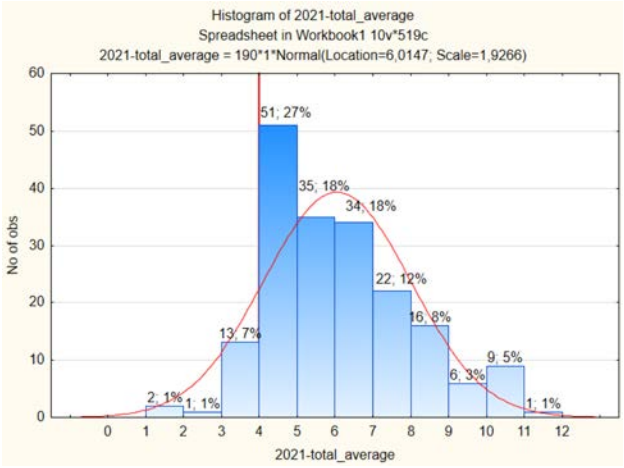

Figure 8. Students' total average score for the total MIB 2020/21 course

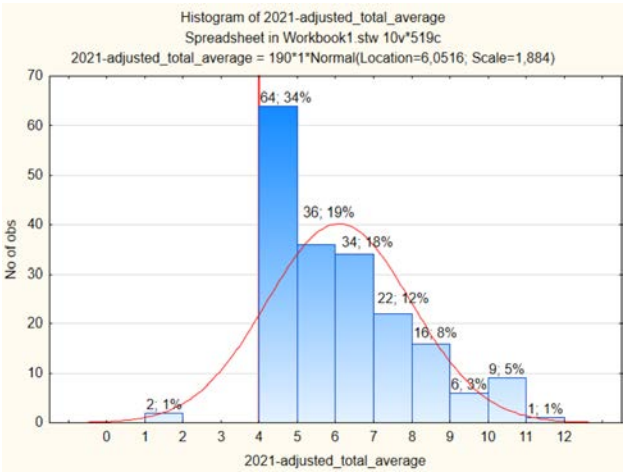

Figure 9. Students' total average score for the total MIB 2020/21 course (adjusted)

The following main outcomes are found after the source data and the corresponded charts (Fig. 2 and Fig. 9) have been studied:

- migration from the blended mode to the full-scale DE workflow in 2019/20 academic year was a very difficult process: grades fell down for all students significantly (Fig. 2 and Fig. 3). About half of students (85 of 184 or 48%) failed to earn even a minimal positive average grade ("4") for topics were taught during DE part of course;
- consequently, general performance of students in the MIB course was quite low in 2019/20 when 42% (78 of 184) of them barely managed to earn credits with grades just above a minimal positive;
- continuation of full-scale DE workflow in 2020/21 academic year is lasted more smoothly. Day-to-day students' performance (Fig. 6, Fig. 7) becomes closer to values were recorded in the past during blended mode (Fig. 2);
- general performance of students in the MIB course improved in 2020/21 as well. Number of those who earned credits with grades just above a minimal positive decreased by 8% (64 of 190 or 34%);
- finally, number of successful students (with average grade above "8") grown significantly form 3% in 2019/20 to 17% in 2020/21

Insufficient basic educational skills and poor educational background of foreign students at TNMU were identified as problems by authors far before COVID-19 lockdown. This is quite obvious because most students come from developing countries with low income and high poverty (Africa, Middle East and South Asia).

Low common digital literacy competencies along with basic computer skills of most of foreign students at TNMU provides additional obstacles which make transition from blended mode of educational process to full DE quite difficult for those students.

Above factors partially explains observed unsuccessful educational outcomes in 2019/20 academic year.

Continuous usage of full-scale DE stimulates students to develop and improve necessary self-education, computer and communication skills to be able to deal with online educational environment. Improved educational outcomes in 2020/21 academic year confirms this.

Introduction of regular online videoconferences as mandatory component of process of distance education also boost educational outcomes significantly for such mostly theoretical disciplines like Medical Informatics and Biostatistics. However, authors have to admit, that it also almost doubled teachers' real workload. So significant concerns appears regarding maintaining of teachers' personal health in long-term prospective.

5. Conclusion

The importance of readiness for full scale distance learning in high medical education is signed. This is illustrated by a history of introduction of the components of distance learning in education process at the I. Horbachevsky National Medical University in Ternopil. The key elements of implementation of full-scale distance education workflow at TNMU during the COVID-19 lockdown as well as its changes are presented. The distance education features of teaching of Medical Informatics and Biostatistics course at TNMU are noted. The experience gained during the implementation of full-scale distance education at TNMU within the COVID-19 lockdown is presented. The analysis of students' performance during the full distance educational period in comparison with a blended part of the Medical Informatics and Biostatistics course are presented. Low performance of foreign students during online learning of the MIB course was noted and explained. A value of real-time online communication as component of distance education process is signed.

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