Strengthening of e-learning at the leading Ukrainian pedagogical universities in the time of COVID-19 pandemic

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Abstract

Distance education has become the mandatory component of higher education establishments all over the world including Ukraine regarding COVID-19 lockdown and intentions of Universities to render valuable knowledge and provide safe educational experience for students. The present study aimed to explore the student's and academic staff's attitude towards e-learning and the most complicated challenges regarding online learning and distance education. Our findings disclosed that the online learning using Zoom, Moodle, Google Meet, BigBlueButton and Cisco has become quite popular among the students and academic staff in Ukraine in time of the lockdown period and beyond. Based on the Principal Component Analysis data processing we can conclude that students' satisfaction and positive e-learning perception are in a good correlation with quality of e-learning resources and set of apps which are used while e-learning and distance education. Also, education style, methods, and manner predict willingness of students to self-study. The self-motivation, time-management, lack of practice, digital alienation, positive attitude towards ICT, and instruction strategy belong to the most important challenges of COVID-19 lockdown based on the students and academic staff interviews. Online learning on daily purpose should be used in the favor of strengthening of classical higher education rather than replacing the former. Blended education is the best alternative to face-to-face education, because the communication with mentor in a live environmental even virtual should have ushered the learners to complete online learning and improve its results.

Keywords

E-learning, blended education, COVID lockdown, Moodle, Zoom, educational platform

1. Introduction

The novel disease COVID-19 caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) has originated from Wuhan (China) and is heavily spreading worldwide [1]. According to report of CSSE at Johns Hopkins University, as of 13 September 2020, more than 28.7 million cases have been reported in more than 188 countries and territories, resulting in

CTE 2020: 8th Workshop on Cloud Technologies in Education, December 18, 2020, Kryvyi Rih, Ukraine
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more than 920,000 deaths. Unfortunately, Ukraine is dealing with worse scenario of COVID-19 spreading than other European countries and takes 47-th place in the world due to new cases of COVID-19 per 100,000 people ([2]). The consequences of a pandemic include not only negative impact on physical health, but also mental health disorders [3], disturbance of economy [4, 5, 6] and some dimensions of education system [7, 8]. Almost 120 countries have stopped face-to-face learning and shifted to e-learning [9, 10]. All of these countries including Ukraine came out the policy of "learning never stops", which encourage higher education establishments efforts to provide safe remote learning on daily basis.

The specificity of teaching in modern universities in COVID-19 era determines the urgent demand for active implementation of distance learning along with traditional face-to-face and its combination with tradition type of education, developing special learning techniques in terms of learning methods and tools of both traditional and distance education [11, 12]. Distance education servers to gain students' knowledge and the academic staff skills and proficiency using ICT independently from external factors [13, 14]. The important feature of e-learning and distance education is the active involvement of students into educational process [15, 16, 17, 18]. They become active collaborators instead of passive learners, when teacher plays the role of guide and even advisor rather that instructor. On the present work we analyzed the perception, benefits and challenges of e-learning. Also, we would like to share some of the successful cases of e-learning and distance education at the leading Ukrainian Pedagogical Universities implemented during total lockdown of Universities while COVID19 pandemic.

2. Methodology

Online adapted surveys in terms of Google Form were carried out at Ternopil Volodymyr Hnatiuk National Pedagogical University (TNPU) and at the National Pedagogical Dragomanov University (NPU). The statistical representative sample included students from both Universities enrolled in online courses in different scientific fields, among them biology, maths, pedagogy, psychology, physics, history, English language, physical rehabilitation and IT. Following the margin of error at 3.7%, confidence interval at 95% and total number of students, the sample size was determined as 450. We gathered the opinions of students from TNPU and NPU who have enrolled to different majors. A majority (63%/37%) of surveyed students were women and represented young generation (19-22 years old). The online courses were available on the Moodle platform. Also, Zoom, Google Meet, Hangout, BigBlueButton and Cisco were used to support and enrich proposed courses. Students were welcomed to fill in the questionnaire that had prepared using Google Form in the mid and at the end of learning a subject. It was accessible via link in the Moodle and in the students Viber groups and Telegram channels for two weeks. The questionnaire contained several blocks of questions namely demographics (age, gender, nationality), peculiarities of education process (faculty, mode of study and enrollment, major area of study), experience with ICT tools and educational platforms, perceptions of the e-learning, perceptions of courses (content, deep sense of meaning, structure, clarity etc), perceptions of the tutor, and challenges and problematic points faced by students in e-learning (Adaptability Struggle, Technical Issues, Computer Literacy, Time Management and Self-Motivation).

We have also conducted survey of academic staff related to key points of success, effective

ways of monitoring students' engagement and learning, and challenges they faced in e-learning and distance education (Adaptability Struggle, Technical Issues, Computer and Media Literacy, Time Management and Self-Motivation).

Data were tested for the normality and homogeneity of variances using Kolmogorov-Smirnov and Levine test, respectively. For the data deviating from normality or homogeneity of variances, Box-Cox or log10 transformation was used. If the transformations did not result in normal distribution, non-parametric tests were used. The effects of analyzed predictors on student success in distance education and e-learning were tested by ANOVA/MANOVA and multiple regression analysis. The Pearson correlation test was used to find out association and linkage between studied parameters. All statistical calculations were performed with Statistica v. 12.0 and Excel 2019 for Windows. Differences were considered significant if the probability of Type I error was less than 0.05.

3. Results

A total of 450 persons admitted for the enquiry. The perception of e-learning, tutor and courses are shown in the table 1. We observed that the most of surveyed students had positive perception towards e-learning and they were basically satisfied with e-learning and distance education (table 1). Zoom, Moodle, Google Meet, BigBlueButton and Cisco have been pertaining to the most popular educational platform among the students and academic staff of TNPU and NPU since the beginning of the COVID-19 lockdown period and beyond. Also, almost of them expected that in near future the e-learning would take the dominant place in the education market due to possibility of students self-regulation and clear and coherent structure of the learning material in online learning, as well as rapid penetration of ICT in teaching strategies.

Importantly, that the present research also underlined the students' appreciation of the e-courses presented in Moodle which had the third largest market share of institutions in the world (17.1%) [19]. E-learning at TNPU, as the example of Ukrainian pedagogical universities, was implemented more than ten years ago on Moodle platform. Now TNPU-Moodle counts 1863 courses in different subjects and for different majors. When a course creates, we follow several quality standards namely informative content, structure environment, communication and availability, cooperation and interactivity, student assessment, flexibility, functionality technical support, faculty qualifications in terms of using novel teaching and learning technology, reports and recommendations for course improvement, vision and institutional leadership, and resource allocation due to recommendation of Swedish National Agency of higher education [13]. As the result, our students positively assessed the user-friendly interface, structure of the material and courses designed, the learning management system, convenience and wide range of communication facilities, including Zoom integrated in Moodle. It allows conducting live online classes, web-conferencing, webinars, video chats, live meetings and business meetings, even voting.

Over half of those surveyed reported that e-learning highly supports instructor accessibility, allows to receive fast feedback. While e-learning fast and flexible creation of a minute counsel with peers and instructor/mentor is also possible. It means that e-learning allows students to stick together, exchange knowledge and innovative ideas with peers during quarantine, and

Table 1
Overall perception of pedagogical universities students on the implementation of e-learning/distance education

	Responses	M	%
e-learning perception and attractiveness	Positive/Higher than offline learning	320	71
	Negative/Lower than offline learning	130	29
future belongs to e-learning	Yes	342	76
	No	108	24
e-learning should combine with face-to-face education	Yes	293	65
	No	157	35
students' satisfaction with e-learning and distance education	EL/DE meet my personal learning needs	311	69
	I wouldn't like to recommend EL/DE to others	139	31
university courses should combine with non-formal education	Yes	378	84
	No	72	16
quality of teacher-student interaction (Student involvement, Practice feedback)	High	279	62
	Low	171	38
quality of e-learning/distance education (Accuracy, Integrity, Completeness, Course management)	High	293	65
	Low	157	35
overall quality of courses available in Moodle (content, deep sense of meaning, clarity skills, etc	Satisfied	315	70
	Inadequate	135	30

overcome communication crisis. Many students now prefer to contact their instructors via Viber chat or email rather than during office hours.

Strong evidences of positive impact of informal education as a component of University courses was found when our students intensively attended free-off-charge online courses provided by Coursera for Campus for delivering modern world-class job-relevant and multidisciplinary education. At the beginning of the COVID-19 lockdown Universities all over the world in the favor of Coursera obtained the possibility to enhance their core curricula, offer supplemental learning to students, and deliver lifelong learning to their faculty and staff. More than 11 500 lessons taken and more than 1600 courses were successfully finished by TNPU learners and 14324 and 1894 by NPU learners correspondingly. Coursera for Campus helps our students not only enrich their knowledge with up-to-date information, but also allow to gain their language skills.

Besides there are a lot of preferences and benefits of e-learning and distance education, many students and staff face numerous challenges and pain points while teaching and studying online (figure 1). Except the most common complicated points presented on the figure 1, some of them namely "Maintaining high academic quality standards", "Synchronous class activities", and "Insufficient free content and/or materials for virtual courses" were recognized by respondents

as mid-risk issues (~35-40%).

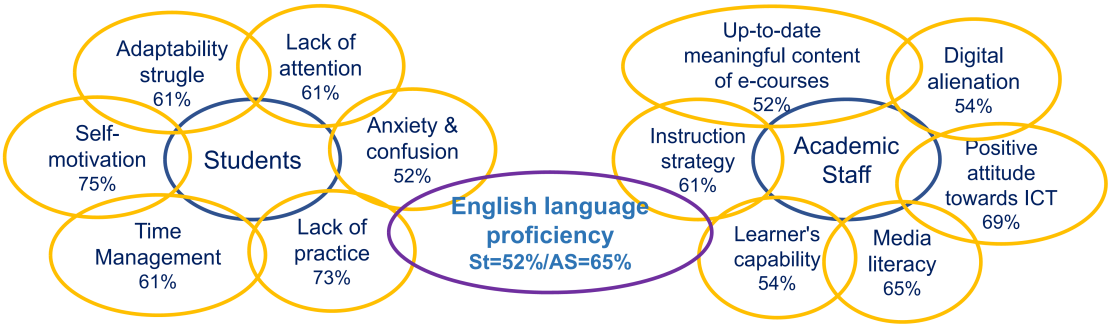

Figure 1: Challenges that students and academic staff faced as participants of e-learning/distance education.

We have applied Principal Component Analysis (PCA) to determine relationship between signs of e-learning perception and which determinants pose the most important influence to the student's decision to study online. The PCA identified two principal components (PC) with the eigenvalues >2 which explained 62.15 % of the variation in the data set (figure 2). The first PC had high positive loadings (>0.6) of the e-learning perception, students' satisfaction, e-learning resources completeness, e-learning material accuracy, practice feedback, and Future belongs to e-learning. The present group of parameters should be recognized as the "Future belongs to e-learning". The PC2 had a high positive loading of students' self-motivation to study and high negative loadings of the educational methods and styles.

Based on the PCA results we can conclude that students' satisfaction and positive e-learning perception are in a good correlation with quality of e-learning resources and set of apps which are used while e-learning and distance education. Also, education style, methods, and manner predict willingness of students to self-study.

To analyze the effects of specialty and maturity of students on their e-learning perception we processed data using discriminant analysis (figure 3). The current approach found that online learning perception and satisfaction don't depend significantly from their specialty ($F_{28,76} = 0.94, p<0.56$) or even year of study ($F_{28,76} = 0.48, p < 0.98$). Nevertheless we didn't observe significant difference between groups of interest, there is a clear trend that students of natural science and technical divisions responded in a different manner than liberal art students (Mahalanobis square distance = 2.4/2.2 versus 1.3 for difference between natural science and technical majors). It is interesting to note that students of first year study, Bachelor degree programs had a little bit different point of view than elder students (Mahalanobis square distance for IB compare to IVB and IM = 0.9 and 1.6).

4. Discussion

Nowadays, e-learning is becoming more-and-more popular. The latest survey conducted in the US proved that US companies with "comprehensive training programs" have 218% higher revenue per employee and 24% higher profit margins. IBM saved approximately $200 million

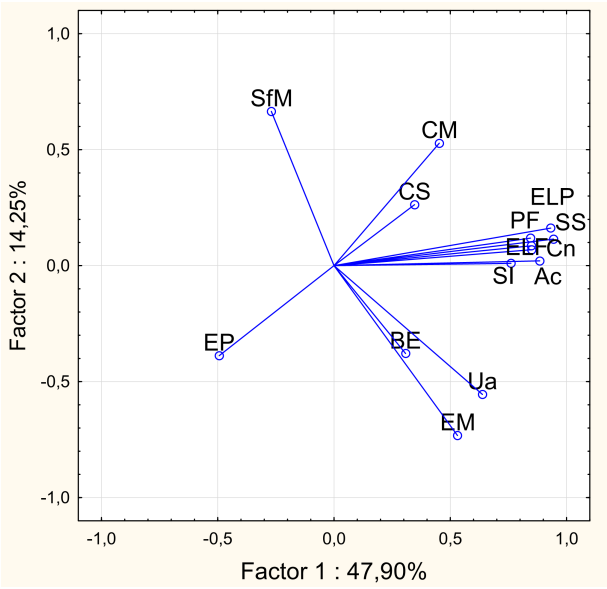

Figure 2: Principal component analysis of the results of the survey of students from Ternopil Volodymyr Hnatiuk National Pedagogical University and National Dragomanov Pedagogical University regarding e-learning perception and putative challenges. Factor loading is highly significant when more/less then +/-0.6. ELP – e-learning perception, ELF – Future belongs to e-learning, BE – e-learning should combine with face-to-face education, SS – Students' satisfaction, SI – Students' involvement, PF – Practice feedback, Ac – e-learning material accuracy, Cn – e-learning resources completeness, CM – Course management, CS – Course meaningful, EM – Educational methods and styles, Ua - Understandability, SfM – Self motivation, EP – English language proficiency.

after switching to e-learning. There is the expectation that the US e-learning market will grow by $12.81 billion between 2020 and 2024 [20].

E-learning is able to open new horizons for both educators and learners and offers a very effective way to conduct classes using electronic devices through educational videos [21], simulators [22], virtual laboratories [23], and virtual discussing. In this way distance education offers a new paradigm for teachers in which dynamic learning-centered courses rather than traditional ones with standard mode "lecturing – followed by testing" can be developed. As an option, students can build a team concept map collaboratively via Zoom or Google Meet and enhance their communicational and analytical skills simultaneously. Also, Think-Aloud-Pair-Problem Solving or Send-a-Problem mode can be used to gain students' thinking competencies. The conducted surveyed proved positive perception towards e-learning in students enrolled to study at Ukrainian pedagogical universities. In general, our results are in line with recently reported in literature. In particular, among 175 students, who are currently pursuing their undergraduate degrees in different colleges and universities in India, around 76% of the students are in favor of e-learning [24]. Indonesia students also perceived the e-learning web-based module to be useful in improving their understanding, independence, self-discipline, motivation to learn, and interactions with each other and with the teacher [25]. Nearly all participants of a secondary US history e-learning course maintained a belief that e-learning was best used

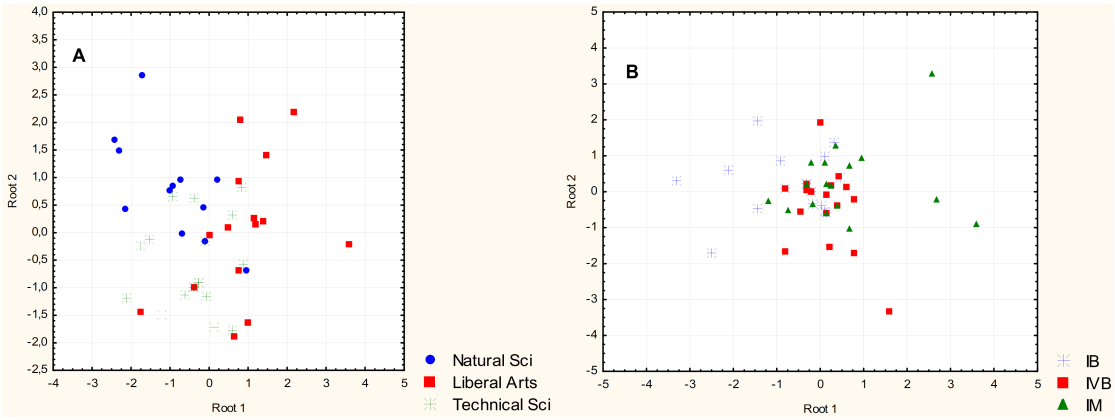

Figure 3: Graphical representation of discriminant analysis of the results of the survey of students from Ternopil Volodymyr Hnatiuk National Pedagogical University and National Dragomanov Pedagogical University regarding e-learning perception and putative challenges depends on the specialty (A) and year of study (B). IB – first year study, Bachelor degree, IVB – fourth year study, Bachelor degree, IM – first year study, Master degree

for information transmission and rote memorization rather than active or social learning [26]. According to Statista around 30% of students in the USA stated they had taken an online course in the 2018 and this number was dramatically increasing while COVID-19 lockdown [27, 28]. Indeed, positive perception on using e-learning technologies in future teachers is highly important not only for themselves, but for children will be taught. We are living in the modern world which is being shaped by rapid technological change and future teacher has to be ready to equip and prepare children for this brave digital world.

On the other hand, it has been recently shown that 77.4% students from Pakistan medical college showed negative perception about e-learning, out of which 86% students felt e-learning has little impact on their learning. Majority of the students preferred face-to-face teaching over e-teaching. Following survey results authors came out with conclusion that the students are not yet ready for e-learning [29]. Obviously, it can be connected to specificity of medical education regarding its practical orientation. In our case the response of students had enrolled to study at Natural Science and Technical majors resembled above mentioned. Medical ones regarding lack of practice. Due to that they formed their own cluster when processed by Discriminant Analysis (figure 3) and the practical feedback pertains to the most prominent parameters which predict the perception of e-learning and distance education (figure 2). It means e-learning can be used for all majors, but has to be tightly adapted to educational needs. The building and implementation of simulation apps and virtual laboratories should be helpful [30].

The PCA shows us that the e-learning perception, students satisfaction, e-learning resources completeness, e-learning material accuracy, practice feedback, and Future belongs to e-learning create their own cluster, because correlate with each other. Our finding broadly supports the statements of other research in the area linking students satisfaction. As an example, Granada University students satisfaction with e-learning was predicted by the course plan, contents and the system of evaluation. Moreover, the content was the most powerful determinant

in the multiple regression model (coefficient = 0.9, p <0.001), then followed by interaction (coefficient = 0.531, p <0.001) and technical issues (coefficient = 0.471, p <0.001) [31]. Alqurashi also found that earner-content interaction was the strongest and most significant predictor of Temple University students' satisfaction with e-learning [32]. Indeed, the content of e-courses has to stimulate their interest for the course and help students to relate their personal experience to new knowledge.

Another important finding of the PCA is that self-motivation of students is in a negative relation to educational methods and styles (figure 2). This statement corroborates the results of the previous work and postulates of the self-determination theory. The learning style of students from University of Shahrekord (Iran) significantly correlated with motivation for higher education in general ($r = 0.69, p < 0.001$), but no information about self-motivation to study was presented there [33]. Self-study-oriented and autonomy-supportive Faculty initiate in their students intrinsic motivation, inquisitiveness, and the desire to solve logic problems and overcome practical challenges. The goal-orientated education and extrinsic motivation are also very helpful to catalyze students self-motivation to study.

Based on the response of our students "Future belongs to e-learning" should be recognized as the vision of youth of upcoming changes in the educational system. Substantially, e-Learning and distance education have capabilities to mobilize the educational, cultural, and economical communities in favor of accelerate systemic changes towards professional, intelligent and knowledge-based society. E-learning is much more accessible and in some aspects is more profound than physical learning. All studying materials are available online and you can access them as many times as you want. Moreover, technological performance in the era of e-learning and distance education together with novel challenges can push us towards some uncommon, but very interesting and useful practice. For example, during the COVID-19 lock-down TNPU in the tight cooperation with PreCarpathian National University have launched authorial between-university educational online platform "TerPEdu" for lectures which is based on the Cisco Webex. More than 2400 students from both partner universities attended lectures in different disciplines. Most of them gave positive feedback and emphasized on the interactivity of the presented platform when compared with well-known counterparts including EdEra, Coursera, Alison etc and the possibility to realize mobility in the frame of "internationalization at home". At the moment we are working on expanding partner network in Ukraine and beyond. We expect that we will involve "visiting professors" from partner universities from Germany and Poland by the end of 2020. We are on the way with Chinese courses for TNPU Students cordially provided by partner Shenyang Pedagogical University. Also, we are going to organize online summer school in the same way due to recommendations of the THEA-Ukraine DAAD Project.

Take into account different factors that should affect educational outcomes, our results and previous research findings [34] we can conclude that, on-line learning on daily purpose should be used in the favor of strengthening of classical higher education rather than replacing the former. The statement keeps in line with the point of view of the European University Association. The blended learning pretends to be the most useful scheme in that case. It combines the in-person and online components in suitable ratio depends on the baseline level and needs of learners and capability of teachers. Blended learning builds both a community of inquiry and a platform for free and interactive dialogue [35]. Also, blended learning allows to deliver learning material through both synchronous and asynchronous modes and break up it into smaller chunks [36].

This educational mode should be very useful for learners to process, understand, and keep in mind materials better than in standardized face-to-face ones. In accordance with the present results, numerous last students surveys all over the world proved that blended learning has to be widely promoted at the universities due to reduction of negative attitudes of learners toward digital instruments [37] and as the upcoming educational mainstream.

Nowadays, students' expectations are shifting rapidly from passive learning in class with a teacher as a main owner of information to blended education or even distance education which characterized by flexible schedule and fully accessible materials through online mode in gadgets. In other words, modern education mode allows students to learn at their comfort and requirement. In this context, education process is pretended to be strongly associated with digital and mobile paced. Meanwhile Universities and learners have faced due to that one of some challenges namely robust internet connection with the high band. And Ukraine was not alone in that way. A lot of surveys from different countries have denominated unsatisfied internet connection at the top of the pain list around distance education [12]. In particular, they emphasized that good internet connectivity is urgently needed to avoid buffering and lagging of the live stream, but e-learning is even worse in rural areas compared to urban due to lack of infrastructure that online courses require, and thus fail to attend with their virtual classes [24]. However, we have successfully overcame low-speed internet connection in students from rural area or even unexpected internet outage and conducted classes. Furthermore, we have successfully assessed students (including art students) via Zoom and Moodle at the end of courses in terms of final examination. Also, all Master and Bachelor thesis defense were conducted via Zoom, including foreign students from Greece and Slovakia. It was the very first attempt pushed by COVID-19 lockdown, but very valuable.

E-learning and distance education demands the educators and learners to be technology-friendly which is not the case always. "Digital alienation" and "Positive attitude towards e-learning" were chosen by academic staff as one of the most stressful points of e-learning (figure 1). Nevertheless technology has brought a little alleviation for the teachers so-called "Digital Divide", they recognized this as a challenge, but not as a benefit. Moreover, it is indeed not only in Ukraine, but over the world. In particular, 41% of US teachers stated the lack of ICT skills and knowledge was the biggest barrier to increasing the use of educational tech in their classrooms [38]. Stieler-Hunt and Jones concluded that whilst negative teacher attitudes towards the use of digital tools in the classroom persist, their potential impact in the classroom will not be fully realized [39]. This is especially true for elder generation of instructors and the average age of academic staff at Ukrainian universities varies between 50-55. To attenuate these painful points, we have proposed for TNPU's Faculty some training courses devoted to the most useful online platforms (Zoom, Google Meet, BigBlueButton), workshops about suitable tools for preparation of video lectures and virtual programs, and hotline via Viber channel where every person is allowed to obtain useful tips and advises due to e-learning. They were carried out by center of distance education of TNPU and recognized as very helpful.

Another challenge faced both by students and academic staff (figure 1) is that limited English language proficiency. Language skills are urgently needed for successful handling of ICT, acquisition new information, finding partners and creation of consortia in terms of realization of educational/research projects and searching better job opportunities. We have been tackling present challenge by way of implementation of English language courses for both students and

academic staff and initiation bridging programs for life-science and technical master students that includes English proficiency. Also, we have launched the University call for the best bridging programs and now our Faculty are on their way of the course preparation for contest.

The next very important challenge is related to the theoretical meaning of e-learning and distance education. The distance education focuses predominantly on the theoretical imparting of the subjects when applied majors require practical classes and considerable hands-on skills. In last decades some investigations pointed that students tend to prefer real practical experimentation to computer simulations even though the latter cover similar ground [40]. Moreover, it was proved that personal interaction with equipment leading to the accumulation of knowledge and skills required in a practice-oriented profession [40]. Due to that we have been doing all our best to discover virtual programs and apps which should be very helpful for students who copes with practical issues in technical and natural sciences.

5. Conclusions

The COVID-19 pandemic have complex, unpredictable, and long-term implications for education and research that must be anticipated now. Remote e-learning solution can mitigate the immediate disruption caused by COVID-19 and establish novel approaches to develop more open and flexible education systems for the future. Nevertheless there were some challenges regarding e-learning, the most of surveyed students admitted to study at Ukrainian pedagogical universities had positive perception towards e-learning and they were basically satisfied with e-learning and distance education. Higher education e-learning marks very essential for both students and academic staff and universities have to make eager efforts for discovering the optimal way for reaching best learning outcomes. E-learning on daily purpose should be developed in parallel with the blended education which is a valuable concept to provide students with opportunities for autonomous learning and a decentralized transfer of knowledge in line with face-to-face communication. We have to strengthen the cooperation between Ukrainian universities and their abroad partners in the field of digital education regarding to reciprocation of educational protocols, virtual apps, as well as Faculty exchange in the framework of "Visiting Professor" institution.

Acknowledgments

We are grateful for DAAD for THEA-Ukraine and the opportunity to be involved in the project and Coursera for Campus for free access to e-courses while COVID-19 pandemic. Also, we appreciate our partners from Precarpathian National University.

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