Digitalization of Higher Education Around the Globe During Covid-19

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ABSTRACT E-learning is an evolutionary concept, not a revolutionary concept since it has been introduced and practiced in previous decades as well. The current research paper contributes to educational research based on the investigation of holistic perspectives of the ongoing online teaching activities during the lockdown period. The article is built on a literature review. The methodologies are described and the results are presented. There have been research on distant learning and digitalization, but mostly in terms of potential, obstacles, and student assessments, as well as their influence on education. There are no empirical research on the worldwide trend of how employees utilize e-learning resources to determine instructors' interest in and attitudes about using them. This chasm is also regarded a new angle of empirical research that uses the Chi-square test of independence to find patterns. The present research aims to build a realistic instrument that can assess instructors' attitudes about e-learning during COVID-19 with this purpose in mind. The paper consists of two parts: a literature review and statistical analysis. The research was conducted by means of a diagnostic opinion CAWI (Computer Assisted Web Interview) questionnaire and statistical analysis. This study was conducted among 342 teachers working in various universities located in the following countries: Poland, Pakistan, Iraq, USA, UK, Germany, and Austria. The questionnaire consisted of 20 questions. The researchers provided a detailed overview of e-learning practices during the pandemic and its future prospects from the teacher's point of view. The goals of this article and the research problems are to learn about the worldwide trend of how employees utilize e-learning resources, to identify teachers' interests in and attitudes towards using e-learning resources throughout the globe, and to recommend opportunities for workers to use e-learning resources around the world, which is a very important issue, especially in the era of globalization, society 5.0, and industry 4.0. The authors also proposed a Chi-square statistical analysis to check whether there exists a relationship between two variables based on which the hypotheses were formulated. The results of the study clearly show that the respondents approach to e-learning was very responsible because they realized that it was up to them to properly convey knowledge. The results of empirical research show that the digitalization of education is no longer a future trend, but today's trend or even a university standard in the education improvement direction.

INDEX TERMS Continuing education, distance learning, education courses, statistics.

I. INTRODUCTION

Digitalization, or the replacement of face-to-face contacts with digital interactions [1], is causing changes in higher education and influencing the trilemma; institutions confront new difficulties, and possibilities are arising [2], [3]. The

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COVID-19 pandemic has had a massive impact on human life across the globe. The strategies of companies nowadays are adapting to the conditions of the epidemic by using digitalization of processes and tasks as well as innovative approaches in management [4]. The outbreak of the covid-19 pandemic created a negative impact on education too [5]. In order to contain the spread of COVID-19, most countries in the world temporarily closed educational institutions [6] to stop the

infection from spreading [7]. According to UNESCO, by the end of April 2020, educational institutions were shutting down in 186 countries, affecting approximately 74% of total enrolled learners on the planet [7]. With the spread of the COVID-19 pandemic increasing due to new mutant types, there is a paradigm shift that occurred during this period towards online teaching mode, since it is the only option left to continue education due to the indefinite shut down of schools, colleges, and universities [8]. Online education is a modern approach and pedagogical shift from the traditional method of education that transformed the teaching-learning experience from the classroom to online portals, from personal to virtual, and from seminars to webinars [9]. As noted by the authors, Gajdzik B. and Wolniak R., digitalisation is the technical achievement of the Third Industrial Revolution [10]. COVID-19 and the mass transition of educational relations into the distance learning form have unexpectedly boosted digitalization in education [11]. Digitalization in education is a very important trend in the world, which will fundamentally change the nature of education in the upcoming decades [12] as well as enable the creation of services of much higher quality than today [13]. The development of the Internet and, nowadays, COVID-19 determined an increase in the role of computer-based instruments in the education process. This is the reason why educational institutions have an increasing need to use virtual learning environments (VLE), namely an electronic learning platform [12]. The education system has experienced a sudden shift from a conventional classroom environment to electronic devices and online applications [14]. Without the means of e-learning platforms, education would have reached a sudden halt since the outbreak of COVID-19 [15]. Because of COVID-19, there is not sufficient time to assure the quality of e-learning and teaching environments [16].

II. DISTANCE LEARNING – LITERATURE REVIEW

The COVID-19 Pandemic wreaked havoc on many areas of society, including education, drastically altering students' learning environments. Governments all over the globe have had to shut schools and colleges in order to transition to an online method of delivery in the education sector [17], [18]. Because of the fast shift to online learning, educators and institutions must create more creative teaching approaches to help students cope with the issue. It's important to remember that we're living in the age of large-scale online learning, in which education is given remotely through a variety of digital platforms [19]. Mohalik and Sahoo (2020) argued that the transformation of teaching and learning to an online mode has received huge acceptance from teachers, especially during the COVID-19 pandemic situation [16], [17]. Due to the urgent adoption of the online mode, many teachers are left unprepared mentally, financially, socially, and even technically. This is because teachers too face difficulty in handling technological pedagogical approaches as they are unfamiliar with them [16], [18], [20]. Tam and El-Azar (2020) advocated that "resilience must be built into our educational

systems," and their study also indicated three trends expected in future transformations: increasing educational innovations, emboldened public-private educational partnerships, and a digital divide gap [21], [22]. The authors showed that the time-bound relevance and critical nature of the online teaching mode have been realized during the lockdown period [9]. Dhawan [23] mentioned that there are several arguments positively associated with e-learning, such as accessibility, affordability, flexibility, learning pedagogy, life-long learning, and policy. Moreover, it is said that the online mode of learning is easily accessible and can even reach rural and remote areas. It is a relatively cheaper mode of accessing education since it reduces the costs incurred in transportation, accommodation, and the overall cost of institution-based learning.

Online teaching of the courses requires detailed lesson plans and good study materials should be developed accordingly. Certain challenges are faced in online education modes, such as a lack of online teaching skills among educators, time-consuming preparation of lesson plans, lack of appropriate support from technical teams, and traffic overload in online educational platforms. Not only the teachers, but also the students realized the challenges. There are the following challenges, in their opinion: a lack of a proper learning attitude, lack of suitable learning materials, an inclination towards classroom-based learning, incapability of maintaining self-discipline, and an inadequate learning environment at their homes during self-isolation [24].

The experience gained from the COVID-19 pandemic demands new laws, regulations, platforms, and results to be generated [25] or future cases when countries, governments, and people will be better prepared than today [22], [26].

Narayanan (2020) showed that more than 70% of the respondents in his study agreed that COVID-19 increased the general awareness and importance of technology in today's world and also expressed concern about the loss of job opportunities. Furthermore, more than 60% of the respondents agreed that COVID-19 resulted in psychological stress and complicated visa and visa-extension procedures. Most of the respondents who took the survey (55%) said that the home environment and where the person is staying, as well as technical skills and location flexibility, were the most important factors in the success of online learning [27]. Allo (2020) did a study and found that online learning is very useful when there is a pandemic outbreak [28].

III. ATTITUDE TOWARDS DISTANCE LEARNING DURING COVID-19

In recent years, e-learning has gained immense popularity and wide acceptance among higher education institutions and the student community to access e-learning resources [18]. Modern technology facilitates and provides students with ease of access to learning new things. Attitude plays a crucial role in using e-learning approaches as a strong tool for positive change. During the COVID-19 lockdown, the e-learning approach was widely accepted by higher education institutions to educate their students [29]. Krishnakumar and

Rajesh (2011) stressed that teachers should have a positive attitude and must be familiar with using technology-related products in the teaching-learning process. The study confirmed that those teachers who are familiar with the e-learning approach remain more satisfied than those who are not familiar with the technology. The comparison revealed the attitudes of both types of teachers in universities [21].

In the study conducted by Alhumaid *et al.* (2020), the authors investigated the perception and attitude of teachers towards e-learning acceptance in developing countries. They found a positive relationship between e-learning and technological acceptance in Pakistan during the COVID-19 lockdown. The teachers also exhibited a positive attitude towards the research findings. The teachers said that the technology is very useful when there is a crisis, and it also helps the students do better in school [30].

Another study by Akbarilakeh *et al.* (2019) showed that university workers were happy with the e-learning method [31].

IV. METHODOLOGY

A. RESEARCH PROBLEM

The purpose of this article is to know the global trend of how e-learning resources are used by workers, identify the interest and attitude of workers towards using e-learning resources across the world, and suggest prospects for using e-learning resources by workers across the world. Based on the research problem, objectives were defined. The sudden outbreak of the COVID-19 pandemic has affected education prospects across the globe, irrespective of its status i.e., developing or developed countries [25], [28], [32]. The pandemic has disrupted the traditional teaching-learning form of education that we have been accustomed to for many years. However, the current situation is a completely unprecedented one and has never been experienced by any generations in history. There are studies that have examined distance learning issues and digitalization, but first of all in terms of opportunities, challenges, and basis on students' evaluations or its impact on education [11], [21], [22], [24], [33]. There are no empirical studies on the global trend of how workers use e-learning resources to determine instructors' interests in and attitudes toward utilizing e-learning resources. This gap is also considered a further perspective of empirical research to identify trends by using Chi-square test of independence. With this motivation, the current study is aimed at developing a practical tool that can measure teachers' attitudes towards e-learning during COVID-19. Education has been suspended for a long time now since the COVID-19 pandemic continued for almost two years, with third and fourth waves predicted in the upcoming months. So, researchers should find a measure of trends towards e-learning. Even if the COVID-19 pandemic ends, e-learning must be continued in anticipation of future disasters so that the human community will be better prepared. The researchers provided a detailed overview of e-learning practices during the pandemic and its future prospects from the teacher's point of view.

A Chi-square statistical analysis was also suggested by the authors. This is a way to see if there is a relationship between two variables that were used to make hypotheses.

H1. *It is assumed that COVID-19 has a significant impact on the educational digitalization of higher schools.*

H2. *Adaptation of universities to the new situation has a significant impact on the level of education.*

Students nowadays expect their university to not only provide them with a valuable source of practical knowledge, but also to be prepared to provide appropriate distance learning opportunities on a daily basis to diversify and enrich their study process experience, as well as during global pandemic crises, which will most likely be a reality in their lives in the coming decades [34], [35]. However, the twenty-first century has brought new challenges: today's digital possibilities are founded on the knowledge and systems of the previous three industrial revolutions, maturing into a new level of human-technological integration for more efficient goods that satisfy today's society's demands [25], [28], [32]. The COVID19 pandemic, which began in March 2020, posed unanticipated and major problems for all European Union education and training institutions, necessitating quick actions from Member States. The coronavirus outbreak posed several new and unforeseen challenges to higher education institutions. Today's universities in Europe face both difficulties and possibilities, particularly in terms of digitization and digitally enhanced learning and teaching [36].

B. SIGNIFICANCE OF THE STUDY

The current study is aimed at finding out the e-learning experience during the COVID-19 pandemic. This study was conducted among teachers working in various universities so as to gain additional information regarding the contribution of the e-learning approach during this pandemic. It can be a way to learn in schools to improve the teacher's knowledge and skills by using digital technology.

C. OBJECTIVES

- To know the global trend of how e-learning resources are used by workers;
- Identifying workers' interest in and attitudes toward using e-learning resources around the world;
- To suggest prospects for using e-learning resources by workers across the world.

D. STUDY SAMPLE

The current study was conducted based on primary data. The data was collected from workers associated with different universities. An online questionnaire was prepared and the data was collected by uploading the questionnaire as a Google form. Among the workers, only 342 samples were scrutinized based on the stratified sampling method. The study period was October 2020. There were a total of 20 questions in the survey. Table 1 shows the demographic information of the study samples.

TABLE 1. Demographic information.

	Type	Freq.	%
Sex	Male	224	65.5
	Female	118	34.5
Age (years)	30–39	94	27.5
	40–49	97	28.0
	50–59	93	27.5
	more than 60	58	17.0
Seniority (years)	up to 5	40	12.0
	6–10	71	21.0
	11–15	42	12.0
	16–20	95	28.0
	21–25	63	18.0
	26–30	21	6.0
	more than 30	10	3.0
University Type	Private	224	65.0
	Public	112	33.0
	Other	6	2.0
Education Level	Master	82	24.0
	PhD.	142	42.0
	Prof.	72	21.0
	Other	46	13.0
Country	Poland	53	15.0
	Pakistan	28	8.0
	Iraq	57	17.0
	USA	18	5.0
	UK	6	2.0
	Germany	3	1.0
	Austria	8	2.0
	Other	169	49.0

TABLE 2. Important problems.

Questions	Type of Problem	Freq.	%
Q2: What kinds of problems did you have while conducting e-learning classes?	problems with Internet	93	22
	problems with student's activity	69	17
	problems with quiz	48	12
	problems with inserting material for students	29	7
	I have a problem with understanding what is creating modules, because I have not completed the e-learning platform course	34	8
	problem with grading students	21	5
	problem with checking student activity	31	7
	communication problem with students	62	15
	other	30	7
Q3: Which form on the e-learning platform activity do you most often use?	test	246	49
	discussion	108	21
	www page	54	11
	task	47	9
	forum	24	5
	another	28	6
Q4: What resources do you most often use when presenting new material?	power Point presentation	203	34
	text in word	97	16
	link to the www website	57	9
	case study	41	7
	video	163	27
	other	40	7
Q5: What kinds of problems did you have while conducting the exams in e-learning mode?	students did not take the exam	105	31
	broken Internet connection	142	42
	some technical problems	81	24
	other	10	3

V. PRACTICAL SIDE

As shown in the results, most of the teachers prefer to use Google Class.

Because it is still the best and most flexible way to learn, as shown by the sample members' answers to the first question (see Fig. 1).

Table 2 shows the most important problems faced by teachers during the COVID-19 pandemic.

VI. CHI-SQUARE TEST OF INDEPENDENCE

Table 3 shows the results of the descriptive statistics (frequencies and percentages) for the questions underlying the e-learning scale. The scale consists of 15 questions from V1 to V15, and most of the questions are of the Yes/No question type, while a few are Yes/No/Don't know questions. The analysis of this scale is followed by cross-tabulation for V1 with other questions associated with the Chi-square test in order to test if there is a correlation or independence between the selected items.

Based on the questions asked by the respondents (V1-V15), factors with or without dependencies were developed. In order to check their origins by means of the student's t-test, the Chi-square values and C-Pearson coefficients were calculated, which are presented in the following tables.

Table 4 shows the cross-tabulation results between V1 and V2 associated with the Chi-square test of independence. The results of the Chi-square test show that V1 and V2 are independent of each other since ($\chi^2(1) = 0.399$, $P > 0.05$).

TABLE 3. Frequencies and percentages for variables.

V	Variables	Category	Freq.	%
V1	Has distance learning been introduced at your University during the covid -19 pandemic?	Yes	302	88.3
		No	40	11.7
V2	Did you conduct e-learning classes before the pandemic?	Yes	244	71.3
		No	98	28.7
V3	Was it difficult for you to convince yourself of the e-learning platform in the face of COVID-19 when you had to switch to remote work?	Yes	73	21.3
		No	269	78.7
V4	Have you ever participated in e-learning courses?	Yes	241	70.5
		No	101	29.5
V5	From the teacher's point of view, do you think that e-learning is hard?	Yes	261	76.3
		No	81	23.7
V6	Do you think that e-learning requires more work in preparing materials for students than traditional classes?	Yes	307	89.8
		No	35	10.2
V7	Do you agree with the statement that the pandemic has forced you to try a new form?	Yes	276	80.7
		No	66	19.3
V8	Were your students actively involved in e-learning classes?	Yes	284	83.0
		No	58	17.0
V9	Did you have any problems while conducting e-learning classes?	Yes	307	89.8
		No	35	10.2
V10	Do you like conducting classes in e-learning mode?	Yes	218	63.7
		No	51	14.9
		Don't know	73	21.3
V11	Do you think that e-learning is our future?	Yes	205	59.9
		No	40	11.7
		Don't know	97	28.4
V12	Do you think that e-learning gives you the opportunity to get to know the potential of students?	Yes	295	86.3
		No	47	13.7
V13	Has the pandemic made students more involved than ever before in e-learning classes?	Yes	249	72.8
		No	93	27.2
V14	Did you conduct e-learning exams?	Yes	272	79.5
		No	70	20.5
V15	Did you have problems while conducting exams in e-learning mode?	Yes	198	57.9
		No	71	20.8
		Don't know	73	21.3

Table 5 shows the cross-tabulation results between V1 and V3 associated with the Chi-square test of independence. The results of the Chi-square test show that V1 and V3 are correlated with each other, since ($\chi^2(1) = 18.193$, $P < 0.001$).
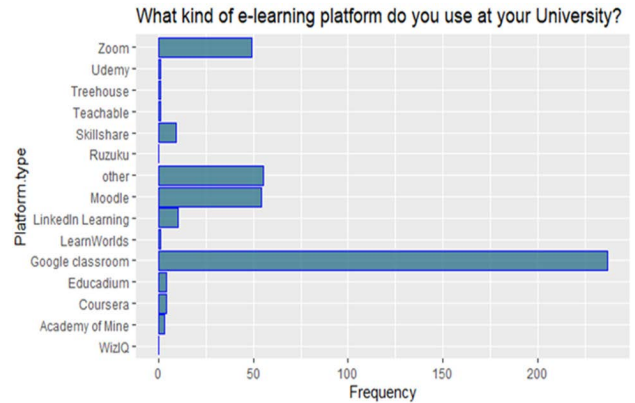

FIGURE 1. Kind of e-learning platform.

TABLE 4. Cross-tabulation between V1 and V2.

Variables		V2		Total
		Yes	No	
V1	Yes	66	236	302
	No	7	33	40
Total		73	269	342

Chi-Square = 0.399, df = 1, P-value = 0.528.

TABLE 5. Cross-tabulation between V1 and V3.

Variables		V3		Total
		Yes	NO	
V1	Yes	204	98	302
	NO	40	0	40
Total		244	98	342

Chi-Square = 18.193, df = 1, P-value = 0.000

Table 6 shows the cross-tabulation results between V1 and V4 associated with the Chi-square test of independence. The results of the Chi-square test show that V1 and V4 are correlated with each other, since ($\chi^2(1) = 13.1$, $P < 0.001$).

TABLE 6. Cross-tabulation between V1 and V4.

Variables		V4		Total
		Yes	No	
V1	Yes	203	99	302
	No	38	2	40
Total		241	101	342

Chi-Square = 13.1, df = 1, P-value = 0.000

Table 7 shows the cross-tabulation results between V1 and V5 associated with the Chi-square test of independence.

The results of the Chi-square test show that V1 and V5 are independent of each other, since ($\chi^2(1) = 1.00$, $P > 0.05$).

TABLE 7. Cross-tabulation between V1 and V5.

Variables		V5		Total
		Yes	No	
V1	Yes	233	69	302
	No	28	12	40
Total		261	81	342
Chi-Square = 1.00, df = 1, P-value = 0.317				

Table 8 shows the cross-tabulation results between V1 and V6 associated with the Chi-square test of independence. The results of the Chi-square test show that V1 and V6 are independent of each other, since ($\chi^2(1) = 0.253$, $P > 0.05$).

TABLE 8. Cross-tabulation between V1 and V6.

Variables		V6		Total
		Yes	No	
V1	Yes	272	30	302
	No	35	5	40
Total		307	35	342
Chi-Square = 0.253, df = 1, P-value = 0.615				

Table 9 shows the cross-tabulation results between V1 and V7 associated with the Chi-square test of independence. The results of the Chi-square test show that V1 and V7 are independent of each other, since ($\chi^2(1) = 0.003$, $P > 0.05$).

TABLE 9. Cross-tabulation between V1 and V7.

Variables			V7		Total
			Yes	No	
V1	Yes		271	31	302
	No		36	4	40
Total			307	35	342
Chi-Square = 0.003, df = 1, P-value = 0.959					

Table 10 shows the cross-tabulation results between V1 and V8 associated with the Chi-square test of independence. The results of the Chi-square test show that V1 and V8 are correlated with each other, since ($\chi^2(2) = 8.938$, $P < 0.05$).

Table 11 shows the cross-tabulation results between V1 and V9 associated with the Chi-square test of independence. The results of the Chi-square test show that V1 and V9 are independent of each other, since ($\chi^2(1) = 0.640$, $P > 0.05$).

Table 12 shows the cross-tabulation results between V1 and V10 associated with the Chi-square test of independence. The results of the Chi-square test show that V1 and V10 are independent of each other, since ($\chi^2(1) = 0.946$, $P > 0.05$).

TABLE 10. Cross-tabulation between V1 and V8.

Variables		V8			Total
		Yes	No	Don't know	
V1	Yes	201	41	60	60
	No	17	10	13	13
Total		218	51	73	73
Chi-Square = 8.938, df = 2, P-value = 0.011					

TABLE 11. Cross-tabulation between V1 and V9.

Variables		V9		Total
		Yes	No	
V1	Yes	249	53	302
	No	35	5	40
Total		284	58	342
Chi-Square = 0.640, df = 1, P-value = 0.424				

TABLE 12. Cross-tabulation between V1 and V10.

Variables		V10		Total
		Yes	No	
V1	Yes	246	56	302
	No	30	10	40
Total		276	66	342
Chi-Square = 0.946, df = 1, P-value = 0.331				

Table 13 shows the cross-tabulation results between V1 and V11 associated with the Chi-square test of independence. The results of the Chi-square test show that V1 and V11 are independent of each other, since ($\chi^2(2) = 3.265$, $P > 0.05$).

TABLE 13. Cross-tabulation between V1 and V11.

Variables		V11			Total
		Yes	No	Don't know	
V1	Yes	182	32	88	302
	No	23	8	9	40
Total		205	40	79	342
Chi-Square = 3.265, df = 2, P-value = 0.195					

Table 14 shows the cross-tabulation results between V1 and V12 associated with the Chi-square test of independence. The results of the Chi-square test show that V1 and V12 are correlated with each other, since ($\chi^2(1) = 4.939$, $P < 0.05$).

Table 15 shows the cross-tabulation results between V1 and V13 associated with the Chi-square test of independence.

TABLE 14. Cross-tabulation between V1 and V12.

Variables		V12		Total
		Yes	No	
V1	Yes	214	88	302
	No	35	5	40
Total		249	93	342
Chi-Square = 4.939, df = 1, *P*-value = 0.026				

The results of the Chi-square test show that V1 and V13 are correlated with each other, since ($\chi^2 (2) = 12.35, P < 0.01$).

TABLE 15. Cross-tabulation between V1 and V13.

Variables		V13			Total
		Yes	No	Don't know	
V1	Yes	168	61	73	302
	No	30	10	0	40
Total		198	71	73	342
Chi-Square = 12.35, df = 1, *P*-value = 0.002					

Table 16 shows the cross-tabulation results between V1 and V14 associated with the Chi-square test of independence. The results of the Chi-square test show that V1 and V14 are correlated with each other, since ($\chi^2 (1) = 10.1, P < 0.001$).

TABLE 16. Cross-tabulation between V1 and V14.

Variables		V14		Total
		Yes	No	
V1	Yes	267	35	302
	No	28	12	40
Total		295	47	342
Chi-Square = 10.1, df = 1, *P*-value = 0.001				

TABLE 17. Cross-tabulation between V1 and V15.

Variables		V15		Total
		Yes	No	
V1	Yes	253	49	302
	No	19	21	40
Total		272	70	342
Chi-Square = 28.55, df = 1, *P*-value = 0.000				

Table 17 shows the cross-tabulation results between V1 and V15 associated with the Chi-square test of independence. The results of the Chi-square test show that V1 and V15

are correlated with each other, since ($\chi^2 (1) = 28.55, P < 0.001$).

Through the statistical analysis, the following hypotheses (H$_1$, H$_2$) are accepted. This confirms the existence of a relationship among the variables. The analysis of data about digitalization of higher education around the globe during covid-19 allows for the conclusion that the selection of the sample for the study was correct.

VII. CONCLUSION

Future learning will be replete with easy, cost-effective, and efficient digital technologies. As a result, aggressive improvement, outstanding service systems, determination, unique aptitudes, talents to lead data and information resources, continual transformation and development, alignment to excellence, and completion must all be encouraged by education administration and learning procedures. The COVID-19 epidemic shown that smart learning technologies have become one of the most important components in integrating universities into the global higher education market [37]. Massive changes are occurring in education, skills, and employment as a result of digital technology. These developments reflect how technology is becoming more and more important in education 4.0 [38]. Through education cooperation, digital technologies are growing beyond creative and less conventional teaching and learning practices [39], [40].

Our results provide some initial evidence that during pandemic-forced e-learning, many teachers appreciate the opportunities offered by distance learning. We also showed distance learning is related to various problems, but in the age of a pandemic, it is the only possibility of contact and teaching. Therefore, teachers approach this form of education very responsibly. Despite the fact that some of the respondents had never participated in training before and had never taught in the distance learning, it turns out that they quickly adapted to this type of class. It seems that supporting teachers with training in the use of tools as well as the opportunities created by the platform is critical in the current educational landscape, especially in the context of the growing expectations of students. Research has shown that teachers liked COVID-distance learning in the era of COVID-distance learning, and many of them took advantage of the opportunities offered by this education. Three platforms were most often used in schools: Google Classroom, Zoom, and Moodle. Research has shown that teachers use various educational tools, but the most common are PowerPoint presentations and videos. Online learning has made it more difficult for teachers to get students to participate in class.

In today's scenario, learning has stepped into the digital world. The focus of education is changing to technology learning and usability [41]. Both teaching professionals and students are virtually connected with each other through e-learning platforms. Higher education has been transformed from a conventional to a smart learning model thanks to innovative information and communication technology. Smart learning takes use of technical and social

advancements to enable successful tailored learning via the use of cutting-edge technology, particularly smart devices and internet technologies [42], [43]. The academic community is becoming more interested in smart learning [34], [35], [44]. The e-learning approach has been widely accepted in this COVID-19 pandemic lockdown and has proved its excellence in all the stages of education [4]. In the study conducted by Radha *et al.* (2020), e-learning seems to be the forthcoming trend and is becoming widespread already. The pandemic situation demands tech-savvy and highly skilled educators. Thus, educators should enhance their knowledge and skills to leverage technological devices, e-learning tools, educational apps, and other such online platforms [10], [45]. E-learning has significantly evolved in parallel with the development of information and communication technologies. The real growth of e-learning has started after the introduction of the web and is developing to cope with the new challenges. E-learning has many benefits for both trainers and learners in their teaching-learning process.

The current study results claim that the workers' perception of online learning is good in the midst of the COVID-19 pandemic. Though online learning is considered a good option during the COVID-19 pandemic, it also highlights the availability of internet access, financial issues, and online learning implementation. Taking the paper's objectives into consideration, there following conclusion follows:

To know the global trend of how e-learning resources are used by workers, The use of e-learning is now a trend and a requirement for teachers who had not been involved in this type of class and were reluctant to take such classes. It turned out that in times of the pandemic, e-learning was the only alternative to schools shutting down.

To identify the interest and attitude of workers towards using e-learning resources across the world, teachers approach e-learning very responsibly because they realize that it is up to them to properly convey knowledge. At the same time, research showed that teachers noticed that the pandemic and confronting students with a new type of education increased their involvement in the implementation of tasks. Initially, it was difficult for both teachers and students to switch to e-learning as it required a lot of work, but over time they developed a way to get things done. To suggest prospects for using e-learning resources by workers across the world, research results show that university employees have a positive attitude towards e-learning. Universities use different platforms, but the most common ones are Google Classroom, Moodle, and Zoom. The resources they most often use in e-learning are PowerPoint presentations and videos.

Future educational directions include not only learning content, learning competencies, and appropriate pedagogical approaches, but also specific support from the field of information and communications technology, which is intended to contribute positively to shaping the architecture of the man of the future [36]. To conclude, the current study emphasized the need for training both students and teachers to become familiar with digital knowledge and skills. Multimodal approaches

should be developed to achieve course content objectives, and better learning outcomes can be attained through these approaches with a complex online education model. The digitalization of education is no more a future trend or even a university standard in the education improvement direction. However, its interface and other features need to be developed to meet international requirements. For example, the database for students is linked with the Google Classroom database so that the scores of each exam get transferred directly to the school or university database and are compared with previous grades so as to provide the final result to the student. Further, when performing the exam, it is preferable to include all the names of the students. Even if a student is absent, his or her name can be mentioned with an ''absent'' sign and zero marks can be scored. It is also preferable to introduce the augmented reality technique into Google Classroom so that the student feels as if he or she is attending the physical classrooms. Further, e-learning-based education must continue in the future as well, even after the end of COVID-19.

This is because the human community needs to be ready for any kind of new situation and use its resources to the fullest extent possible to make preparations for the future. The authors decided that the next step would be to compare not only teachers' but also students' to determine which country is more oriented towards the conscious use of water and energy resources in terms of sustainable development.

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