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PAPER

The Effect of Strengths/Opportunities and Weaknesses/Challenges on Online Learning during the COVID-19 Pandemic

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ABSTRACT

This paper researched the effect of strengths, opportunities and weaknesses or challenges on the online learning process during the COVID-19 pandemic. The research approach focuses on curriculum implementation and teaching quality using information technology systems (online teaching platforms). The research included 146 teachers (lower secondary and upper secondary school level), from whose responses we identified the strengths and opportunities as well as the weaknesses and challenges of online learning. While analyzing the data, we tested the construct reliability and noticed that Cronbach's Alpha turned out to be at an acceptable level. From the paired sample t-test data analysis, it has also been concluded that, in the online learning process, strengths and opportunities are more considerable than weaknesses and challenges. Furthermore, linear regression indicated that the adjusted R-square of this model is 0.353, which signifies that the independent variables, strengths and opportunities and weaknesses or challenges, have an effect of 35.30% on the dependent variables, the curriculum implementation and the teaching quality, when using the information technology systems. As a result, we reached the conclusion that the positive effect of strengths and opportunities is higher than the negative effect of weaknesses or challenges.

KEYWORDS

online learning, strengths, opportunities, weaknesses, challenges, curriculum implementation, teaching quality

1 INTRODUCTION

COVID-19 was declared an international public health emergency and a pandemic on March 11, 2020, by the World Health Organization (WHO) [1] [2]. COVID-19 has accelerated Industry 4.0's digital transformation in education. Institutions, educators, and students must adopt flexible use of digital learning management systems (LMSs). Some countries have nationwide changes, while others use individual or

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institutional-level efforts to maintain their education systems [3]. This study seeks to determine the impact of COVID-19 on the education system of the Republic of Kosovo, as well as the curriculum implementation and teaching quality in lower and upper secondary schools (grades 6 to 12).

2 LITERATURE REVIEW

The COVID-19 pandemic has affected all fields of life, including education. Some of the WHO [2] guidelines, such as social separation and isolation, have been impossible to implement in each country. Therefore, they were obliged to alter their teaching and learning systems to accommodate flexible, remote, and online learning. Following the Centers for Disease Control and Prevention (CDC), e-learning programs were designed to ensure sustained learning during the COVID-19 pandemic [4].

This had major ramifications for students, teachers, and educational institutions worldwide [5]. The United Nations Educational, Scientific and Cultural Organization (UNESCO) declared that they had never seen such a widespread educational disruption [6]. Academic directors advocated for online education to combat the challenge. Online training was not an ad hoc alternative to face-to-face delivery. Due to the COVID-19 pandemic, several schools and universities were shuttered. Many institutions, colleges, and universities stopped teaching in person. The pandemic closed schools, colleges, and universities almost worldwide, allowing students to withdraw from civilization [7]. Education units are struggling to address this issue. This makes us recognize that academic institution scenario planning is critically required. Homeschooling is a wonderful surprise for parents, social life, and student education. Also, recognizing the COVID-19 epidemic, consider teaching online and using online assessment technologies to replace traditional exams [8].

Although we think the first generation of remote education started in the 1850s, the term distance education is not universally accepted in the literature [9] [10]. Even though many recent studies define remote learning as a digital learning experience, the term has long been used to describe education that is provided via radio, letter, mail, or television [11] [12]. Remote learning has changed into a type of online learning because of the development of digital technology [13]. However, the widespread use of digital technology has introduced fresh ideas about learning approaches into literature, including massive open online courses (MOOCs), learning management systems (LMS), virtual learning environments (VLE), and computer-assisted instruction (CAI) [14] [15]. Distance education is now a generic phrase for online education in virtual learning environments.

Initially, the term “online learning model” referred to Internet-based systems [16]. Prior to the recent period, extensive research was undertaken on online learning in primary schools with the aid of zoom, Google Classroom, etc. [17]. Numerous studies have indicated that online learning is successful and applicable to training and that the development of online learning is extremely beneficial when students investigate ways to adopt personal, behavioral, and environmental self-regulation strategies [18] [19]. Online learning is advantageous in education since it combines secondary and higher education students who are competent with technology. Online education is described as the use of Internet-connected devices for synchronous or asynchronous learning environments (e.g., phones, computers). Students can connect with professors and peers from any location [20].

Online learning with its unique educational philosophy, theory, and practice, clearly varies from the above-mentioned difficulties. Online education is rooted in rebuilding and humanism [21] [22].

Certain elements of instructional design, educational philosophy, and learning theory are present in online learning contexts [23] [24]. Collaboration, connectivity, student focus, community, virtual reality, knowledge sharing, exploration, multimodal experiences, and authenticity are characteristics of online learning [25]. Su also mentions significant social, cognitive, and educational presentations, established online learning communities, and self-directed online learners [26].

The rapid evolution of technology has certainly facilitated the distance education [27]. According to Janssen and van der Voort, one of the most effective ways for governments to combat the disruption in the twenty-first century is to educate and train individuals to become IT experts [28]. This approach can be used to enhance the quality of learning, disseminate educational materials over the Internet, and develop training in life skills. COVID-19 pandemic has emphasized the importance of online learning models and applications [29]. Innovation in education is necessary to advance global education [30].

Online schooling has technology concerns, such as installation, audio, video, and other issues, and lacks personal attention. Two-way interaction and practical application of learning are desired. The course medium can be challenging, with theoretical content and a lack of community. Technical issues and unclear educational goals are also issues [31]. There is also evidence indicating that students are underprepared for e-learning and academics [32]. The core curriculum of the Republic of Kosovo comprises seven areas, namely language and communication, arts, mathematics, natural sciences, society and environment, health and welfare, and life and work [33].

There have been observations that the COVID-19 pandemic situation has affected the implementation of technology for the purpose of providing qualitative online learning; however, the private sector has invested more in technology than the public sector [34]. Peer tutoring and interactive case methods using ELENA and Zoom have increased student engagement and learning results in online learning. Student interaction improved significantly, including questioning, sharing ideas, and giving replies. Cooperation to resolve the presented cases was observed [35]. Sahoo's study found that students face difficulties and need time to adjust to online learning. Many students are dissatisfied with online learning due to communication gaps with teachers, feelings of alienation, and issues with evaluation. Students value personal touch, conceptual clarity, and class focus [36]. To get around the challenges of learning during the COVID-19 epidemic, Amnouychokanant's research offered online learning exercises. Freshmen enrolling in the course Innovation in Educational Technology and Mass Communication were taught computational thinking skills through block-based programming and group projects [37].

Teachers and parents face issues with online teaching and learning. Teachers struggle with managing the process, engaging students, including parents, and understanding technology. Parents struggle with time management and helping children of various ages and academic levels learn online while running a business [38]. Hoti et al. concluded that distance learning offers opportunities for efficient completion of tasks for both teachers and students. Technology should not hinder revealing daily plans. Technology affects our learning methods, and society should increase its understanding and proper use of it [39].

3 RESEARCH HYPOTHESES

We have raised the following research hypotheses in this study:

H1: The online learning process during the COVID-19 pandemic has had a positive influence on the education system.
H2: The strengths and opportunities associated with the curriculum implementation are more considerable than the weaknesses and challenges.
H3: The strengths and opportunities associated with the teaching quality are more considerable than the weaknesses and challenges.

Because of the COVID-19 crisis that has affected the entire world, including the Republic of Kosovo, remote learning or online learning was the only alternative to ensure process continuity, curriculum implementation, and teaching quality. Before the COVID-19 pandemic, online learning was rarely used in Kosovo. However, because of the COVID-19 pandemic, teachers and institutions have been urged to employ online teaching methods, which have increased their awareness of technology and its application to online learning.

4 METHODOLOGY

The research methodology used in this paper is descriptive and non-experimental. This research was conducted in the academic year 2020–2021, and the research instrument was an online questionnaire, randomly distributed to teachers at different schools in different municipalities of the Republic of Kosovo, with the aim of covering as many municipalities as possible. The questionnaire consists of six sections. The first one includes demographic questions as well as some questions regarding the understanding of the tools used in online learning, questions related to the organization and the need to organize various distance learning training sessions, attempts to identify the investments made by the relevant institutions in the distance learning process, and the way teachers perceive it. In this section, an attempt was also made to understand the state of the curriculum implementation and the teaching quality through several questions included in the questionnaire, which are summarized in an average for the purpose of analysis.

The second section of the questionnaire was designed to understand and identify the strengths of the online learning process during the COVID-19 pandemic, and several factors considered to be the strengths of online learning compared to traditional learning were measured. All questions in this section were rated on a scale from 1 to 5, with 1 being the lowest score and 5 being the highest score for each factor we tried to measure.

The third section of this questionnaire focused on the identification of the opportunities created by the online learning process for the use of information technology systems even during the normal teaching process. We also tried to identify the growing interest of state institutions in investing in the improvement of the learning process through the introduction of information technology systems. Also in this section, the form of the scale from 1 to 5 was used, with 5 being the highest score.

In the fourth section, we tried to identify some factors that had a negative impact on the online learning process, so we tried to identify and measure the negative impact of these factors on online learning. Responses to this part were also scaled from 1 to 5, where, in this case, rating 5 was the worst rating, through which we tried to measure some factors such as the use of different non-centralized platforms or the impact of technology on the implementation of the online learning process during the COVID-19 pandemic.

In the fifth section, we tried to identify the challenges that teachers faced in distance learning during the COVID-19 pandemic. The answers in this part were also rated from 1 to 5, where, 5 was the worst rating. The final section featured the respondents' general opinions on the distant learning procedure.

5 RESULTS

This research included 146 teachers from different fields, of whom 60 were males, or 41.09%, and 86 were females, or 58.91%. Concerning the participants' age, 9 participants were younger than 26, 76 participants were between 26 and 35 years old, 15 participants were between 36 and 45 years old, 35 participants were between 46 and 55 years old, and 11 participants were over 56 years old. Concerning the work experience, there was a wide range of participants as well, including 41 teachers with less than 5 years of work experience, 35 participants with 5 to 10 years of work experience, 25 teachers with 11 to 15 years of work experience, 13 teachers with 16 to 20 years of work experience, and 32 teachers with more than 20 years of work experience.

In regard to the location (village or town) of the schools the participants came from, 49 teachers, or expressed in percentage, 33.56% of them came from village schools, while 97 teachers, or expressed in percentage, 66.44% of the teachers came from schools in the towns. As for the division between private schools and public schools, 18 teachers, or 12.33%, taught in private schools, whereas 128 teachers, or 87.67%, taught in public schools. Concerning the participants' division according to the level they teach, 106 teachers taught in the upper secondary school (grades 10 to 12), and 40 teachers taught in the lower secondary school (grades 6 to 9). Concerning the participants' education, only 1 of them had a PhD degree in education, 97 had a master's degree, 38 had a bachelor's degree, and 10 teachers had completed the 4-year higher education studies.

When asked whether they used any technology tools before the COVID-19 pandemic, 105, or 71.92%, of the teachers responded that they did not use any online teaching tools, while 41, or 28.08%, of them responded that they used online learning tools before the COVID-19 pandemic. The most common tools were Google Classroom, Zoom, Kahoot, Skype, Viber, Messenger, E-mail, etc. During the COVID-19 pandemic, teachers responded that they used tools like Google Meet, Zoom, Google Classroom, Kahoot, Skype, Viber, Messenger, E-mail, Schoology, individual school platforms, etc. As regards the form of record keeping, 118 teachers, or 80.82%, reported manually following the instructions of the Ministry of Education, Science, and Technology (MEST), and 29 teachers, or 19.18%, used the reports provided by the systems they used for teaching.

When asked if they had had any training on the use of online learning resources prior to the COVID-19 pandemic, 31 teachers, or 21.23%, claimed they had, while 115, or 78.77%, indicated they had not. When asked whether such

trainings should be organized, 135 teachers (92.47%) said yes, while 11 teachers (7.53%) said no. Also, when asked whether the organizing of such trainings would improve the quality of online teaching, we received an average of 4.11 on a scale of 1 to 5, indicating that they would improve the quality of online teaching by 82.2%.

With regard to the investments made by the relevant institutions for the implementation of online learning, we have received the response that the relevant institutions have invested little in this process. According to participants, on a scale from 1 to 5, the MEST has invested an average of 2.32, which is below the average investment. The Municipal Directorate of Education (MDE) has also invested below average. As for the improvement of the teaching quality, according to participants, if the MESTS invested more, the teaching quality would increase to 3.81, or 76.2%, and if the MDE invested more, the teaching quality would increase to 3.77, or 75.4%.

Concerning the lesson duration during the online teaching and learning process, 18 teachers, or (12.33%), responded that 20 minutes are sufficient to conduct an online lesson; 63 teachers, or 43.15%, said 30 minutes; 63 teachers, or 43.15%, responded that 40 minutes is the appropriate time to complete an online lesson; and 2 teachers, or 1.37%, responded that 60 minutes is a suitable time to conduct an online lesson. When asked if students had enough time to understand the material, 111 teachers, or 76.03%, responded that students had enough time to understand the material; 30 teachers, or 20.56%, responded that students had an average time to understand the material; and 5 teachers responded that the time to complete the online lesson was insufficient for the students to understand the material. When asked if students were motivated and satisfied with the cooperation between the students and the teacher or professor during the online learning process, 59 respondents, or 40.41%, said that students were motivated and satisfied with the cooperation between the students and the teacher or professor during the online learning process; 75 teachers, or 51.37%, responded that students were moderately motivated and that the cooperation between the students and the teacher or professor was moderate; and 12 teachers, or 8.22%, responded that students were not motivated and did not cooperate with the teacher or professor. As to whether online learning has had an impact on the curriculum implementation, the teachers' response was 3.64 out of a total of 5, or divided by level: 82 teachers said that online learning has had a major impact on the curriculum implementation, 46 teachers said that online learning has had an average impact on the curriculum implementation, and 18 teachers responded that online learning did not affect the curriculum implementation.

5.1 Identification of strengths, opportunities, weaknesses, and challenges of online learning

In this section, we have analyzed and identified the strengths, opportunities, weaknesses, and challenges of online learning. In order to identify the strengths, the questionnaire included six questions presented in Table 1. It also included six questions whose answers helped to identify the opportunities created by the implementation of the online learning process, and they are also presented in Table 1, the average of responses, where 5 was the best evaluation and 1 was the worst evaluation.

Table 1. Average answers to questions about strengths and opportunities

	Question	Average 1 to 5	Standard Deviation
Strengths	Do you think that online learning has affected the flexibility of the teaching/learning schedule?	3.18	0.94
	Do you think that online learning has affected the flexibility of location for delivering the lessons?	3.34	0.98
	How do you rate online learning in terms of live chat, video messaging, and written chat?	3.52	0.95
	Do you think that there was a good interaction between the student and the teacher and that the students had the opportunity to ask questions and the teacher answered them while delivering the online lesson?	4.03	0.93
	To what extent has the development of online learning influenced the increase of your knowledge in the use of technology in online learning?	3.75	1.02
	Do you think that the development of online learning has affected the reduction of daily expenses?	3.69	1.24
Opportunities	Do you think that online learning has increased the interest of relevant institutions (MEST and MDE) for investment and new technology developments in online learning?	3.60	1.03
	To what extent has online learning made teachers curious about the use of technology in teaching?	3.90	0.90
	To what extent has online learning influenced the development of skills such as problem-solving under time pressure, critical thinking, and adaptation to rapid change (different situations)?	3.52	0.82
	To what extent has online learning created the opportunity for students to get access from different technological devices and from different locations?	3.79	0.91
	Do you think that the platforms used in online learning can be used even after the COVID-19 pandemic for student monitoring, such as homework, various projects, and consultations?	4.01	1.02
	To what extent has online learning created new opportunities for student assessment, using online tests even after the COVID-19 pandemic?	3.53	1.08

Based on the table above, the following strengths and opportunities have been identified:

- Flexibility of online teaching or learning schedule, and
- Flexibility of the location of online learning.
- Realization of live conversations, video messages as well as short text messages (chat).
- Capacity building in the use of technology in teaching.
- Reduction of the daily expenses.
- Increase of the interest of relevant institutions (MEST and MDE) for investments and new technology developments in online learning.
- Increase of the teachers' curiosity regarding the use of technology in teaching.
- Development of teachers' personal skills, such as problem solving in time pressure, critical thinking, and adaptation to rapid change (different situations).
- Possibility to use the technology even after the COVID-19 pandemic for student monitoring, such as homework, various projects, and consultations; and
- Development of new student assessment opportunities using online tests even after the COVID-19 pandemic.

In order to identify the weaknesses of online learning, the questionnaire included six questions presented in Table 2. In order to identify the challenges posed by the implementation of the online learning process, the questionnaire included seven questions also presented in Table 2, the average of responses where 5 was the worst evaluation and 1 was the best evaluation.

Table 2. Average answers to questions about weaknesses and challenges

	Question	Average 1 to 5	Standard Deviation
Weaknesses	Do you think that the lack of technology has negatively impacted online learning during the COVID-19 pandemic?	3.82	1.31
	What was the level of the students' concentration during the online learning process?	3.11	0.92
	What extent has online learning caused monotony, nervousness and confusion to teachers and students?	3.09	1.13
	To what extent has the lack of a direct contact affected the students' learning during the online learning process?	3.30	1.01
	Do you think that the use of different platforms has negatively affected the quality of online learning?	2.56	1.10
	How difficult has online learning been due to the inadequate technological infrastructure?	3.47	1.13
Challenges	To what extent has the continuation of online learning created additional costs in technological equipment?	3.29	1.13
	To what extent has it hindered online learning? [Power outage]	2.66	1.32
	To what extent has it hindered online learning? [Internet restrictions]	3.17	1.20
	To what extent has it hindered online learning? [Technological equipment]	3.35	1.22
	What was the level of the students' access to online learning?	3.30	0.91
	How difficult has it been to deliver practical learning while teaching online?	3.32	1.28
	Do you think that continuing online learning from home is an obstruction for other family members and vice versa?	3.34	1.24

Based on the results from Table 2, the following weaknesses and challenges have been identified:

- Lack of technology or inadequate equipment and technological systems.
- Lack of students' concentration.
- Monotony, nervousness, and confusion caused to students and teachers.
- Difficulties managing the class as a result of the lack of a direct contact.
- Use of different and non-centralized platforms.
- Creation of additional costs for the purchase of technology equipment.
- Power outages, as well as Internet restrictions.
- Students' lack of access to the platforms used to deliver the online teaching; and
- Obstructions by other family members and vice versa during the online learning process.

5.2 Data analysis and hypothesis validation

In order to verify the construct's reliability, we analyzed Cronbach's Alpha. It is suggested that Cronbach's Alpha values should be higher than 0.7 [40], and in our case, the two independent variables, i.e., strengths or opportunities and weaknesses and challenges, are higher than 0.7, as seen in Table 3. Therefore, we there is no problem with the construct reliability.

Table 3. Cronbach's alpha

Reliability Statistics		
	Cronbach's Alpha	N of Items
S/O	.875	13
W/C	.845	16

To confirm the first hypothesis, we used the statistical analysis through the paired sample t-test, and Table 4 indicates that the average for strengths and opportunities is 3.65, whereas the average for weaknesses and challenges is 3.20, and the significance of the test is 0.000, presented in Table 5. Therefore we can say that despite the weaknesses and challenges, the strengths and opportunities are more considerable in the online learning process at a significance of 1%. This indicates that the first hypothesis has been confirmed.

Table 4. Paired sample statistics

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	S/O	3.6523	146	.62664	.05186
	W/C	3.2038	146	.62228	.05150

Table 5. Paired sample t-test

		Paired Differences							
		Mean	Std. Deviation	Std. Error Mean	99% Confidence Interval of the Difference		df	Sig. (2-Tailed)	Cohen's d–Effect Size
					Lower	Upper			
Pair 1	S/O W/C	.44850	.87309	.07226	.30568	.59131	145	.000	.718216

With regard to the testing of the second and third hypotheses, we took three variables, where the dependent variable of the test was the curriculum implementation and the enhancement of the teaching quality through the use of technology, while the independent variables were the strengths and opportunities as well as the weaknesses and challenges of online learning.

The correlation between the test variables is shown in Table 6. In order to have a strong correlation, it is suggested that the value be between 0.5 and 0.7. Table 6 shows that there is a strong positive correlation between the curriculum implementation and the teaching quality with strengths and opportunities, while there is a weak negative correlation between the curriculum implementation and the teaching quality with weaknesses and challenges, as well as a weak positive correlation between strengths and opportunities and weaknesses and challenges.

Table 6. Correlations

		CIQT	S/O	W/C
Pearson Correlation	CIQT	1.000	.573	–.169
	S/O	.573	1.000	.023
	W/C	–.169	.023	1.000

The following analysis is the linear regression analysis conducted in order to confirm the second and third hypotheses. Table 7 presents a summary model of the regression analysis that shows that the adjusted R-square is 0.353, which means that the independent variables represent 35.30% of the total effect on the dependent variable.

Table 7. Model summary[b]

Model	R	R-Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics					Durbin-Watson
					R-Square Change	F Change	df1	df2	Sig. F Change	
1	.601[a]	.362	.353	.78993	.362	40.489	2	143	.000	1.583

Notes: [a]Predictors: (Constant), Weaknesses_Challenges, Strengths_Opportunities; [b]Dependent Variable: Curriculum implementation and the teaching quality.

Table 8 presents the ANOVA Test which shows the overall model significance which is 0.000 and which is acceptable at 99% confidence level.

Table 8. ANOVA[a] test

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	**Regression**	50.530	2	25.265	40.489	.000[b]
	Residual	89.231	143	.624		
	Total	139.760	145			

Notes: [a]Dependent Variable: Curriculum implementation and the teaching quality; [b]Predictors: (Constant), Weaknesses_Challenges, Strength_Opportunities.

In order to present the linear equation and the effect of independent variables on the dependent variable, we used the table of coefficients as presented in Table 9. It was derived from the analysis of the answers given in the questionnaire through the use of linear regression.

Table 9. Coefficients[a]

Model	Unstandardized Coefficients		Standardized Coefficients	T	Sig.	99.0% Confidence Interval for B		Correlations			Collinearity Statistics	
	B	Std. Error	Beta			Lower Bound	Upper Bound	Zero-order	Partial	Part	Tolerance	VIF
(Constant)	1.258	.509		2.472	.015	–.071	2.586					
S/O	.904	.105	.577	8.634	.000	.631	1.177	.573	.585	.577	.999	1.001
W/C	–.288	.105	–.183	–2.731	.007	–.563	–.013	–.169	–.223	–.182	.999	1.001

Notes: [a]Dependent Variable: Curriculum implementation and the teaching quality.

The linear equation of this model is:
CITQ = 1.258 + 0.904S/O – 0.288W/C

- CITQ – Curriculum implementation and the teaching quality
- S/O – Strengths/Opportunities
- W/C – Weaknesses/Challenges

From the linear equation presented above, it can be seen that the strengths and opportunities have a positive effect on the implementation of curriculum and the increase in

teaching quality. It can also be seen that weaknesses and challenges have a negative effect on the implementation of curriculum and the increase in teaching quality. Therefore, hypotheses 2 and 3 can be accepted through the linear equation as strengths and opportunities have a higher positive effect than the negative effect of weaknesses and challenges in the implementation of curriculum implementation and the increase in teaching quality.

The assumptions of the regression model have also been checked. Normality, multicollinearity, and autocorrelation are the assumptions of the regression model checked here.

5.3 Normality

The below figures show that the distribution of independent variables is a normal distribution, and therefore, we conclude that the normality of this model is not questionable.

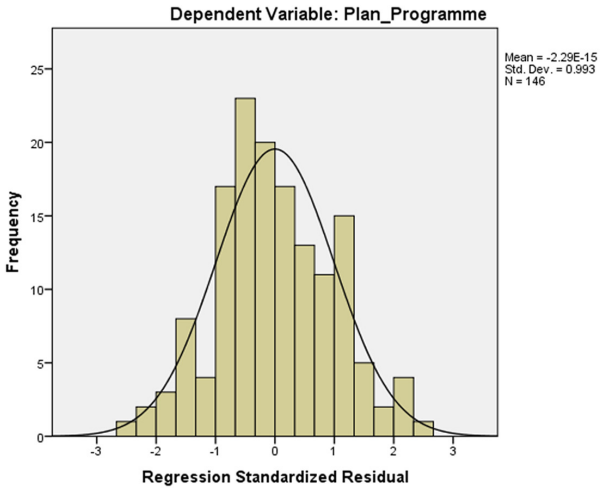

Fig. 1. Histogram

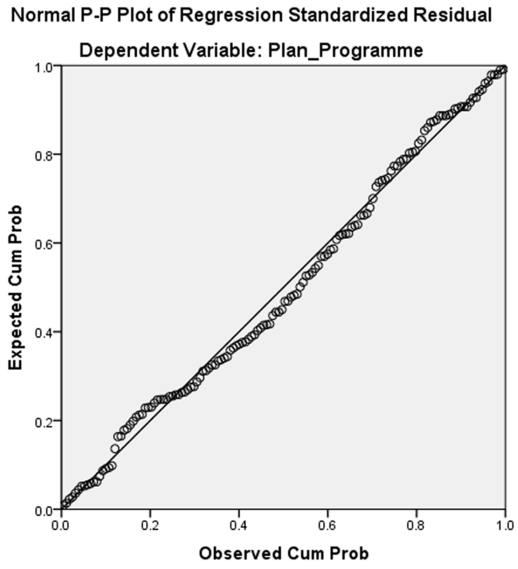

Fig. 2. Normality

5.4 Multicollinearity

In the regression analysis, multicollinearity is detected by a variance inflation factor (VIF). Multi-collinearity exists when there is a relationship between predictors (that is, independent variables) in a model. The VIF assesses the extent to which the difference in regression is inflated by multicollinearity in the model [41] [42]. Multicollinearity is suggested to be a potential problem if the VIF numbers are above 4. It is also a serious problem when the VIF figure is higher than 10, and as shown in Table 9, all of the VIF values are less than 4.

5.5 Autocorrelation

The test statistics from the Durbin-Watson test checks the null hypothesis H_0. the residuals from an ordinary least-squares regression are not automatically associated with the alternative of residues being subjected to an autoregression. In the application of the Durbin-Watson table and the assumption of autocorrelation [43], as well as from Table 7, it is noted that our Durbin Watson value is 1.583, and the following results (Table 10) have been obtained:

Table 10. Drubin-Watson checks

0	dl	du	d	4-du	4-dl	4
	1.502	1.582	**1.583**	2.418	2.498	

From Table 10, it is noted that we do not have autocorrelation problem, hence we do not reject H_0.

6 CONCLUSIONS

In this paper, we have researched the strengths, opportunities, weaknesses, and challenges of online learning in the Republic of Kosovo. This research was conducted through questionnaires distributed randomly to lower and upper secondary school teachers employed in different municipalities of the Republic of Kosovo, with the aim of covering as many municipalities as possible. The research included 146 participants, from whose responses we came to the conclusion that online learning has influenced the curriculum implementation and the use of technology in improving the teaching quality in the Republic of Kosovo since the COVID-19 pandemic has affected the entire education system, and the only way to deliver the lessons was through online learning. In this research, we have identified several strengths regarding online learning, such as schedule flexibility, flexibility of location, live chats, video messages, as well as short text messages (chat), building skills in the use of technology in teaching, and the reduction of daily expenses.

To determine the construct reliability of the responses, we used Cronbach's Alpha analysis, which resulted in 0.875 for the strengths and opportunities and 0.845 for the weaknesses and challenges.

In order to validate the first hypothesis, which states that the online learning process has impacted the education system, we used the statistical analysis, paired

sample t-test. The results indicated that, at a significant level of 1%, the strengths and opportunities are more considerable than the weaknesses and challenges. Therefore, it is clear that the first research hypothesis is valid.

Regarding the validation of the second and third hypotheses, to identify the effect of independent variables on the dependent variable, we used the linear regression analysis. The adjusted R-square of this model is 0.353, signifying that the independent variables account for 35.30% of the impact on the dependent variable. The significance of the model is 0.000, indicating a significance level of 1%. Additionally, we derived the linear equation of this model as CITQ = 1.258 + 0.904S/O – 0.288W/C. This equation suggests that an increase of strengths and opportunities by one unit positively affects the dependent variable by 0.904 units or 90.40%, whereas an increase of weaknesses and challenges by one unit negatively affects the dependent variable by 0.288 units or 28.80%.

7 RECOMMENDATIONS

The results of this research lead to the following recommendations:

For the Republic of Kosovo:

1. To enhance the teaching quality and achieve full implementation of the curriculum, we recommend that the relevant institutions of the Republic of Kosovo:
   a. Organize training sessionss for teachers with experts in the relevant fields to increase their awareness of using of technological tools for improving the quality of teaching and learning.
   b. Invest in appropriate and updated technological infrastructure.

For teachers:

2. We recommend the adoption of modern teaching methods and techniques to implement the curriculum effectively and improve teaching quality.
3. We encourage teachers to use various applications, programs, and platforms that facilitate learning even after the COVID-19 pandemic, making their lessons more understandable and engaging.

For researchers:

4. Our research identified several factors related to curriculum implementation and teaching quality, but there may be other factors influencing these parameters. Therefore, we recommend conducting further research to identify positive and negative factors related to the use of technological tools, which can increase the teaching quality and curriculum implementation.
5. To conduct research with a focus on the implementation of applications, programs, and different computer platforms, and their impact of teaching and learning in a relevant subject. This research should involve both teachers and students as the research sample.

8 LIMITATIONS

This research investigated the effect of online learning during the COVID-19 pandemic in the Republic of Kosovo, specifically focusing on the lower and upper secondary schools.

9 REFERENCES

[1] D. Cucinotta and M. Vanelli, "WHO declares COVID-19 a pandemic. *Acta Biomedica*, vol. 91, no. 1, pp. 157–160, 2020. https://doi.org/10.23750/abm.v91i1.9397

[2] WHO, "WHO Director-General's opening remarks at the media briefing on COVID-19 – 11 March 2020." 2020. https://www.who.int/director-general/speeches/detail/who-director-general-s-opening-remarks-at-the-media-briefing-on-covid-19---11-march-2020

[3] G. Korkmaz and C. Toraman, "Are we ready for the post-COVID-19 educational practice? An investigation into what educators think as to online learning," *International Journal of Technology in Education and Science (IJTES)*, vol. 4, no. 4, pp. 293–309, 2020. https://doi.org/10.46328/ijtes.v4i4.110

[4] Centers for Desease Control and Prevention (CDC), "Interim guidance for administrators of US K-12 schools and child care programs plan, prepare, and respond to coronavirus disease 2019 (Covid-19)," 2023. https://www.cdc.gov/coronavirus/2019-ncov/community/schools-childcare/k-12-childcare-guidance.html

[5] A.M. Mailizar, S. Maulina, and S. Bruce, "Secondary school mathematics teachers' views on e-learning implementation barriers during the Covid-19 pandemic: The case of Indonesia," *Eurasia Journal of Mathematics, Science and Technology Education*, vol. 16, no. 7, pp. 1–9, 2020. https://doi.org/10.29333/ejmste/8240

[6] UNESCO, "UNESCO rallies international organizations, civil society and private sector partners in a broad Coalition to ensure #LearningNeverStops," 2020. https://en.unesco.org/news/unesco-rallies-international-organizations-civil-society-and-private-sector-partners-broad

[7] C.M. Toquero, "Challenges and opportunities for higher education amid the Covid-19 pandemic: The Philippine context," *Pedagogical Research*, vol. 5, no. 4, pp. 1–5, 2020. https://doi.org/10.29333/pr/7947

[8] S. Burgess and H. Sievertsen, "Schools, skills, and learning: The impact of Covid-19 on education, VoxEU, 2020. https://cepr.org/voxeu/columns/schools-skills-and-learning-impact-covid-19-education

[9] M.D. Agostinelli, "From distance education to online education: A review of the literature," [Unpublished doctoral dissertation]. *University of Montana, Missoula*, 2019.

[10] I. Jung, "Introduction to theories of open and distance education," In: *Jung, I. (eds) Open and Distance Education Theory Revisited, Springer Briefs in Education(), Springer, Singapore*, pp. 1–9, 2019. https://doi.org/10.1007/978-981-13-7740-2_1

[11] M. Simonson, S.M. Zvacek, and S. Smaldino, "Teaching and learning at a distance: Foundations of distance education," 7th Ed., Information Age Publishing, 2019.

[12] Y. Zhao, J. Lei, B. Yan, C. Lai, and H.S. Tan, "What makes the difference? A practical analysis of research on the effectiveness of distance education," *Teachers College Record*, vol. 107, no. 8, pp. 1836–1884, 2005. https://doi.org/10.1111/j.1467-9620.2005.00544.x

[13] G. Siemens, D. Gašević, and S. Dawson, "Preparing for the digital university: A review of the history and current state of distance, blended and online learning," Athabasca University Press, 2015.

[14] J. Daniel, "Foreword to the special section on massive open online courses MOOCs: Evolution or revolution?" *MERLOT Journal of Online Learning and Teaching*, vol. 10, no. 1, 2014.

[15] M.G. Moore, and G. Kearsley, "Distance education: A systems view of online learning," *Belmont: Wadsworth Cengage Learning*, vol. 72, no. 6, p. 800, 2020. https://doi.org/10.1080/00131911.2020.1766204

[16] M. Baig, "A critical study of effectiveness of online learning on students achievement," *Journal of Educational Technology*, vol. 7, no. 4, pp. 28–34, 2011. https://doi.org/10.26634/jet.7.4.1391

[17] P. Beach, "Examining elementary teachers' use of online learning environments: An exploratory study," *Journal of Research on Technology in Education*, vol. 50, no. 1, pp. 34–47, 2018. https://doi.org/10.1080/15391523.2017.1383216

[18] E. Delen and J. Liew, "The use of interactive environments to promote self-regulation in online learning: A literature review," *European Journal of Contemporary Education*, vol. 15, no. 1, pp. 24–33, 2016. https://doi.org/10.13187/ejced.2016.15.24

[19] B. Shelton, J. Hung, and P. Lowenthal, "Predicting student success by modeling student interaction in asynchronous online courses," *Distance Education*, vol. 38, no. 1, pp. 59–69, 2017. https://doi.org/10.1080/01587919.2017.1299562

[20] V. Singh and A. Thurman, "How many ways can we define online learning? A systematic literature review of definitions of online learning (1988–2018)," *American Journal of Distance Education*, vol. 33, no. 4, pp. 289–306, 2019. https://doi.org/10.1080/08923647.2019.1663082

[21] J. Barnett, V. McPherson, and R.M. Sandieson, "Connected teaching and learning: The uses and implications of connectivism in an online class," *Australasian Journal of Educational Technology*, vol. 29, no. 5, pp. 685–698, 2013. https://doi.org/10.14742/ajet.243

[22] J. Goldie, "Connectivism: A knowledge learning theory for the digital age?" *Medical teacher*, vol. 38, no. 10, pp. 1064–1069, 2016. https://doi.org/10.3109/0142159X.2016.1173661

[23] C. Larmuseau, P. Desmet, and F. Depaepe, "Perceptions of instructional quality: Impact on acceptance and use of an online learning environment," *Interactive Learning Environments*, vol. 27, no. 7, pp. 953–964, 2019. https://doi.org/10.1080/10494820.2018.1509874

[24] R. Mayer, "Thirty years of research on online learning," *Applied Cognitive Psychology*, vol. 33, no. 2, pp. 152–159, 2019. https://doi.org/10.1002/acp.3482

[25] R. Branch and J. Stefaniak, "Instructional design theory," *Open and Distance Education Theory Revisited, SpringerBriefs in Education(), Springer, Singapore,* pp. 85–94, 2019. https://doi.org/10.1007/978-981-13-7740-2_10

[26] J. Su, "Successful graduate students' perceptions of characteristics of online learning environments," *Tennessee: University of Tennessee,* 2016.

[27] J. L. McBrien, R. Cheng, P. Jones, "Virtual spaces: Employing a synchronous online classroom to facilitate student engagement in online learning," *The International Review of Research in Open and Distributed Learning*, vol. 10, no. 3, 2009. https://doi.org/10.19173/irrodl.v10i3.605

[28] M. Janssen and H. van-der-Voort, "Adaptive governance: Towards a stable, accountable and responsive government," *Government Information Quarterly*, vol. 33, no. 1, pp. 1–5, 2016. https://doi.org/10.1016/j.giq.2016.02.003

[29] S.L. Schneider and M.L. Council, "Distance learning in the era of Covid-19," *Arch. Dermatol. Res.*, vol. 313, pp. 389–390, 2021. https://doi.org/10.1007/s00403-020-02088-9

[30] U. Verawardina, L. Asnur, A.L. Lubis, Y. Hendriyani, D. Ramadhani, I.P. Dewi, R. Darni, T.J. Betri, W. Susanti, and T. Sriwahyuni, "Reviewing online learning facing the Covid-19 outbreak," 2020.

[31] L. Song, E. Singleton, J. Hill, and M. Koh, "Improving online learning: Student perceptions of useful and challenging characteristics," *The Internet and Higher Education*, vol. 7, no. 1, pp. 59–70, 2004. https://doi.org/10.1016/j.iheduc.2003.11.003

[32] M. Parkes, S. Stein, and C. Reading, "Student preparedness for university e-learning environments," *The Internet and Higher Education*, vol. 25, pp. 1–10, 2015. https://doi.org/10.1016/j.iheduc.2014.10.002

[33] Masht, "Core curriculum for pre-university education in Republic of Kosovo," Prishtine: Ministry of Education and Science and Technology, 2016.

[34] M. Fetaji, F. Halili, B. Fetaji, M. Ebibi, and B. Duriqi, "Assessment of the impact of ICT in the digitalization process in high schools during the Covid-19," In *International Conference on Computing, Networking, Telecommunications & Engineering Sciences Applications (CoNTESA)*, Skopje, North Macedonia, pp. 72–76, 2022. https://doi.org/10.1109/CoNTESA57046.2022.10011310

[35] A. Nurkhin, J.T.B. Santoso, S.Y. Baswara, Harsono, and C.W. Wolor, "Applying peer tutor learning and interactive case methods in online learning: Its effect on student activities and learning outcomes," *International Journal of Educational Methodology*, vol. 8, no. 3, pp. 551–565, 2022. https://doi.org/10.12973/ijem.8.3.551

[36] B. P. Sahoo, A. Gulati, and I. U. Haq, "Covid-19 and challenges in higher education: An empirical analysis," *Int. J. Emerg. Technol. Learn.*, vol. 16, no. 15, pp. 210–225, 2021. https://doi.org/10.3991/ijet.v16i15.23005

[37] V. Amnouychokanant, S. Boonlue, S. Chuathong, and K. Thamwipat, "Online learning using block-based programming to foster computational thinking abilities during the Covid-19 pandemic," *Int. J. Emerg. Technol. Learn.*, vol. 16, no. 13, pp. 227–247, 2021. https://doi.org/10.3991/ijet.v16i13.22591

[38] A. Khaled, W.A. Hazaymeh, and M.E. Montierre, "Challenges of online education for teachers and parents in the Emirati school system," *European Journal of Educational Research*, vol. 11, no. 4, pp. 2345–2355, 2022. https://doi.org/10.12973/eu-jer.11.4.2345

[39] H. Hoti, A. Hoti, and E. Kurhasku, "Effects and the analyzing of e-learning on higher education during Covid-19 period time – case study university "Ukshin HOTI" Prizren," *Int. J. Emerg. Technol. Learn.*, vol. 17, no. 11, pp. 146–159, 2022. https://doi.org/10.3991/ijet.v17i11.29069

[40] J.C. Nunnally and I.H. Bernstein, "Psychometric theory," New York: McGraw Hill, 1994.

[41] D. Gujarati, "Basic econometrics," 6th Ed., MC GRAW HILL INDIA 2019.

[42] S. Glen, "Variance inflation factor," from StatisticsHowTo.com: Elementary Statistics for the rest of us! Recuperado el 02 de 2021. https://www.statisticshowto.com/variance-inflation-factor/

[43] E. Savin and K.J. White, "The Durbin-Watson test for serial correlation with extreme sample sizes or many regressors," *Econometrica*, vol. 45, no. 8, pp. 1989–1996, 1977. https://doi.org/10.2307/1914122

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