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DETERMINING FACTORS AFFECTING THE ABILITY OF TEACHERS AND PUPILS TO ADAPT TO TECHNOLOGY BETWEEN 2020 AND 2022

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Abstract

This study examined the variables that influenced instructors' and students' conduct over the 2020–2022 school year. A questionnaire that was given to 100 pre-university students and 100 teachers in 2022 was used to gather the results (over half of them were from rural areas). Principal components analysis was used to find the identified factors. Two main elements were discovered in grouping models for teachers and students following the inquiry. The results demonstrated that, for teachers, the most important tasks during the pandemic were effectively using computers and the effort needed to complete this step; for students, on the other hand, the online component of teaching and interacting with parents and other students were the most important tasks.

Key words: *principal component analysis, teachers, pupils, COVID-19, adaptability, IT technology*

INTRODUCTION

The quickening pace of digitization and the increasing infusion of technology into everyday life is causing a dramatic and immediate transformation of society and the world economy. Initiatives to modernize educational institutions and make significant modifications to them in order to adapt to the rapid changes brought about by technology are the top goals for many different nations, wealthy and poor. Since 2020, every research on the topic of education's digitization and the new roles it should play has focused on the COVID-19 pandemic. Discussions about how to modernize and enhance teachers' skills have arisen as a result of changes in a number of areas, including new communication channels, adjustments to the classroom and school, diversity of educational resources, flexibility of curricula, management styles, learner profiles, and parent profiles.

Following the COVID-19 epidemic, education was shifted to an online platform in 2022, followed by a hybrid structure in 2021, and a return to in-person instruction for all pupils in 2022. Several studies have been carried out to determine the factors affecting the conduct of teachers, students, and learners at this time.

Numerous respondents confirmed that there has been a distinct shift in the relationship between teacher- and student-centered technology use. First off, trust, work engagement, effort expectancy, social influence, technology anxiety, performance expectancy, and work engagement are factors that significantly affect teachers' behavioural intention to use distance learning technologies, according to some evaluations of these technologies' acceptability [3]. Furthermore, individual inventiveness in educational technology and perceived utility have an indirect impact on the acceptance of computer technology [12]. Other scholars have noted that the following elements influence actual technology use: "perceived usefulness, perceived ease of use, perceived enjoyment, intention to use, actual use, compatibility, attitude, and self-efficacy" [9]. Moreover, as instructors became more acclimated to using technology, the relationship between it and instructional practices weakened over time [5].

The epidemic has created a new atmosphere in which the dynamics of the relationships between teachers and pupils also change. Teachers faced a number of difficulties, including a lack of technology, students' lack of respect, and parental engagement [7]. By the end of the pandemic, a large number of them had come to the conclusion that in-person instruction is superior and that online learning negatively affected the entire educational system [8].

However, students have a variety of viewpoints. When taking lessons online, several students felt they were not getting their teacher's full attention [4]. Additionally, the living conditions of the students—parents, access to a personal computer, etc.—had an effect on their opinions toward online learning, their perceptions of their level of IT competency, their level of study motivation, and their experiences with overload [11]. The majority of learners' assessments of the online features were favorable, but they also highlight the need for educational institutions to design a visually stimulating and captivating environment in order to effectively deliver online courses [1]. Furthermore, a few studies looked at the relationship between students' intention to utilize technology, compatibility with it, and reported enjoyment. They discovered that these variables may have a favorable impact on students' actual use of technology in the classroom [10]. The primary advantages that the students themselves recognized had to do with overcoming the difficulties associated with studying virtually and the sense of fulfilment that came from participating in peer-to-peer activities. An effort of this kind makes it possible for students to work in a flexible and healthy atmosphere, which facilitates better online learning. Additionally, it teaches students new online working techniques that they were not aware of, how to resolve intervening difficulties on their own, and who to contact for support when needed [6]. The study aimed to determine the key elements that influence teachers and students in their adoption of digital technologies in the educational context.

MATERIALS AND METHODS

To analyze the data, we conducted a factorial analysis known as Principal Components Analysis. We used the responses from the 5-Linkert questionnaires, which consisted of 15 variables for teachers and 16 variables for students (Table 1).

Table 1. Variables for PCA

Statement	Professor	Pupil
“It was easy for me to work online”	x	x
“It was easy to learn to work with online programs”	x	x
“The schedule was malleable”	x	x
“I worked harder than in face-to-face schooling”	x	x
“I had more teaching/learning tools at my disposal”	x	x
“I changed my teaching (learning) technique”	x	x
“I am at an intermediate-advanced level of laptop/PC use”	x	x
“I worked for the first time with a tablet/laptop/PC”	x	x
“I was more stressed and tired than in face-to-face schooling”	x	x
“I received online teaching/learning support from the school”	x	x
“I needed more time to prepare the lessons than in face-to-face schooling”	x	x
“I changed the content of the taught assignments”	x	
“It was easy to keep students motivated online”	x	
“In online I had conflicts with parents”	x	
“In online, students do not follow the lessons”	x	
“It was easy to focus online”		x
“I could not collaborate with my colleagues online”		x
“I constantly needed the help of my parents”		x
“I couldn't follow the teacher online”		x
“I felt more pressure from my parents when I was online”		x

Source: Own calculation.

Principal Component Analysis (PCA) is a statistical method employed for data reduction. It involves transforming a big set of variables into a smaller set of components that represent the original variables. This enables us to explore additional variables of interest that are associated with a reduced number of unobservable parameters. The technique essentially analyzes the systematic interrelationship among a set of observable variables, and those variables that exhibit a stronger correlation are grouped together. The approach is characterized by exploration, as we seek to understand the relationship between variables inside the principal components. Exploratory analysis, when applied to a data set, aims to identify links between variables by examining various combinations. The ultimate goal is to condense the variables into a more concise collection of composite factors.

The process of applying the ACP (Analytic Continuation Principle) approach in SPSS consists of multiple sequential steps:

-conducting the Kaiser-Meyer-Olkin (KMO) measure test to assess the suitability of the selected data set for factor analysis (KMO value must exceed 0.5).

-conducting Bartlett's test of sphericity to evaluate the null hypothesis, which states that the variables in the population are uncorrelated. A significance level below 0.05 indicates a strong relationship between the variables, making them suitable for factor analysis.

The Varimax model is chosen as the factor extraction method because it minimizes the correlation between factors and reduces the number of variables with high loadings on a single factor. The threshold for the minimal factor loading was established at 0.70.

RESULTS AND DISCUSSIONS

Examining the factors that influence teacher behavior in connection to technology

Principal Component Analysis (PCA) was utilized to analyze the 15 variables measured on a 5-point Likert scale. The dataset consisted of responses from 100 teachers. The results were statistically significant (Bartlett's test with $p<0.5$), and the Kaiser-Meyer-Olkin test (with a value of 0.559) showed that it was appropriate to do the factor analysis. The study yielded a factor solution consisting of four factors, which accounted for 74.4% of the variation in the data. Nevertheless, certain components that did not exhibit significant loading on any dimension were detected, necessitating the repetition of the analysis four times.

The ultimate model produced validated a configuration consisting of two primary elements (Table 2) exhibiting the following attributes: The Kaiser–Meyer–Olkin value of 0.626 is deemed sufficient for doing the component analysis. The Bartlett test validates the model's statistical significance. The two dimensions account for 73.3% of the variation among the study's items. The correlation matrix, derived from the extracted components, indicates that less than 50% of the residuals are below 0.05 [2]. This finding supports the validity of the model, as 45% of the residuals have an absolute value greater than 0.05 and are not redundant.

Factor 1, accounting for 42% of the data's variance, encompasses items related to computer interaction and technology adaptation. Factor 2, explaining approximately 31% of the variance, pertains to the effort exerted in online work, time management, and school support. The matrix of rotated factors reveals that the items pertaining to the teaching process have a higher loading on the first principal component (with values exceeding 0.83), whereas the amount of time and effort needed to prepare online classes has a significant loading on the second component (with a value of 0.94). The latter three items exert minimal and predominantly adverse influence on the initial group, indicating that they do not regard the exerted effort as crucial factors for delineating the process of adapting to technology within the pandemic. In the second group, the emphasis was placed on the level of effort exerted rather than the actual understanding of IT components.

Investigation on the factors influencing student behavior in regard to technology

Principal Component Analysis (PCA) was utilized to analyze the 16 variables measured on a 5-point Likert scale in the database, which consisted of responses from 100 student participants.

Table 2. ACP model for teachers

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		**.626**
Bartlett's Test of Sphericity	Approx. Chi-Square	543.280
	Df	28
	Sig.	**.000**

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	3.360	42.003	42.003	3.360	42.003	42.003	3.353	41.909	41.909
2	2.500	31.252	73.256	2.500	31.252	**73.256**	2.508	31.347	73.256
3	.761	9.515	82.771						
4	.555	6.938	89.710						
5	.347	4.333	94.043						
6	.268	3.350	97.393						
7	.129	1.613	99.006						
8	.080	.994	100.000						

Extraction Method: Principal Component Analysis.

Rotated Component Matrix[a]

	Component	
	1	2
"It was easy for me to work online"	.771	(-.128)
"It was easy to learn to work with online programs"	.783	(-.324)
"I changed my teaching technique"	.834	(.137)
"I changed the content of the taught assignments"	.838	(.143)
"I am at an intermediate-advanced level of laptop/PC use"	.797	(.178)
"I was more stressed and tired than in face-to-face schooling"	(-.133)	.926
"I received online teaching/learning support from the school"	(.304)	.755
"I needed more time to prepare the lessons than in face-to-face schooling"	(-.053)	.942

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.
a.Rotation converged in 3 iterations.

Source: Own calculation

The results were statistically significant (Bartlett's test with $p<0.5$), and the Kaiser-Meyer-Olkin test (with a value of 0.616) showed that it was appropriate to do the factor analysis. The study resulted in a factor solution that identified five variables, which collectively accounted for 63.5% of the variation in the data. Nevertheless, certain components that did not exhibit substantial loading on any dimension were noted, necessitating the repetition of the research on four occasions.

The ultimate model produced (Table 3) validated a configuration consisting of two primary elements (Table 2) possessing the subsequent attributes: The Kaiser-Meyer-Olkin value of 0.660 is deemed sufficient for doing the factor analysis. The Bartlett test validates the statistical significance of the model. The two dimensions account for 74.8% of the variability among the items in the study.

The correlation matrix, derived from the extracted factors, indicates that 50% of the residuals are below 0.05 when compared to the initial correlation matrix (Field, 2009). This finding provides evidence for the validity of the model. Factor 1, accounting for 46.8% of the variance in the data, encompasses items related to adapting to technology. Factor 2, explaining approximately 28% of the variance, pertains to the interactions with coworkers and parents.

Table 3. ACP model for pupils

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		**.660**
Bartlett's Test of Sphericity	Approx. Chi-Square	151.542
	Df	10
	Sig.	**.000**

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	2.339	46.784	46.784	2.339	46.784	46.784	2.286	45.712	45.712
2	1.404	28.083	74.867	1.404	28.083	74.867	1.458	29.155	74.867
3	.525	10.494	85.361						
4	.481	9.624	94.985						
5	.251	5.015	100.000						

Extraction Method: Principal Component Analysis.

Rotated Component Matrix[a]

	Component	
	1	2
"It was easy for me to work online"	.903	(-.119)
"It was easy to learn to work with online programs"	.873	(.056)
"The schedule was malleable (i liked that ...) "	.811	(-.087)
"I could not collaborate with my colleagues online"	(.094)	.865
"I felt more pressure from my parents when I was online"	(-.205)	.827

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.
a. Rotation converged in 3 iterations.

Source: Own calculation.

CONCLUSIONS

Drawing on the data derived from the factor analysis, it can be deduced that, in the midst of the pandemic, educators regarded the amount of effort they put in to complete their real computer-related tasks as the most important aspect of their work. For children, the most important thing was the online learning environment, followed by interacting with other students and parents.

Nonetheless, we must acknowledge that the digital world has created a new learning environment, particularly in light of artificial intelligence (AI) technology' substantial impact on all informational processes. This learning environment, which is discussed in today's educational literature, has a new dimension because of the digital world. In addition to the learning environment, this universe has opened up new dialogue on significant subjects including the nature, provenance, and nature of knowledge itself. It represents endless, multilingual, and multicultural truths that are defined for different purposes. Online learning is a test procedure that has revealed new debate topics, even if it has been crucial to the COVID-19 process and will remain a helpful practice for learning settings in the future.

Apart from spearheading innovations in fields such as curriculum development and delivery, this experience will surely offer substantial perspectives on the architectural design of schools and classrooms in the future. There is still potential for online or distant learning—but only if the necessary circumstances are in place for students to engage in it, if educators receive didactic training specific to the demands of this mode of instruction, and if student-teacher collaboration is fostered throughout the learning process

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