

Integrating Opinion Analysis With SWOT Analysis to Improve Online Learning in School

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Abstract

Online learning or e-learning is a method of teaching that takes place in a virtual environment. It has become very popular in higher education as it facilitates students from diverse backgrounds to connect virtually and learn at their own pace. In this study opinion analysis is integrated with SWOT analysis on online learning to identify the pros and cons of online learning and to suggest measures for making online learning more effective. The literature review also revealed that most of the research deals with the scope of online learning in higher education (undergraduate and postgraduate students) but the scope of online learning in schools is left. The main aim of this research study is to analyze the perception of school students and teachers toward online learning and identify the strengths and weaknesses of the system. A survey was conducted for collecting the responses of students and teachers of different schools. The responses were treated statistically, further text summarization and sentiment analysis were implemented for opinion analysis. SWOT analysis was performed to suggest measures for improvement in online school education. The findings of this research study include: viewpoint factors that affect learning through online education system, perspective of school teachers and students regarding online learning and measures to improve the online school learning system so that the students can get the maximum benefits from it.

Keywords: *Opinion analysis , Text summarization , Sentiment analysis, SWOT analysis, Online learning*

1. Introduction

Opinion analysis is a method of extracting key knowledge automatically from public opinions for a given problem. It helps in providing a wealth of information about the public's thoughts and feelings. Opinion analysis allows understanding opinions about a business that can be used to improve the customer experience and perform competitive research. This analysis is performed by researchers in different fields. D'Andrea, Ducange, Bechini, Renda & Marcelloni (2019) and Tavošchi et al. (2020) performed opinion mining to monitor the public opinion about the vaccination topic from tweets analysis. Jia, Zhu, Zhang, Liu & Qi (2022) determined the international public opinion for Olympic Games using opinion analysis. Kpiebaareh, Wu, Agyemang, Haruna & Lawrence (2022) presented a graph-based method to perform aspect opinion analysis of the product customer feedback. Grljević, Bošnjak & Kovačević (2022) presented a Serbian language corpus manually annotated for opinions in the domain of higher education. Zhou & Mou (2022) collected microblogs related to online education in three distinctive phases: pre-pandemic, amid-pandemic, and post-pandemic to obtain broad insight into how online learning was viewed by the public in China's educational landscape.

Online learning (or e-learning) has become a popular approach for teaching today. It is an umbrella for any learning that takes place across distance over the Internet and not in the traditional classroom. This new paradigm of teaching has various benefits like remote access to the study material, ease in accessibility of study material, reduced expenses and improved technical skills of students. Fastening digital technologies and education has enabled teachers and students in learning with this new style of education to reduce the impact of the pandemic on academics. However, online learning has several challenges for students as well as teachers, like internet accessibility, hindrances in comprehensive learning experiences, real-time doubt solutions, lack of technical knowledge, time management, communication and feedback, and difficulty in understanding practical concepts. The main goal of this paper is to analyze the opinion of students and teachers about online learning, particularly taking online classes, on school education and then design strategies for improvement in online learning system so that students get maximum benefits from virtual learning.

2. Related Work

Studies are conducted to understand the limitations of online learning. Balachandran & Kirupananda (2017) designed a web application to evaluate online reviews for higher education institutes and performed the aspect-based sentiment analysis. Data was gathered from various social media APIs and online review platforms and the features of institutions were analyzed. Paul & Jefferson (2019) conducted a comparative analysis of students' performance in online vs. face-to-face interaction over the period of 8 years on 548 students. Score variability between genders and classifications was also examined to determine if teaching modality had a greater impact on specific groups. Purwoningsih, Santoso, & Hasibuan (2019) judged student behavior in online learning by exploratory analysis and machine learning approaches. Patterns were obtained on different parameters in the context of teaching and learning processes and the result showed the correlation between those parameters.

Crisostomo, Balida & Gustilo (2020) investigated the readiness of teachers and students in the online learning process. The K-means clustering algorithm was utilized to determine the efficiency level of teachers and students. Three clusters were formed based on confidence level, provision level, and online preparedness. These levels include various factors like IT tools, IT skills, and internet speed for online learning. Mishra, Gupta & Shree (2020) focused on a quantitative and qualitative approach to study the perception of students and teachers on online teaching-learning modes during the pandemic. The research was conducted by collecting data from Mizoram University. Tseng (2020) investigated the functionalities of Blackboard Learn and demonstrated how students can perceive its benefits. Blackboard Learn is a type of learning for online courses that focuses on students' perceptions of teaching, and cognitive and social presences. The results revealed that students who consider Blackboard tools more beneficial to their learning are most likely to have higher perceptions of teaching presence. Baltà-Salvador, Olmedo-Torre, Peña & Renta-Davids (2021) analyzed the academic and emotional effects of online learning during the pandemic period on engineering students. The data was collected at two different time points to identify the effect of lockdowns and pandemics on the education of engineering students. The finding showed that the majority of students were not satisfied with this new mode of teaching. Chakraborty, Mittal, Gupta, Yadav & Arora (2021) conducted a survey of undergraduate students in an Indian university to analyze their opinion on different aspects of online education during the pandemic. The authors concluded that students learn better in physical classrooms or by attending Massive Open Online Course rather than online education. However, online education was also appreciated in this pandemic period. Muthuprasad et al. (2021) focused on the perception of online education system for Indian agriculture students. The survey was conducted online on 307 students and the result showed that 70% of respondents were ready to opt the online classes during the pandemic. Rahman, Prasetyo, Mashuri (2021) conducted survey-based research to measure the impact of online learning on physical education teachers. Qualitative and descriptive statistics was used to analyze the data. The author concluded that physical education teachers have to adopt innovative strategies to overcome the obstacles they face during online learning.

Akhter et al. (2022) dealt with identifying the barriers that create hindrances in online learning by using the partial least square method. The findings showed that insufficient institutional and technical support are significant barriers to online learning. Zapata-Cuervo, Montes-Guerra, Shin, Jeong & Cho (2022) analyzed the psychological perceptions of students towards online learning engagement during the pandemic. Students' motivation, self-efficacy, and anxiety were considered the key factors for their online learning engagement and outcomes. Hypothesis testing and group analysis were conducted to identify the differences among students. The finding of this study showed that self-efficacy and anxiety significantly affect online learning.

It can be observed from the above review that online learning has a significant impact on students as well as teachers. Most of the studies have considered undergraduate and postgraduate students, however, online learning has a great impact on school education also. Thus, the main aim of this research study is to analyze the impact of online learning on school teachers as well as students of class 1st to class 12th. The goal of the study is to analyze the opinion of students and teachers about online learning in school education and then suggest measures for overcoming the difficulties of online school education.

Significance of the study

Online education has now become a popular mode of teaching and learning as it helps to connect students and teachers internationally, offers flexible learning hours, and considers individual learning patterns. However, this method has several challenges. Thus, it becomes necessary to understand the problems faced by teachers and students in online learning and derive solutions to overcome the difficulties in online learning so that they can appreciate this method of teaching and learning.

3. Materials & Methods

a. Data Collection

Students and teachers of classes 1st to 12th from different schools are selected for the study. This data is divided into 3 categories based on their classes. 1st to 5th class students were named *primary group*, 6th to 8th class students as a *junior group*, and 9th to 12th class students as a *senior group*. Similar categories were made for the teachers also. A sample of 193 respondents (129 students and 64 teachers) was chosen for this study. The group of 129 students consisted of 4 students in the primary group, 35 students in the junior group, and 90 students in the senior group. The group of teachers consisted of 20 teachers for the primary group, 15 teachers for the junior group, and 29 teachers for the senior group.

Questionnaires were designed using Google Forms for the teachers and students to get their opinions. The respondents were also asked to provide their views on online teaching and learning experience. For primary group students, parents were asked to fill out the form according to their experience. A SWOT questionnaire was also designed for the experts to identify the strengths, weaknesses, opportunities, and threats of online learning.

b. Statistical Summarization

The collected responses are analyzed and summarized using descriptive analysis. χ^2 test is applied to find the dependency between the identified viewpoint factors and the groups of students.

c. Opinion Analysis

Opinion analysis is performed to determine the opinion of respondents for online learning using:

- **Text Summarization:** Text summarization is performed on the collected reviews to generate a precise summary by preserving the important key points. For generating the summary of text reviews, the online available tools Quilbot, AI Summariser, TLDRthis, and Resoomer are used.
- **Sentiment Analysis:** Positive, negative, and neutral sentiments in the text are determined by identifying the subjective information. The support vector machine classifier is used to classify the sentiments into different categories. The textblob module is used for labeling the reviews. The sentiments of teachers and students were

analyzed during online classes using a support vector machine classifier along with the TF-IDF feature extractor to classify the sentiments into positive, negative, and neutral categories.

d. Integrated SWOT Analysis

SWOT Analysis is combined with ANP (Analytical Network Process) and TOPSIS (Technique for Order Performance by Similarity to Ideal Solution) Methods to design the strategies for overcoming various challenges of online learning. The SWOT analysis is performed to identify the strengths, weaknesses, opportunities, and threats of online learning in schools. Strategies were formulated after discussion with experts. ANP and TOPSIS are utilized to prioritize the strengths, weaknesses, opportunities, and threats, and then determine the improvement strategies.

The steps of methodology to achieve the goal of study are:

Step 1: Data collection.

Step 2: Identification of factors of online learning.

Step 3: Statistical Summarization.

Step 4: Text Summarization.

Step 5: Sentiment Analysis.

Step 6: Identification of strengths, weaknesses, opportunities, and threats of online learning.

Step 7: Identification of strategies to overcome the challenges (weaknesses) of online learning.

Step 8: Computation of the Independent priority weight (Pw_i) for each SWOT factor.

Step 9: Computation of the Internal dependence weights (Iw_i) between each SWOT factor.

Step 10: Computation of the interdependent priority weight (Dw_i) for each SWOT factor using equation (1):

$$Dw_i = Pw_i \times Iw_i \quad (1)$$

Step 11: Calculating the global priorities G_i of the SWOT sub-factors using equation (2):

$$G_i = L_i \times Dw_i \quad (2)$$

Where L_i is local priority weights of the SWOT sub-factors

Step 12: Establishing an aggregated decision matrix by making a pairwise comparison of alternatives with respect to strength, weakness, opportunities, and threats respectively to get the decision weights (f_{ij}).

Step 13: Calculation of the normalized decision matrix using equation (3):

$$r_{ij} = \frac{f_{ij}}{\sqrt{\sum f_{ij}^2}} \quad (3)$$

where r_{ij} are the normalized elements of the matrix.

Step 14: Determination of the Positive Ideal Solution (R^+) and the Negative Ideal Solution (R^-) using equations (4) and (5):

$$R^+ = \{max_i r_{ij} | j \in J, i = 1, 2, \dots, n\} \quad (4)$$

$$R^- = \{min_i r_{ij} | j \in J, i = 1, 2, \dots, n\} \quad (5)$$

Step 15: Calculating the weighted Euclidean distances for each strategy using equations (6) and (7):

$$D_i^+ = \sqrt{\sum w_{ij}(r_{ij} - R_j^+)^2} \tag{6}$$

$$D_i^- = \sqrt{\sum w_{ij}(r_{ij} - R_j^-)^2} \tag{7}$$

where w_{ij} is the global priority of swot sub-factors

Step 15: Calculation of the relative closeness coefficient using equation (8):

$$C_i = \frac{D_i^+}{D_i^+ - D_i^-} \tag{8}$$

4. Analysis

The respondents (school teachers and students) ranked the questionnaire on a 5-point scale. 26 viewpoint factors were determined for analyzing the students’ perspective toward online learning and 26 viewpoint were identified for analyzing the teachers’ perspective (Table 1).

Table 1: Selected Factors

Viewpoint Factors for determining the opinion of Online Education					
Students’ View			Teachers’ View		
Category	Factor	Values	Category	Factor	Values
Mode of teaching	Main mode for delivering lectures	*VC, VR, AR, PP	Mode of teaching	Preference to online teaching after the pandemic tool	Yes, No
	Preferred method of teaching theory courses			Main mode for delivering lectures	#VC, RL, OC
Satisfaction Level	Preferred method of teaching numeric Subjects		Preferred method of teaching numeric Subjects	Preferred method of teaching numeric Subjects	*VC, VR, AR, PP
	Practical Courses	*VC, VR, AR, PP		Impact of Online Educ	Most affected class
	Tutorial, Seminar		Affects the board and compt exams		Pre-primary, Primary, Senior, All classes
	Theory Courses		Effective for school		Yes, No
Challenges	Workload	Yes, No	Challenges faced	Lack of teaching expertise	Yes, No
	Infrastructural Problems			Infrastructural problem	

Viewpoint Factors for determining the opinion of Online Education					
Students' View			Teachers' View		
Category	Factor	Values	Category	Factor	Values
Emotions	Distraction			Choosing the most appropriate mode	
	In-person Interaction			Class management	
	Learning new technologies			Time management	
	Technical issues			Distraction	
	Time management			Student learning capability	
	Instant Comm			Student skills	
	Not receiving instr clearly			Students' behavior	
	Use of VC tools			Technical issues	
	Using internet			Workload	
	Online exam pattern			Use of VC tools	
	Timely feedback			Using internet	
	Teacher's response to queries			Clearing student doubts	
	Joyful			Instant comm	
	Frustrated			Inefficient comm	
	Angry			Health issues	
	Bored			Teaching numeric subjects	
	Hopeful			Conducting practical sessional Courses	

*VC: Video Conferencing, VR: Video Recording, AR: Audio Recording, PP: PowerPoint presentations

#RL: Recorded lecture, OC: Offline class

@CP: Camera-paper-pen, D: Digitizer

The chosen viewpoint factors were treated statistically. The descriptive analysis shown in Table 2 illustrates the summary statistics of student respondents and Table 3 illustrates the summary statistics of teacher respondents.

Table 2: The summary statistics of student respondents

Categories	Viewpoint Factors	PRIMARY			JUNIOR			SENIOR		
		Mean	SD	Ske w	Mean	SD	Ske w	Mean	SD	Ske w
Mode of teaching	Main mode for delivering lectures	1.75	1.50	2.00	1.80	1.32	1.36	2.12	1.41	1.05
	Preferred method of teaching theory courses	1.25	0.50	2.00	1.89	1.21	0.98	2.11	1.34	0.60

	Preferred method of teaching numeric Subjects	1.25	0.50	2.00	1.89	1.21	0.98	2.11	1.34	0.60
Satisfaction level	Practical Course	1.75	1.50	2.00	1.54	0.92	1.56	1.67	0.94	1.31
	Tutorial seminar	1.50	1.00	2.00	2.00	1.19	0.78	2.04	1.02	0.63
	Theory courses	1.50	1.00	2.00	1.54	0.85	1.37	1.79	1.05	0.97
	Numeric courses	2.00	1.15	0.00	1.63	0.91	0.83	1.54	0.81	1.02
Challenges	Workload	1.50	0.58	0.00	1.34	0.48	0.69	1.66	0.48	-0.67
	Infrastructural Problems	1.25	0.50	2.00	1.43	0.50	0.30	1.49	0.50	0.05
	Distraction	1.00	0.00	-	1.37	0.49	0.56	1.30	0.46	0.89
	In-person Interaction	1.00	0.00	-	1.20	0.41	1.57	1.27	0.44	1.07
	Learning new technologies	1.00	0.00	-	1.77	0.43	-1.35	1.66	0.48	-0.67
	Technical issues	1.25	0.50	2.00	1.46	0.51	0.18	1.49	0.50	0.05
	Time management	1.00	0.00	-	1.31	0.47	0.84	1.16	0.36	1.93
	Instant Comm	1.00	0.00	-	1.37	0.49	0.56	1.29	0.46	0.95
	Not receiving instructions clearly	1.00	0.00	-	1.09	0.28	3.09	1.47	0.50	0.14
	Use of VC tools	1.00	0.00	-	1.23	0.43	1.35	1.44	0.50	0.23
	Using internet	1.00	0.00	-	1.37	0.49	0.56	1.82	0.38	-1.71
	Online exam pattern	1.75	0.50	-2.00	1.86	0.36	-2.13	1.67	0.47	-0.72
	Timely feedback	1.50	0.58	0.00	1.54	0.51	-0.18	1.49	0.50	0.05
	Teacher's response to queries	1.50	0.58	0.00	1.34	0.48	0.69	1.22	0.42	1.36
Emotions	Joyful	3.25	1.50	-2.00	2.29	1.05	-0.13	2.36	0.95	-0.05
	Frustrated	1.75	0.96	0.85	1.94	0.97	0.53	2.52	0.99	-0.21
	Angry	1.75	0.96	0.85	1.97	0.89	0.06	2.42	0.95	-0.30
	Bored	3.00	0.00	0.00	2.20	0.93	0.27	2.66	0.96	-0.42
	Hopeful	3.00	1.41	-1.41	2.77	1.17	-0.47	2.66	0.97	-0.38

Table 2 shows that the students were satisfied with online learning. The preferred mode was video conferencing. All the respondents, however, faced difficulties in attending online classes.

Table 3: The summary statistics of teacher respondents

Categories	Viewpoint Factors	PRIMARY			JUNIOR			SENIOR		
		Mean	SD	Skew	Mean	SD	Skew	Mean	SD	Skew
Mode of teaching	Preference to online teaching after the pandemic tool	1.90	0.31	-2.89	1.73	0.46	-1.18	1.93	0.26	-3.59
	Main mode for delivering lectures	2.80	0.52	-2.74	2.33	0.98	-0.79	2.90	0.41	-4.20
	Preferred method of teaching theory courses	1.25	0.64	2.44	1.73	0.80	0.55	2.66	1.11	-0.42
	Preferred method of teaching numeric Subjects	1.85	0.37	-2.12	1.73	0.46	-1.18	1.76	0.79	0.47
Impact of Online Education	Most affected class	2.10	0.85	0.93	2.93	0.70	-1.33	3.14	0.69	-0.88
	Affects the board and competitive exams	1.10	0.31	2.89	1.07	0.26	3.87	1.14	0.35	2.22
	Effective for school	1.35	0.49	0.68	1.53	0.52	-0.15	1.66	0.48	-0.69
Challenges	Lack of teaching expertise	1.00	0.00	-	1.13	0.35	2.40	2.00	0.00	-
	Infrastructural problem	1.50	0.51	0.00	1.73	0.46	-1.18	1.00	0.00	-
	Choosing the most appropriate mode	1.70	0.47	-0.95	1.47	0.52	0.15	1.48	0.51	0.07
	Class management	1.00	0.00	-	1.40	0.51	0.46	1.31	0.47	0.87
	Time management	1.35	0.49	0.68	1.47	0.52	0.15	1.41	0.50	0.37
	Distraction	1.00	0.00	-	1.00	0.00	-	1.00	0.00	-
	Student learning capability	2.05	0.60	-0.01	1.87	0.64	0.10	2.28	0.59	-0.13
	Student skills	1.15	0.37	2.12	1.33	0.49	0.79	1.00	0.00	-
	Students' behavior	3.60	0.50	-0.44	3.60	0.83	-1.67	3.21	1.29	-1.16
	Technical issues	1.00	0.00	-	1.20	0.41	1.67	1.59	0.50	-0.37
	Workload	1.10	0.31	2.89	1.07	0.26	3.87	1.14	0.35	2.22
	Use of VC tools	1.40	0.50	0.44	1.60	0.51	-0.46	1.24	0.44	1.28
	Using internet	1.75	0.44	-1.25	1.73	0.46	-1.18	1.79	0.41	-1.53
	Clearing student doubt	1.00	0.00	-	1.67	0.49	-0.79	1.28	0.45	1.06
	Instant communication	1.40	0.50	0.44	1.47	0.52	0.15	1.28	0.45	1.06
	Inefficient communication	1.00	0.00	-	1.33	0.49	0.79	1.38	0.49	0.53
	Health	1.45	0.51	0.22	1.60	0.51	-0.46	1.17	0.38	1.83
	Teaching numeric subjects	1.25	0.44	1.25	1.33	0.49	0.79	1.07	0.26	3.59
	Conducting practical sessions	1.20	0.41	1.62	1.00	0.00	-	1.07	0.26	3.59

According to the teachers, the classes are affected by online teaching. Graphs are plotted to show the results of the analysis. A Chi-square test was performed to check the dependency of factors with different groups. The designed hypotheses are:

Hypothesis_{Student}: Does the performance of students in online classes degrade according to their classes?

H0: There is no significant relation between groups and the performance of students in online classes.

H1: There is a significant relationship between the standard and the performance of students in online classes.

Hypothesis_{Teacher}: Do the challenges faced by teachers in online teaching have a relation with the class they teach?

H0: There is no significant relationship between the challenges faced by teachers and the class.

H1: There is a significant relationship between the challenges faced by teachers and the class.

Text Summarization of the collected responses from the students is shown in Figure 1 and for teachers in Figure 2. Next, sentiment analysis was performed on students’ and teachers’ reviews and is shown in Figure 3.

The identified strengths, weaknesses, opportunities, and threats are shown in Table 4. 11 strategies were identified to overcome the challenges faced by the respondents (Table 4). Let these be A1,A2,A3.....A11.

Table 4: SWOT Factors and Alternatives

	SWOT	Factors	Strategies
Internal Factors	Strengths	S1: Time flexibility	A1: Flexible learning
		S2: Location flexibility	A2: Flipped learning
		S3: Catering to a wide audience	A3: Monitor performance of students weekly
		S4: Wide availability of courses and content	A4: Prepare students for online learning experience
	Weaknesses	W1: Technical issues (like internet connectivity may lead to receiving unclear instructions)	A5: Stimulate Conversation
			A6: Build a learning community
		W2: Inefficient communication (like the problem in instant communication, clearing students' doubt timely, giving timely feedback, or delay in teacher's response)	A7: Provide regular feedback
			A8: Present clear, organized learning materials
		W3: Time Management	A9: Prevent isolation by increasing the presence of instructors
		W4: Distraction	A10: Use the 'chunking' strategy to section out tasks
		W5: Health Issues (mental health like frustration, anxiety, and confusion; and physical health like eyesight or postural problems)	A11: Clear expectations of what students will need
W6: Lack of physical attention			
W7: Online exam pattern			
W8: Class management			
W9: Expertise in using online education tools (like video conferencing, tools to record the lectures, or using the internet)			

		W10: Infrastructure problem	to do before, during and after lessons.
External Factors	Opportunities	O1: Scope for innovation and digital development O2: Designing flexible programs O3: Strengthen skills O4: Innovative pedagogical approach.	
	Threats	T1: Reduced students participation T2: Reduced student and teacher engagement. T3: High drop-out of students T4: Cheating in online class exams by students T5: Health problems T6: Reliability and validity of assessment and evaluation.	

Now, assuming independence between the SWOT factors, a pairwise comparison matrix is formed between the factors for the overall goal using the pairwise comparison scale (Saaty, 2004) as shown in Table 5 and Pw_i for the SWOT factors were computed. The consistency ratio for the matrix was 0.052.

Table 5: Pairwise Comparison Matrix with Pw_i

SWOT Factors	S	W	O	T	Pw_i
S	1	2	2	5	0.409
W		1	3	2	0.266
O			1	3	0.215
T				1	0.110

Next, the pairwise comparison matrices are formed for each SWOT factor based on the internal dependencies using the pairwise comparison scale (Tables 6 through Table 9) and Iw_i of SWOT factors were computed. The consistency ratios for strengths, weaknesses, opportunities, and threats matrices are 0.073, 0.09, 0.024, and 0.019 respectively.

Table 6: Interdependence of SWOT factors w.r.t. Strength

Strength	W	O	T	Priorities
W	1	0.20	0.25	0.097
O		1.00	3	0.620
T			1	0.284

Table 7: Interdependence of SWOT factors w.r.t. Weakness

Weakness	S	O	T	Priorities
S	1	4	3	0.620
O		1	2	0.224
T			1	0.155

Table 8: Independence of SWOT factors w.r.t Opportunities

Opportunities	S	W	T	Priorities
S	1	5	6	0.723
W		1	2	0.174
T			1	0.103

Table 9: Independence of SWOT factors w.r.t Threats

Threats	S	W	O	Priorities
S	1	7	4	0.702
W		1	0.33	0.085
O			1	0.213

$$Iw_i = \begin{bmatrix} 1 & 0.620 & 0.723 & 0.702 \\ 0.097 & 1 & 0.170 & 0.085 \\ 0.0620 & 0.224 & 1 & 0.213 \\ 0.0284 & 0.155 & 0.103 & 1 \end{bmatrix}$$

Using equation (1) Dw_i for each SWOT factor is computed as:

$$Dw_i = \begin{bmatrix} 0.807 \\ 0.260 \\ 0.158 \\ 0.031 \end{bmatrix}$$

Computed L_i of the SWOT sub-factors using the pairwise comparison matrices for each SWOT subfactor is illustrated in Table 10. Then G_i is computed for each SWOT sub-factor and is shown in Table 11.

Table 10: Local Priorities Weights of SWOT sub-factors

SWOT factors	SWOT sub-factors	Evaluation of SWOT subfactors										L_i				
		S1	S2	S3	S4	W1	W2	W3	W4	W5	W6		W7	W8	W9	W10
S	S1	1	2	2	5											0.382
	S2		1	0.25	3											0.163
	S3			1	5											0.355
	S4				1											0.066
W	W1	1	2	3	5	2	5	4	2	4	4	4	4	4	4	0.213
	W2		1	1	4	5	3	5	2	2	2	4	4	4	4	0.150
	W3			1	4	3	2	2	4	4	4	3	3	3	3	0.142
	W4				1	2	0.25	0.2	0.2	0.2	3	4	4	4	4	0.054
	W5					1	0.2	3	0.25	0.25	0.25	3	3	3	3	0.053
	W6						1	0.2	0.2	0.2	2	3	3	3	3	0.076
	W7							1	3	0.25	5	5	5	5	5	0.100

SWOT factors	SWOT sub-factors	Evaluation of SWOT subfactors									L_i	
	W8								1	2	5	0.113
	W9									1	3	0.074
	W10										1	0.025
		O1	O2	O3	O4							
O	O1	1	5	1	2						0.363	
	O2		1	0.25	0.2						0.068	
	O3			1	2						0.346	
	O4				1						0.223	
		T1	T2	T3	T4	T5	T6					
T	T1	1	0.2	0.25	0.2	0.2	3					0.066
	T2		1	0.2	0.25	4	4					0.173
	T3			1	5	4	2					0.373
	T4				1	2	4					0.208
	T5					1	3					0.118
	T6						1					0.062

Table 11: Global Priorities of SWOT sub-factors

SWOT factors	SWOT sub-factors	Dw_i	L_i	G_i
STRENGTHS	S1	0.807	0.382	0.308
	S2		0.163	0.131
	S3		0.355	0.286
	S4		0.066	0.054
WEAKNESSES	W1	0.260	0.213	0.055
	W2		0.150	0.039
	W3		0.142	0.037
	W4		0.054	0.014
	W5		0.053	0.014
	W6		0.076	0.020
	W7		0.100	0.026
	W8		0.113	0.029
	W9		0.074	0.019
	W10		0.025	0.007
OPPORTUNITIES	O1	0.158	0.363	0.057
	O2		0.068	0.011
	O3		0.346	0.055
	O4		0.223	0.035
THREATS	T1	0.031	0.066	0.002
	T2		0.173	0.005
	T3		0.373	0.012
	T4		0.208	0.006
	T5		0.118	0.004
	T6		0.062	0.002

The weights f_{ij} are then computed by comparing each alternative with strengths, weaknesses, opportunities, and threats. The pairwise comparison matrix of alternatives with respect to strength S1 and the computed weights f_{ij} is given in Table 12. Similarly, these were calculated for all the Strengths (S2, S3, and S4), Weaknesses (W1,W2 ..., W10), Opportunities (O1, O2, O3, and O4), and Threats (T1,T2..., T6).

Table 12: Pairwise comparison matrix of alternatives with respect to S1

S1	A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	A11	f_{ij}
A1	1.000	4.000	0.200	3.000	5.000	4.000	3.000	6.000	3.000	6.000	3.000	3.473
A2		1.000	2.000	5.000	7.000	2.000	4.000	8.000	0.200	7.000	4.000	4.020
A3			1.000	1.000	6.000	5.000	0.140	2.000	7.000	0.125	0.110	2.486
A4				1.000	2.000	5.000	3.000	6.000	4.000	5.000	4.000	3.750
A5					1.000	5.000	6.000	0.166	2.000	4.000	6.000	3.452
A6						1.000	0.200	0.200	3.000	4.000	7.000	2.567
A7							1.000	4.000	5.000	0.250	5.000	3.050
A8								1.000	6.000	2.000	2.000	2.750
A9									1.000	0.250	0.200	0.483
A10										1.000	2.000	1.500
A11											1.000	1.000

A decision matrix is established by comparing each strategy with every SWOT sub-factors as shown in Table 13. Normalized decision matrices are calculated for each element of the decision matrix using equation (3) as illustrated in Table 14. R^+ and the R^- are computed using equations (4) and (5) and the weighted Euclidean distances of each strategy are calculated using equations (6) and (7). Finally, the relative closeness coefficients, C_i , of all strategies are calculated for each strategy (Table 15).

Table 13: Aggregated rating of Strategies with respect to swot sub factors

	Decision Matrix																							
	S1	S2	S3	S4	W1	W2	W3	W4	W5	W6	W7	W8	W9	W10	O1	O2	O3	O4	T1	T2	T3	T4	T5	T6
A1	0.155	0.184	0.254	0.227	0.150	0.225	0.160	0.219	0.213	0.257	0.214	0.180	0.216	0.148	0.229	0.194	0.170	0.204	0.252	0.248	0.163	0.178	0.228	0.247
A2	0.157	0.140	0.164	0.167	0.172	0.129	0.069	0.158	0.175	0.140	0.127	0.104	0.129	0.242	0.163	0.171	0.154	0.180	0.063	0.069	0.080	0.112	0.165	0.126
A3	0.123	0.085	0.118	0.114	0.148	0.129	0.148	0.151	0.146	0.164	0.118	0.169	0.142	0.121	0.153	0.111	0.110	0.116	0.139	0.152	0.140	0.149	0.101	0.138
A4	0.102	0.114	0.128	0.130	0.119	0.113	0.119	0.118	0.147	0.101	0.101	0.100	0.111	0.122	0.126	0.120	0.086	0.121	0.104	0.088	0.074	0.106	0.091	0.068
A5	0.082	0.085	0.096	0.100	0.070	0.090	0.089	0.083	0.085	0.084	0.069	0.059	0.098	0.074	0.075	0.084	0.059	0.064	0.088	0.059	0.065	0.061	0.086	0.069
A6	0.051	0.046	0.068	0.071	0.142	0.116	0.080	0.085	0.065	0.065	0.070	0.117	0.129	0.107	0.053	0.051	0.094	0.055	0.106	0.112	0.156	0.150	0.140	0.100
A7	0.086	0.074	0.061	0.061	0.036	0.077	0.050	0.053	0.055	0.058	0.094	0.063	0.040	0.040	0.078	0.071	0.093	0.131	0.077	0.081	0.073	0.057	0.060	0.057
A8	0.068	0.072	0.034	0.043	0.097	0.046	0.215	0.046	0.043	0.045	0.064	0.066	0.062	0.063	0.045	0.106	0.105	0.044	0.063	0.067	0.081	0.053	0.052	0.071
A9	0.051	0.058	0.035	0.038	0.031	0.035	0.029	0.035	0.032	0.034	0.045	0.040	0.033	0.037	0.033	0.031	0.030	0.048	0.044	0.057	0.074	0.058	0.039	0.047
A10	0.071	0.078	0.025	0.028	0.023	0.025	0.023	0.028	0.023	0.032	0.083	0.086	0.025	0.029	0.027	0.047	0.040	0.022	0.040	0.040	0.051	0.047	0.024	0.044
A11	0.054	0.064	0.018	0.019	0.013	0.016	0.017	0.023	0.014	0.019	0.015	0.014	0.015	0.018	0.019	0.014	0.059	0.015	0.025	0.026	0.043	0.029	0.014	0.032

Table 14: Normalized Decision Matrix

	Normalized Decision Matrix																							
	S1	S2	S3	S4	W1	W2	W3	W4	W5	W6	W7	W8	W9	W10	O1	O2	O3	O4	T1	T2	T3	T4	T5	T6
A1	0.477	0.563	0.673	0.623	0.423	0.627	0.442	0.604	0.575	0.682	0.623	0.528	0.601	0.403	0.619	0.554	0.513	0.563	0.698	0.689	0.496	0.521	0.624	0.687
A2	0.481	0.428	0.433	0.459	0.485	0.362	0.190	0.437	0.473	0.371	0.371	0.303	0.358	0.660	0.440	0.487	0.463	0.497	0.173	0.193	0.244	0.329	0.453	0.351
A3	0.376	0.259	0.312	0.313	0.418	0.361	0.409	0.417	0.395	0.436	0.345	0.495	0.396	0.329	0.413	0.317	0.332	0.319	0.384	0.420	0.425	0.437	0.275	0.384
A4	0.314	0.347	0.339	0.357	0.335	0.316	0.327	0.324	0.397	0.269	0.293	0.294	0.309	0.332	0.340	0.341	0.260	0.333	0.288	0.245	0.223	0.311	0.249	0.190
A5	0.253	0.258	0.255	0.275	0.198	0.251	0.247	0.229	0.229	0.223	0.200	0.172	0.272	0.200	0.203	0.240	0.179	0.178	0.244	0.164	0.196	0.178	0.235	0.192
A6	0.156	0.142	0.180	0.195	0.402	0.324	0.222	0.235	0.175	0.173	0.203	0.343	0.358	0.291	0.145	0.145	0.282	0.152	0.292	0.312	0.473	0.439	0.383	0.279
A7	0.265	0.227	0.161	0.168	0.101	0.215	0.137	0.146	0.148	0.153	0.275	0.185	0.111	0.108	0.211	0.203	0.280	0.362	0.213	0.224	0.221	0.166	0.166	0.159
A8	0.208	0.221	0.091	0.119	0.274	0.128	0.593	0.128	0.117	0.119	0.188	0.195	0.172	0.171	0.122	0.303	0.316	0.122	0.174	0.185	0.246	0.155	0.142	0.199
A9	0.156	0.176	0.092	0.104	0.086	0.097	0.081	0.096	0.087	0.091	0.132	0.118	0.092	0.101	0.089	0.088	0.091	0.132	0.122	0.159	0.226	0.171	0.108	0.132
A10	0.219	0.239	0.067	0.076	0.064	0.068	0.065	0.078	0.062	0.084	0.241	0.251	0.068	0.080	0.073	0.133	0.121	0.062	0.111	0.112	0.156	0.139	0.065	0.122
A11	0.166	0.194	0.047	0.053	0.038	0.045	0.046	0.064	0.039	0.051	0.045	0.042	0.043	0.049	0.050	0.041	0.178	0.041	0.069	0.071	0.130	0.086	0.038	0.090

Table 15: Computed C_i for each strategy

	Di+	Di-	Ci	Rank
A1	0.00148	0.298577	0.9951	1
A2	0.04111	0.153497	0.7888	2
A3	0.07632	0.092144	0.5470	3
A4	0.08374	0.073409	0.4671	4
A5	0.14587	0.031273	0.1765	5
A6	0.18659	0.030319	0.1398	6
A7	0.18193	0.020979	0.1034	7
A8	0.21558	0.02303	0.0965	8
A9	0.26513	0.00227	0.0085	10
A10	0.25977	0.005222	0.0197	9
A11	0.29814	0.000796	0.0027	11

5. Results

Graphs were plotted for each viewpoint factor in various categories. Only the one with maximum percentages in each of the three categories is shown.

Referring to Figure 1, it can be seen that video conferencing mode is the most preferred mode of learning for every group of students. However, the senior group students were not satisfied with this mode also.

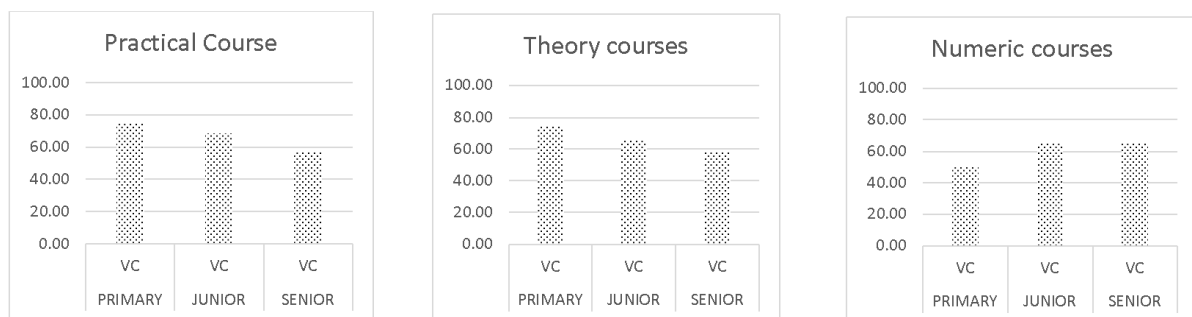


Figure 1: Student-Satisfaction Level

It can be seen from Figure 2 that around 75% of the students preferred the video conferencing mode for learning theoretical, numerical as well as practical subjects. This opinion is the same for almost all categories of students.

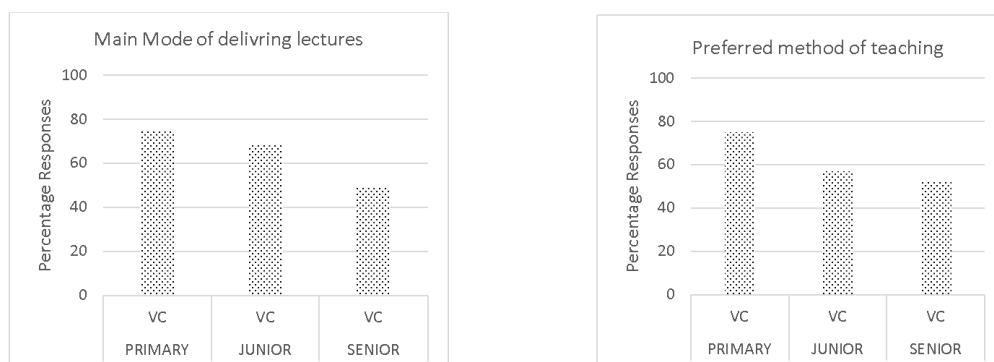


Figure 2: Mode of teaching

Various challenges were faced by each group of students (Figure 3). Primary group students were most distracted during their studies, they found difficulties in learning the technology like learning to use video conferencing tools, and were not able to manage their time. Other difficulties faced by them were in-person interaction, and instant communication with their teachers, and most of the time they were not able to receive the instructions clearly. The junior group students were also not able to receive the instructions clearly, and they were not getting the response to their queries timely. These students also found difficulty in using video conferencing tools. The senior group faced lesser problems in online learning as compared to the other two groups. The reason may be differences in their understanding levels. The main problem faced by them was in-person interaction and receiving responses to their queries.

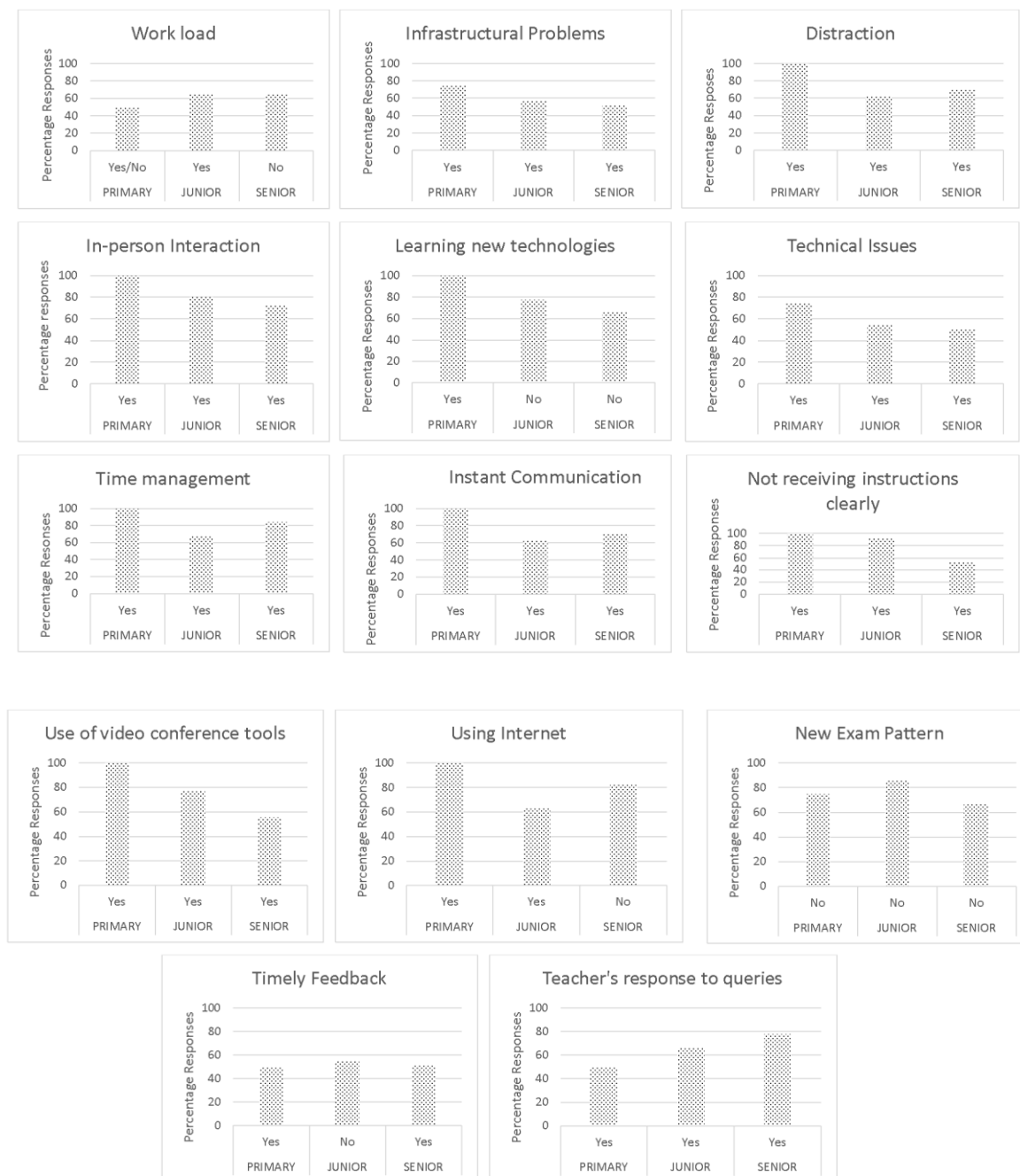


Figure 3: Challenges Faced by Students

Around 90% of the students of the primary group faced difficulties in learning new technologies and using video conferencing tools as they are not aware of how to use these new technologies. Internet connectivity issue is one of the major issues that is faced by every group of students whether it is primary, junior, or senior. 80% of students in the senior group also raise the same issue and because of this technical issue students are not able to receive the instructions clearly.

Despite various challenges, students’ perspective toward online learning was good because students thought that it provides them an opportunity to learn new technologies and improve their technical skills to some extent.

From the teachers’ perspective, all the teachers preferred offline teaching over online teaching (Figure 4). The preferred mode of teaching during online teaching, however, was video conferencing. For numeric subjects, a camera-paper-pen was preferred. All the classes and exams were affected by online teaching. This mode affected primary education the most (Figure 5).

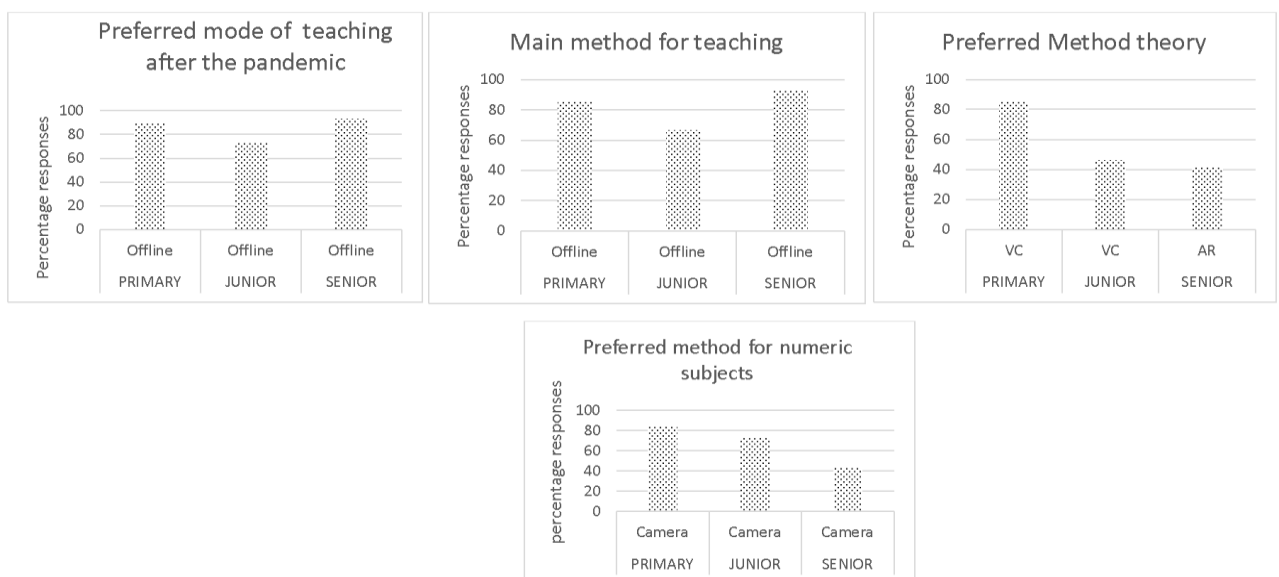


Figure 4: Mode of online teaching

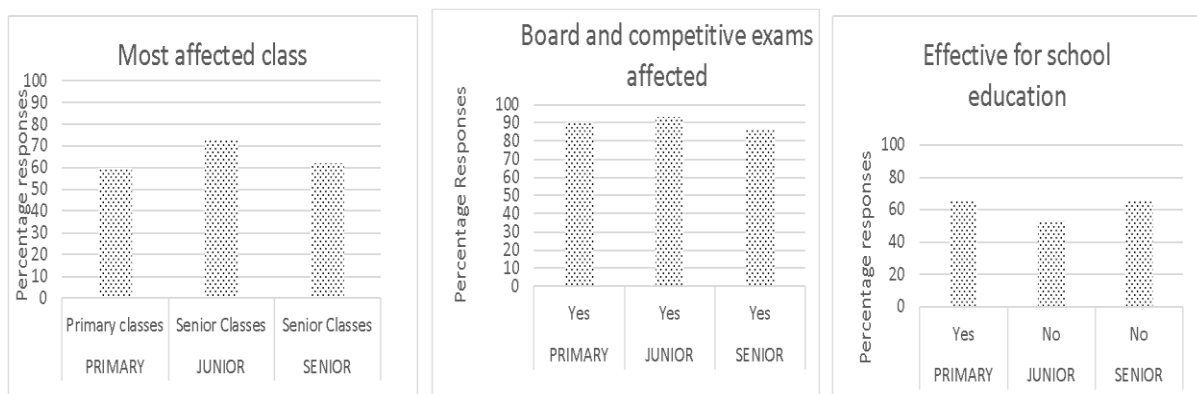


Figure 5: Affecting the exams

The teachers faced a lot of difficulties while taking online classes (Figure 6). Primary group teachers had a problem managing the class, faced distractions during teaching, and faced technical issues also. It was difficult for them to communicate properly with the students and clear their doubts.

The Junior group teachers also were distracted, and they faced difficulties in conducting practical sessions. Senior Group teachers found infrastructural problems, had difficulties in managing classes, difficulty teaching numeric subjects and conducting practical sessions.



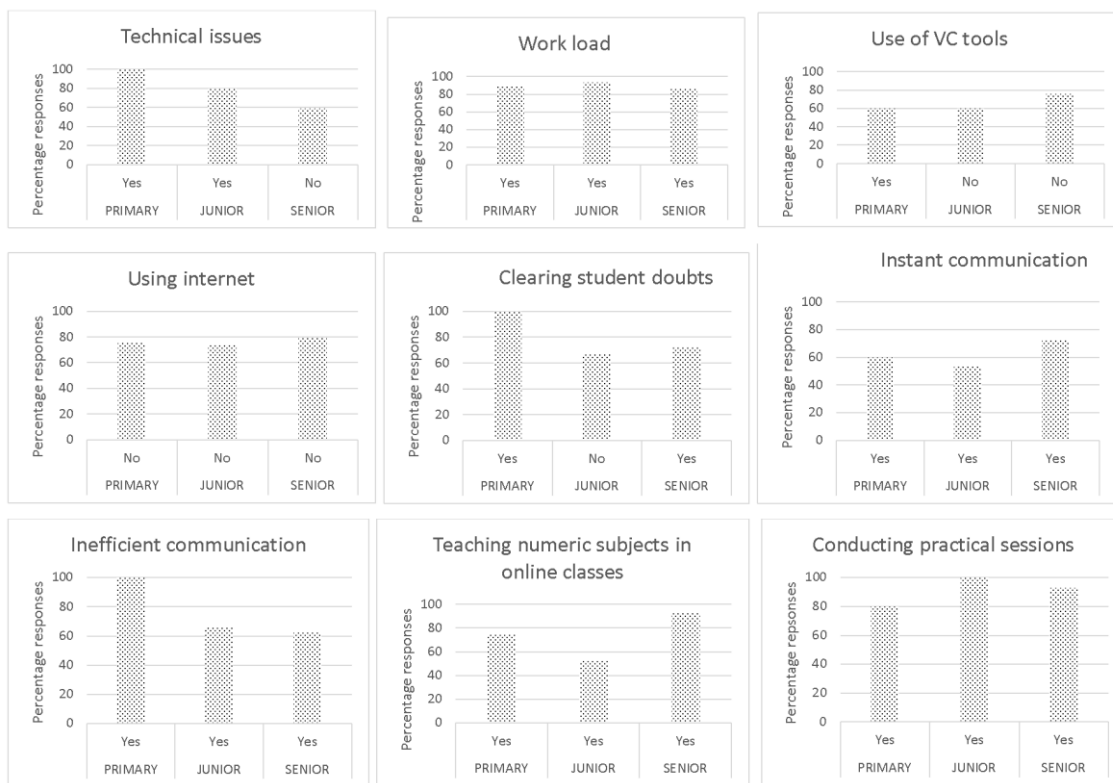


Figure 6: Challenges faced by teachers

Teachers of all classes felt that online teaching has increased their workload. They were distracted during teaching, and had a problem conducting practical sessions. They also found that the students of all groups get bored after some time.

From the given analysis, it can be observed that most of the teachers preferred offline classes over online classes and they find the online classes less effective for schools. This opinion is the same for almost all categories of teachers. About 85% of primary class teachers and about 93% of senior class teachers preferred offline classes, as it is very difficult to deal with children in an online class and make them understand. Also, senior classes are the base for some competitive exams so students need to focus more which could be not possible in online classes. Another concern in online classes was practical and numeric subjects. Practical knowledge is that knowledge where students have to perform experiments physically, but it couldn't be possible in online classes. Same was the opinion about teaching numeric subjects as subjects like maths, physics are only understandable when taught on the blackboard. Online classes have surely an impact on students and it is found from the results, that most of the teachers find that the performance of students has become lower than in offline classes. Several teachers found that their performance has decreased while some students show improvement. Another major challenge was poor infrastructure and internet connectivity.

By using the chi-square test it was determined that there is only one variable (challenges) that has a dependency on the class levels. The computed value for students ($\chi^2_{\text{calculated}} = 4.24$) signifies that the performance of students in online classes does not depend upon the class in which they studied but it depends upon the level of understanding. The computed value for

teachers ($\chi^2_{\text{calculated}} = 22.1$) signifies that there is a significant relationship between the challenges faced by teachers and the class they teach. As the standard increases, there is also an increase in the difficulty level of subjects, so it is more challenging to teach online to higher standards.

The output of text summarization is shown in Figure 7 and Figure 8. As illustrated in Figure 7, it can be concluded that students are satisfied with this new system of learning as it also provides opportunities for students to learn new technologies along with their academic course.

The summary of teachers' reviews (Figure 8) shows that their overall experience during the online classes was not good. Various challenges were faced by teachers during online teaching like students were not attentive in online classes, it was also difficult to observe each student during the session, and interaction with students was very less. Most of the teachers were not in the favor of online teaching.

Quilbot	AI Summariser
<p>Online classes during the pandemic provide us with great Experience. Although they did not provide the same experience as live class still the overall experience was positive. online classes are very convenient and useful as well because at the last 15 minutes there is a query section so we can ask anything related to the chapter through chatbox. The experience throughout online classes was good but some network issues are faced during online classes. Having a good experience during online classes. The classes were amazing as all the teachers were studying like they are teaching in the classroom. Sometimes internet issues occur which is my bad experience. Online classes had mixed experience as it was good also bit due to internet issues we also faced many problems. These classes offers more of one –one teacher student relationship rather than spread their focus amongst thirty other students.</p>	<p>Online classes were a moderate solution during the pandemic. New way of learning. Not so bad, but its not much effective as compare to offline classes. It was fun to join online classes and something new to do. That's not good but all teachers did hard work at that time. Online classes not a good idea because there are so many worries in it. Sometimes I hate online classes because of network issues . In online classes teachers will teach students very well. But this year I comfortably sit on the study bench and do my activities . During online class there are so many worries. Online classes gives us a good experience . Provide a platform to learn new technologies. Online classes had a mixed experience as it was good also but bit bad due to network issues we also faced many problems . A best experience in online classes. Although there is no vast changes between online and offline classes. Easy to turn around online classes,online classes are convenient and offers flexibility.</p>
TLDRthis	Resoomer
<p>The experience throughout the online classes was good but there are some network issues that are faced during online classes. Some teachers do not explain anything. They finish the large concept in two or three lines. But hindi and english teachers teaches well. Some teachers only appreciate one particular student. No schedule no time given to paper. But the experience was great. I learned many new things and gaining experience. Being able to communicate with instructors and other students, that are taking these courses, has made me be a more active participant during the courses. Also, you are able to learn well by doing the required work on your own, without depending solely on interaction with other students as a means of learning.</p>	<p>New way of learning. The experience throughout the online classes was good but there are some network issues that are faced during online classes. It was fun to join online classes and something new to do it. It was helpful way for studying in quarantine period and during the pandemic although it did not had the same experience as during the live classes but it was fine. Classes were amazing as all the teachers were teaches like they are teaching in classroom. In online classes doubts are taken timely. But sometimes network issues came and then its difficult to study because doubts didn't solve and when teacher explaining the chapters voice breaks because of network issues. But teachers are always working hard. Online classes is really very helpful because in lockdown period we have no source to gain knowledge and during this it will helps us too much.</p>

Figure 7: Text Summary of Student's Review

Quilbot	AI Summariser
<p>Teaching online is fine for the time being, but it is damaging and dull for linguistic. In online classes students were not paying attention. Online classes are beneficial for focused learner but it was difficult to teach slow learner and undisciplined pupils because they were out of reach. On other hand teaching numeric subjects in online classes is also difficult as compare to literary subjects. Teachers also struggled a lot due to lack connection with pupils and lack of discipline on part of students. Overall pupil in online classes had a negative experience particularly those in pre-primary and elementary school.</p>	<p>Students were not attentive in online classes. Creating ppt is very difficult with symbols and no platform provides ease of access. Students and teachers both faced net glitches. It was a challenge to teach slow learner and undisciplined students as they are not within our reach. It is a great experience for teachers and learn many things too. Online classes are not effective as offline classes as teacher struggle to schedule their classes. Lack of interaction with students and lack of discipline in students is difficult to deal with. Student are adopting new technologies very fast. There is a less chance of missing online classes. It was challenging in the beginning but learn many new things. Online classes affect studies of children and it can also be helpful but offline classes are necessary. Students are not participated sincerely in studies. Online classes are not fully successful. Students do not attend the classes attentively. Students wants face to face interaction so it was good as offline classes.</p>
TLDRthis	Resoomer
<p>Online classes are not effective as offline classes. Teachers becomes more hi-tech. Teachers and students both faces net glitches. No authentic results can be drawn in online exam. Students were not attentive in online classes. Teachers become more technically advanced but with respect to students performance our efforts were not as fruitful as it has to be. As a teacher it was a satisfying experience because it needs lots of efforts to keep your students focused and understand what is being told.</p>	<p>Challenging and difficult but scope to learn technology. It was a satisfying experience because it needs lots of efforts to keep your students focused and understand what is being told. Face to face explanation is like the comfort zone for our students, they need to see your reaction and your body movement which is a little bit difficult with online lessons. Students and teachers both faced net glitches. It was a new experience but somewhere somehow the lack of resources on the behalf of students and teacher didn't able to give that output which was expected. It was difficult to interact with students properly. There is less chances of missing the online classes. Online classes were interesting and children learn more things. Online classes are not very affective. Not very good, it is difficult to teach as the students belong to small age group. Online classes are not fully successful. Online classes can be helpful but offline classes is most necessary. Not satisfied with online system.</p>

Figure 8: Text summary of Teachers' reviews

The sentiment analysis on reviews resulted in graphs depicting sentiments polarity (Figure 9).

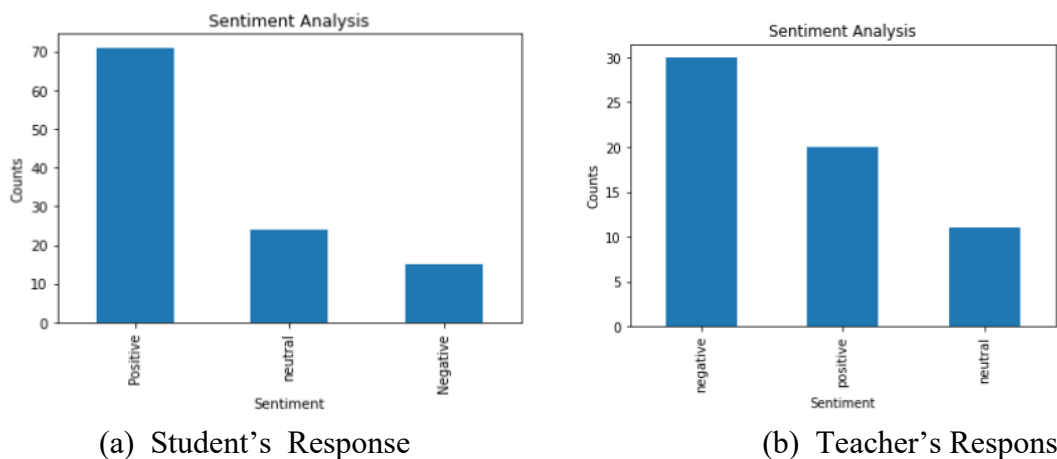


Figure 9: Sentiments Polarity

Most of the students had positive reviews, i.e., they were satisfied with online learning. On the other hand, most of the teachers had negative reviews which reveal that their satisfaction level is very low. An accuracy of 86% was achieved in classifying the reviews of students and was 79% in classifying the teacher's reviews. The difference in accuracy rate is because of the number of text reviews. As student reviews were more in number than the teachers, the model trained on student reviews yields good results compared to teachers.



Figure 10: Wordcloud

The generated word cloud (Figure 10) also supports that students had a positive view of online learning whereas teachers were not happy with online teaching. Thus, in the summarization process, the results show that students were positive overall and most of the teachers have negative comments for online teaching & learning.

The integrated SWOT analysis resulted in deriving prioritized strategies. Based on the ranking of strategies, the following measures must be taken to overcome the difficulties faced by the teachers and students during their online learning:

1. **Provide Flexible learning:** Provide students the freedom of how, what, when, and where they will learn. Observe how students can be grouped during learning and how time can be used throughout teaching. Schedules may be provided to students with time for collaboration and other activities such as performances to assist their understanding of a topic. Modes of flexible learning may include websites with interactive content and/or chat rooms, discussion boards, or videoconferencing.
2. **Perform Flipped learning:** The teaching material like links, reading, videos, and PowerPoint presentations should be uploaded onto the learning platform. Students should be encouraged to access these before lessons.
3. **Monitor Performance:** The performance of the students should be monitored weekly. Counsel the students who are struggling due to lack of focus, may have some emotional issues, or may have some learning disorders. Encourage them by contacting and solving their difficulties with the content, the technology, or the schedules. A small-group session may be conducted where they can share their concerns, and discuss how to improve their time management and study habits.
4. **Prepare students for the online learning experience:** As the students are used to traditional learning they should be assisted in adjusting themselves to the online learning experience. For this, introduce the online learning system and explain to them how to work with the associated learning management system. For example, briefly introduce them to registering for the online classes explain how online learning is different from the traditional classroom experience, provide tips on time management, goal setting and planning the work and take them on a guided video tour through the learning management system to show them how to find materials, assignments, and assessments, and how to communicate with their instructor and fellow students.

5. **Stimulate Conversation:** Transfer the campus experience of lively debate to the cloud by including forums, chats, and social-media groups in the course planning; and include student participation in the assessment protocols.
6. **Build a learning community and Forge Connections:** Include an online community component so that students have more opportunities to connect with instructors and fellow students, discuss coursework, help each other through struggles, and share ideas. Not only building a community is necessary, but it is also required to forge connections. Provide a platform through chat forums design projects for collaborative teamwork, and set up small groups where its members can become more familiar with each other. The teacher may stay online after synchronous sessions for any questions or answers.
7. **Provide regular feedback:** Instructors should provide feedback on all assignments with suggestions for improvement. To convey a personal sense of connection, instructors may use video to deliver feedback. Instructors can model the type of responses and feedback they want students to give each other. Students can be asked to further elaborate or think of the topic from a different angle to help them revisit what they have learned.
8. **Present clear and organized learning materials:** Students must be able to find their course materials, assessments, and records easily. Course materials prepared by the instructor should be organized and labeled in a consistent way to reduce student confusion. For each lesson help may be given to students so that they know how far they have come and how far they still have to go. This will also provide students with a sense of progress.
9. **Use the ‘chunking’ strategy to section out tasks:** Students may be motivated to divide their large tasks into smaller units. For example, instead of staring at a computer screen for a long duration, suggest students “chunk” their time by following a specific pattern.
10. **Clear expectations of what students will need to do before, during, and after lessons:** Provide an introductory video describing the learning outcomes for the course so that students know what is expected. **Instructors should explain the purpose of each course activity and connect it to the learning outcomes for the course.**
11. **Prevent isolation by increasing the presence of instructors:** Students should feel as if the instructor is right there with them. This can be done by talking to them as if in a one-on-one conversation via instructional videos. In case a student has not logged into the course for a while, instructors should contact them to see whether the student needs help or encouragement. Instructors can ask students to get in touch with them via email through a regularly scheduled *office hour* to deal with the issues or questions students may have. These touchpoints will help students feel less isolated.

6. Discussion and Conclusion

Educational technologies have improved over the years. Today, there are several sophisticated online education platforms and many specialized educational resources for various courses. (Adhikary, Gupta, Singh, & Singh, 2010). However, self-reflection on the part of students is extremely important in online learning. In this study it was found that inspite of various difficulties, students preferred online learning. However there is a need for periodic assessment to keep the teaching-learning process on the right track. Implementing the designed strategies

will help the students in this direction. Some empirical studies have revealed that students are suffering from stress and anxiety during this pandemic (Arora, Chakraborty, Bhatia, & Mittal, 2020). Flexibility learning will help the students in improving their performance in online learning (Mahmood, 2020). There are many homes where there are a limited number of digital devices whereas more people need to use them simultaneously. This is a new form of digital divide. The social impact of online education needs to be studied carefully (Toquero & Talidong, 2020).

In this study, opinion analysis of students and teachers is performed regarding online learning. For serving this purpose a survey was conducted to collect the opinions of teachers and students towards online learning. Statistical analysis is done to find out the satisfaction level of teachers and students. Results showed that the majority of students preferred online learning whereas teachers preferred offline learning. For analyzing the text reviews of students and teachers text summarization and sentiment analysis were performed which also depict the same result. By observing all the parameters from students' as well as teachers' perspectives it can be concluded that despite various challenges that are faced by students during online classes, they are in favor of online learning systems as they thought their technical skills also got improved along with their curriculum. On the other hand teacher's perception was different from the students they were dissatisfied with this system as they faced various challenges in conducting the classes and it also becomes very difficult for them to teach in the virtual classroom. Integrated SWOT analysis was done to suggest some improvements for making online teaching and learning styles more effective. In future this type of analysis will be helpful for predict the growth rate of online learning system.

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