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July 01, 2022
Prof. Dr. Aytekin ISMAN
Sakarya University

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A 3- YEAR COHORT STUDY OF INTERNET USE AND PARENT-CHILD RELATIONSHIP AMONG SENIOR SECONDARY SCHOOL STUDENTS

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ABSTRACT
The advent and expansion of the internet have revolutionized education systems, aided in universal access to education, and transformed traditional teaching. However, disparities in internet use persist based on a variety of factors, including gender. Also, the internet is used by the students for different purposes classified as curricular educational, extra-curricular educational, social, and recreational use in this study. Moreover, little is understood about the impacts of intensified internet use on the parent-child relationship which consists of different attributes viz. affection, intimacy, companionship, guidance, enhancement of the worth, guidance, and satisfaction. The data was collected using a cohort study survey design from students in senior secondary school who were recruited using a stratified sampling technique and a self-constructed questionnaire in two stages (2018 and 2021; $N_1 = 394$, $N_2 = 376$). The findings reveal a disparity in pattern and intensity of internet use among males and females and across phases. Furthermore, the parent-child connection differed significantly by gender and phase. Female students were found to have better parent-child relations than male pupils. Also, the parent-child relationship is degraded over time. Moreover, the intensity of internet use was negatively correlated with the parent-child relationship.
Keywords: Internet use, parent-child relationship, India, senior secondary school students, cohort study

INTRODUCTION

Recent advancements in information technology have opened up new avenues for educational study. Education is a critical factor in determining social and economic growth (Katz, 2001; Pritchard & Jones, 1996; Psacharopoulos, 1988). Education has altered as a result of new technologies and ideologies. Technology has given incredibly low-cost access to knowledge and has eroded all barriers leading to free or open-source software movements. Worldwide, there are 4.66 billion active internet users, or 59.5 percent of the world's population, with a 7.3 percent increase in a year (Datareportal, 2021).

Internet use in India

The number of internet users in India is second only to China (*Internet usage in India - statistics & facts*, n.d.). However, they account for only 41% of the national population (World Bank, n.d.). As of January 2021, there are 6.24 million people are using the internet often, representing 45.0 percent of the nation's total population, representing an 8.2 percent increase annually (Datareportal, 2021, pp. 17–18). 96.3 percent of internet users aged 16 to 64 have smartphones, 56.4 percent have laptops, and 23.1 percent have tablets (2021, p. 21). Mobile phones were the primary means of internet access for most of India's digital population. (*Internet usage in India - statistics & facts*, n.d.). An average Indian internet user spends 6 hours 36 minutes every day on the internet (2021, p. 22). The advancement of India's technological and infrastructural development has contributed to an increase in Internet

speed, with the average download speed of a mobile internet connection increasing 12.7 percent year on year to 12.91 MBps and the average download speed of a fixed internet connection increasing 27.9 percent year on year to 53.90 MBps (2021, p. 27). The age range of Indian internet users, however, was between 20 and 29, with a somewhat greater percentage coming from rural regions.

Gendered digital divide

In India, male internet users outweigh female internet users. Indian females are 15% less likely than males to possess a mobile phone and 33% less inclined to mobile internet services utility (Carboni et al., 2021). In India, the gendered digital divide is frequently the result of a threefold disadvantage for women. First, there is a digital divide between rural and urban areas, with rural broadband penetration at just 29 percent compared to the national average of 51 percent. Second, there is a digital gap between households depending on income. Finally, intra-household discrimination prohibits women from having equal access to digital devices in the home, widening the gender-based digital gap (2021). In rural hinterlands, the digital gender gap expanded significantly more than in metropolitan cities.

Role of the internet in learning

The widespread use of the internet is a defining feature of the information era, and more children and adolescents are receiving access to it. MOOCs (Massive Open Online Courses) on sites such as Coursera, Udemy, EdX, and SWAYAM have all brought classroom courses to students' doorsteps and enabled students to make realistic choices about their education. These initiatives have helped to eliminate the disparity in student accessibility based on socioeconomic and geographic origins. The historical nationwide lockdown during a pandemic has also aided the growth of such efforts and the rising importance of technology in education.

The flip side

The use of the internet has opened up new avenues for information access and has proven to be a reliable alternative to classrooms in adverse times. However, there are certain concerns in society related to increased internet utility. Students' social behavior and psychological health may suffer as a result of frequent internet use. Research performed in the USA found that 59 percent of parents of 8 to 17-years-olds considered that too much online activity can lead children to alienate from other people, and 41 percent reported that children who use the internet excessively tend to exhibit antisocial conduct (Turow & Nir, 2000).

Usage of the internet has been linked to greater loneliness and depression, according to Kraut et al. (1998), who also explained the internet paradox by pointing out that online connections are more likely to be of lesser quality than in-person ones. However, the follow-up investigations discovered no link to depression or loneliness (Kraut et al., 2002). They explained these inconsistencies by pointing to modifications in the online environment, such as the growing internet utility and the rise in the availability of online communication tools. The positive impact of internet use on loneliness and sadness has also been demonstrated in a few previous research (Shaw & Gant, 2002; White et al., 1999). Several studies have looked at the connection between aggressiveness and the use of the internet. A study regarding online gaming (Williams & Skoric, 2005) demonstrated that playing online games has no discernible direct influence on aggressiveness, whereas another study (Slater et al., 2003) demonstrated bi-directional causal relationships between violent media content and aggressiveness.

Concern exists that children and teenagers may start to favor online communication over the in-person connection (Griffiths, 2000). Kraut et al. (1998) stated that online communication is less effective than face-to-face interaction, as there is a risk that the emotional health of children and teenagers engaging mainly in internet communication may degrade. Maladaptive cognition, which occurs when people prefer using the internet for communication, may also lead to pathological internet usage, which can lead to undesirable behaviors including scholastic failure, family conflict, and employment abandonment (Davis, 2001). According to a cross-sectional study conducted to test this theory, those who had unfavorable cognition, such as the desire for social advantages offered online, were more inclined to exhibit negative conduct, including skipping classes or social gatherings. (Caplan, 2002).

Pathological internet usage, often known as internet addiction disorder (IAD), is a compulsive-impulsive spectrum condition that comprises five main forms of addiction.: “information overload (compulsive web surfing); computer addiction to programming or game playing; compulsions to online auctions; gambling or trading; and cyber-sexual relationship addictions” (K. Young, 1998a, 1998b). Mental health issues and personality features like psychoticism and introversion coexist with IAD. The internet provides a discrete forum for individuals to address inadequacies in their lives, such as impairments, poor family dynamics, a lack of companionship, and frustration with their appearance (Huang et al., 2010). Internet addicts frequently establish fictitious online personas that they emotionally connect to, preferring online interactions to social relationships in the real world (Whang & Chang, 2004; K. Young, 1998a). Online gaming, pornography, and gambling, especially among young male adolescents

for whom these activities have a greater behavioral and cognitive salience, offer the delights of control and perceived fluidity of identity, as well as give relief from dysphoric moods and negative impacts (K. Kim et al., 2006; Leung, 2004). IAD can also result in significant psychological issues including depression, sleep disturbances, anxiety, and alcohol and substance abuse (Bakken et al., 2009). Moreover, these conditions tend to prevail lifetime (Black et al., 1999).

Internet use and parent-child relationship

The parent-child relationship is critical to our understanding of both good and detrimental online experiences for children. We perceive children's internet use as the outcome of a complex interaction between their preferences, competencies, parental or caretaker mediation, and the cultures in which they thrive. The connection between regionally based value ecologies and technology development influences how children and their parents interact with the internet and with one another with this medium (Kirwil, 2009). A large body of research suggests that how parents "control, supervise, or interpret (media) content" (Warren, 2001, p. 212) can affect how their children interact with the internet. Most teenagers will struggle to balance time spent on gaming and networking without adequate regulation and parent involvement (Huang et al., 2010). According to Problem Behavior Theory, problematic family dynamics, explicitly those between parents and teenagers, have a major role in the establishment and development of teenagers' internet addiction (De Leo & Wulfert, 2013; Yen et al., 2008). Teenagers sharing a good bonding with their parents have greater social competence and fewer behavioral difficulties (Schneider et al., 2001), whereas teenagers sharing adverse relationships with their parents have various behavioral problems including drug misuse and anti-social conduct (Laursen et al., 1998). A vast number of empirical research have found a negative link between parent-child relationships and adolescent internet addiction (Cheng et al., 2021; Deng et al., 2013; Liu et al., 2013; Zhang et al., 2011; Zhu et al., 2015), whereas parent-child conflicts enhance adolescent internet addiction risk (Deng et al., 2013; Yen et al., 2007). Similar findings have been repeated in investigations on video game addiction (Y. H. Kim et al., 2007; Kwon et al., 2011).

According to a study conducted among Taiwanese high school students, loneliness served as a mediating factor between the parent-child relationship and smartphone addiction, which in turn had a negative impact on both. The degree of loneliness associated with smartphone addiction was also shown to be moderated by self-efficacy (Cheng et al., 2021). While parental overcontrol moderated the mediating effects of parent-child relationships, Gong et al. (2022) observed that adolescents had a stronger inclination toward smartphone addiction when their parents used smartphones excessively. Furthermore, several longitudinal pieces of research have suggested that the parent-child connection may be a critical antecedent of teenage internet addiction. According to Szwedo et al. (2011), dysfunctional mother-teen connections predict adolescents' eventual preference for online contact and increased chance of starting a friendship with someone encountered online. According to Kong and Lim (2012), the parent-child connection predicted cyber delinquency adversely. As a result, existing research has repeatedly demonstrated that adolescents with poor parent-child relationships are more likely to become internet addicts.

Summary of literature

While the aforementioned studies have provided some insight into the linkages between internet use and parent-child relationships, further research—specifically in the Indian context—is still required. Three major shortcomings in the related area have been discussed as follows.

First of all, very few pieces of research have looked at the causative linkages; the majority were cross-sectional and case studies, which makes it challenging to find causal relationships. We must explicitly analyze the causal links to have a meaningful conversation about the impacts of internet usage (Shklovski et al., 2006).

Second, children and teenagers were rarely included in studies. However, because of their underdeveloped cognitive and social capabilities, probably, children and adolescents are more negatively impacted by internet use than adults. Children might not be able to manage internet conversation well since they cannot see the person they are connecting to.

Third, very few researchers have looked at the causal linkages that go the other way. It has been noted that there may be causal links between psychological factors and internet use, although these assertions are based on cross-sectional data (Amichai-Hamburger & Ben-Artzi, 2003). The impacts of internet usage on psychological and social variables are also significant, even though the effects of psychological and social variables on internet use typically receive greater attention.

Present study

As described in the preceding section, the research regarding the association between internet use and the parent-child relationship is prevalent. The majority of the earlier studies have emphasized that internet use affects the

parent-child relationship, whereas recent studies have also discussed how the parent-child relationship affects the internet use of children. Some of these studies have also emphasized that there is a bi-directional causal relationship between internet use and the parent-child relationship. It should not be overlooked that the usage of internet technology may become troublesome and even dangerous, resulting in hazards such as addiction. Furthermore, online technologies are becoming more popular in schools, and students must be able to successfully integrate internet technologies into their education. As a result, the ability of a parent's behavior and connection with their kid to influence a student's use of technology for educational reasons should not be overlooked. However, the majority of such studies have been conducted in Europe, China and the Americas where the internet was introduced much earlier as compared to India and the majority of the populations residing in these regions are accessing the internet. In contrast, the development of the internet and its popularity among citizens is still flourishing in India. Also, studies regarding the relationship between internet use and parent-child relationships are scarce and such studies would have not produced any reliable results.

Therefore, through this study, the researchers aimed to answer the following exploratory questions: (a) What are the patterns of internet use (location of internet use, device used to access the internet, time of internet use, purpose of internet use) among the students? (b) For what duration do the students use the internet for different purposes? (c) Are there any statistically significant differences in internet use between the male and female students as suggested by the literature? (d) What are the differences in the intensity of internet use among the students in 2018 and 2021? (e) What is the quality of relationship that students are having with their parents? (f) Are there any significant differences in parent-child relations between male and female students? (g) What are the differences in the parent-child relationship among students in 2018 and 2021? (h) How do the durations of internet use among students for different purposes correlate to different aspects of their relations with their parents?

METHODS AND INSTRUMENTS

Research design

The present study adopted a cohort longitudinal survey design to study the internet use and parent-children relationship among senior secondary school students in the Himachal Pradesh state of India. The population of the study remains the same i.e. senior secondary school students, but different samples of participants representing the same population have been studied in 2018 and 2021.

Sampling

The sample was recruited using a stratified random sampling technique. In the first stratum, the two districts, namely Mandi and Dharamshala, were recruited using a simple random technique. At the second stratum, five schools from each district were selected using a simple random technique. All the students studying at these ten schools and using the internet (647 in 2018 and 584 in 2021) were asked to fill up the questionnaire and get filled passive consent from their parents and return them within two days. However, only 425 (65.7%) and 406 (69.52%) duly-filled questionnaires were returned in 2018 and 2021 respectively. Those who did not return the questionnaire were because they were mostly absent on the designated day or their parents have not provided their consent. The questionnaires with careless responses, the same responses for each item, or consistent extreme values were eliminated (Meade & Craig, 2012). The final sample size for the first phase (n_1) of the study was 394, and that for the second phase (n_2) was 376. Out of these 394 and 376 respondents, 229 and 212 were males whereas 165 and 164 were females respectively.

Measures

Purposes of internet use were classified as curricular educational, extra-curricular educational, social and recreational. Curricular educational purposes include internet use for completing assignments, taking online lectures, watching conceptual videos regarding curricula, taking mock tests, browsing notes, and other activities that directly deal with their current education. Meanwhile, extra-curricular educational purposes of internet use include browsing documents and articles, watching videos, and attempting mock tests and practice sets for any specific purpose regarding educational career including upcoming examinations and competitions. On the other hand, the social use of the internet includes mail, instant messaging, social networking activities performed on social networking and professional networking sites, personal conversations, teleconferencing, video-conferencing, and other such activities. The recreational use of the internet includes watching movies, listening to music, playing games, and other such activities. The responses regarding time consumed per day for each of these purposes were received on a 6-point scale varying from 0 to 1 hour to 5 to 6 hours, whereas responses regarding overall time consumed per day over the internet were received on a 9-point scale ranging from 0 to 1 hour to 8 to 9 hours.

The parent-child connection was evaluated using seven items developed by Furman and Buhrmester (1985) and amended by Bao et al. (2014). These items examine important aspects of the parent-child connection such as affection, intimacy, companionship, guidance, worth enhancement, conflict (reverse-coded), and satisfaction. On a 5-point scale ranging from 1 (not at all true) to 5, participants must indicate how truthful the statements are (very true). The total score for parent-child connection was determined by the mean score of all items. The higher the score, the better the relationship.

Instrument

The self-constructed questionnaire contained three sections. The first section of the questionnaire gathered demographic information. The second section gathered information about students' internet use, including their average amount of time spent on the internet for curricular educational, extra-curricular education, and social and recreational purposes. The third section of the questionnaire gathered information about their relationship with their parents. The questionnaire was self-constructed and was standardized through a pilot study administered to over 93 participants from the schools that were excluded from the main study. Based on responses received in the pilot study, item discrimination index and difficulty ratio were calculated and items with low discriminating power and high difficulty ratio were eliminated. The face validity and content validity were established through consultation with domain experts and reliability was established using the test-retest method (r = .762).

Data analysis

For analyzing the data in the present study, frequency and percentage distribution, mean, standard deviation, Student's t-test, and Kendall's τ_c were used. Data were analyzed using Microsoft Excel 2007.

FINDINGS

Demographic profile of respondents

Table 1 shows the demographic profile of the samples. As shown, male students in the survey accounted for 58.12% while female students accounted for 41.88% of the respondents in the initial phase. Whereas, male students accounted for 56.38% while female students accounted for 43.62% of the total respondents in the final phase. Students aged 16 accounted for 24.37% and 22.07% in the initial and final phases respectively; aged 17 accounted for 45.94% and 46.28% respectively; aged 18 accounted for 29.69% and 31.65% in the initial and final phases respectively. Students from mathematics stream constituted 27.41% and 28.19%; biology stream constituted 24.87% and 23.14%; commerce stream constituted 30.71% and 32.98%; humanities stream constituted 17.01% and 15.69% respectively.

Table 1: Demographic profile of respondents

Variable	Value	First phase (2018) (n_1 = 394)		Second phase (2021) (n_2 = 376)	
		Frequency	Percent	Frequency	Percent
Gender	Male	229	58.12	212	56.38
	Female	165	41.88	164	43.62
Age	16	96	24.37	83	22.07
	17	181	45.94	174	46.28
	18	117	29.69	119	31.65
Stream	Mathematics	108	27.41	106	28.19
	Biology	98	24.87	87	23.14
	Commerce	121	30.71	124	32.98
	Humanities	67	17.01	59	15.69

Patterns of the internet use

Table 2 represents the responses of the participating students in terms of their internet use. 160 (69.87%) of the male and 112 (67.88%) of the female responders in the first phase whereas 212 (100%) and 164 (100%) of the female responders in the second phase affirmed that the internet facility was available at their home. However, only 80 (34.93%) males and 35 (21.21%) females were using the internet in their homes in the first phase, whereas all of the participants in phase two were accessing the internet from their homes in the second phase. It suggests the increased use of the internet at the home. On the other hand, 148 (64.63%) and 59 (35.76%) of the male and female participants respectively were accessing the internet at their schools in the first phase increased to 198 (93.40%) and 160 (97.56%) respectively in the second phase. Furthermore, 103 (44.98%) and 89 (53.94%) of the male and female respondents respectively were accessing the internet from other locations in the first phase which was substantially reduced to 34 (16.04%) and 31 (14.62%) respectively in the second phase.

Table 2: Distribution of responses regarding the pattern of internet use

Variable	Value	First phase (2018) (n_1 = 394)		Second phase (2021) (n_2 = 376)	
		Male (n_{11} =229)	Female (n_{12} = 165)	Male (n_{21} = 212)	Female (n_{22} = 164)
		Frequency (Percent)	Frequency (Percent)	Frequency (Percent)	Frequency (Percent)
Availability of internet at home	Available	160 (69.87%)	112 (67.88%)	212 (100%)	164 (100%)
	Unavailable	69 (30.13%)	53 (32.12%)	0 (0%)	0 (0%)
Place of internet use	Home	80 (34.93%)	35 (21.21%)	212 (100%)	164 (100%)
	School	148 (64.63%)	59 (35.76%)	198 (93.40%)	160 (97.56%)
	Others	103 (44.98%)	89 (53.94%)	34 (16.04%)	31 (14.62%)
Device used for internet access	Desktop	162 (70.74%)	73 (44.24%)	201 (94.81%)	161 (98.17%)
	Laptop	38 (16.59%)	12 (7.27%)	44 (20.75%)	28 (17.07%)
	Smartphone	79 (34.50%)	47 (28.48%)	212 (100%)	164 (100%)
Nature of device used at home	Personal	42 (18.34%)	11 (6.67%)	167 (78.77%)	43 (26.22%)
	Shared	38 (16.59%)	24 (14.55%)	45 (21.23%)	121 (73.78%)

Internet access through desktops increased significantly as only 162 (70.74%) males and 73 (44.24%) females were using a desktop to access the internet in the first phase rose to 201 (94.81%) and 161 (98.17%) respectively in the second phase of the study. On contrary, the use of a laptop for internet access has seen almost no change as 38 (16.59%) and 12 (7.27%) males and females were using it in the first phase and compared to 44 (20.75%) and 28 (17.07%) respectively in the second phase. Moreover, there was a drastic change in the use of smartphones for accessing the internet as all the participants were using them to access the internet in the second phase of the study as compared to 79 (34.50%) males and 47 (28.48%) females were using smartphones in the first phase of the study. During the first phase of the study, only 42 (18.34%) of the males and 11 (6.67%) of the females were using personal devices to access the internet that rose to 167 (78.77%) males and 43 (26.22%) females during the second phase. It is also evident that the use of personal devices was increased at a higher pace among males than females.

Moreover, as demonstrated in Table 3, the use of the internet was mainly constrained to early morning (20.09%), duration of school hours (64.63%), immediately after school (23.58%) and evening (31.88%) for males, whereas during school (35.76%), immediately after school (37.58%) and evening (24.85%) for the females in the first phase. Whereas in the second phase, the use of the internet seen a spike in the early morning (79.72% as compared to 20.09% for males and 19.51% as compared to 4.85% for females) and late night hours (76.42% as compared to 5.24% for males and 25.61% as compared to 3.64% for females). This increase in internet use in the early morning and late night has been observed to a greater extent among males as compared to females. During the initial phase of the study, the internet was mainly used for curricular education (86.46% males and 83.03% females), socialization (89.96% males and 92.73% females) and recreational use (99.13% males and 97.58% females), whereas during the second phase, the internet is accessed for all the four purposes almost equally, as the use of the internet for the extra-curricular educational purpose has almost doubled (from 44.98% to 79.25% for males and from 44.85% to 86.58% for females) during the period.

Table 3: Distribution of responses regarding time and purpose of internet use

Variable	Value	First phase (2018) (n_1 = 394)		Second phase (2021) (n_2 = 376)	
		Male (n_{11} =229)	Female (n_{12} = 165)	Male (n_{21} = 212)	Female (n_{22} = 164)
		Frequency (Percent)	Frequency (Percent)	Frequency (Percent)	Frequency (Percent)
Time of internet use	Early morning	46 (20.09%)	8 (4.85%)	169 (79.72%)	32 (19.51%)
	During school	148 (64.63%)	59 (35.76%)	104 (49.06%)	21 (12.80%)
	Immediately after school	54 (23.58%)	62 (37.58%)	208 (98.11%)	112 (68.29%)
	Evening	73 (31.88%)	41 (24.85%)	204 (96.23%)	156 (95.12%)
	Late night	12 (5.24%)	6 (3.64%)	162 (76.42%)	42 (25.61%)
Purpose of internet use	Curricular education	198 (86.46%)	137 (83.03%)	212 (100%)	164 (100%)
	Extra-curricular education	103 (44.98%)	74 (44.85%)	168 (79.25%)	142 (86.58%)
	Socialization	206 (89.96%)	153 (92.73%)	210 (99.06%)	157 (95.73%)
	Recreation	227 (99.13%)	161 (97.58%)	211 (99.53%)	162 (98.78%)

The intensity of internet use for different purposes

Table 4 demonstrates the separately calculated means and standard deviations for the intensity of internet use for different purposes, viz. curricular educational, extra-curricular educational, social, and recreational purposes. It indicates that during the first phase, the internet was mainly accessed for recreational purposes (2.05 hours per day) followed by social (1.75 hours per day) and curricular educational (1.67 hours per day) purposes. The intensity of internet access for extra-curricular educational purposes (0.78 hours per day) was quite low. During the second phase, the internet was mainly accessed for curricular educational purposes (4.51 hours per day) followed by social (2.98 hours per day), recreational (2.82 hours per day), and extra-curricular educational purposes (2.56 hours per day). The intensity of internet use for extra-curricular educational purposes (2.46 hours per day) has drastically increased over time. Moreover, the overall intensity of internet use was found to be 3.45 hours per day during the initial phase and 4.89 hours per day during the final phase of the study.

Table 4: Descriptive statistics regarding the intensity of internet use for different purposes

Purpose	Subgroups	First phase (2018) (n_1 = 394)		Second phase (2021) (n_2 = 376)	
		Mean	Standard deviation	Mean	Standard deviation
Curricular Educational	Male	1.70	1.46	4.57	1.05
	Female	1.62	1.42	4.43	1.19
	Total	1.67	1.44	4.51	1.11
Extra-curricular Educational	Male	0.82	1.31	2.27	1.55
	Female	0.73	1.10	2.70	1.45
	Total	0.78	1.23	2.46	1.52
Social	Male	1.76	1.43	3.16	1.51
	Female	1.73	1.40	2.75	1.33
	Total	1.75	1.41	2.98	1.45
Recreational	Male	2.00	1.42	3.26	1.60
	Female	2.11	1.35	2.24	1.36
	Total	2.05	1.39	2.82	1.58
Overall	Male	4.02	1.85	5.37	1.81
	Female	2.66	1.46	4.27	1.60
	Total	3.45	1.82	4.89	1.80

Differences in internet use between the male and female students

For finding whether there are any significant differences between male and female students in terms of internet use for different purposes, Student's t-test for independent groups was employed. The findings of the tests have been summarized as shown in Table 5. The table demonstrates the existence of a significant difference between the groups in terms of intensity of overall internet use in the first phase. It implies that the intensity of internet use among males (m = 4.02, SD = 1.85) was significantly more than among female students (m = 2.66, SD = 1.46). However, the differences in intensity of internet use for different purposes individually were not significant. On the other hand, during the final phase of the study, the intensity of internet use for curricular educational purposes was found to be not significant. However, the male students (m = 2.27, SD = 1.55) tends to use internet less intensely for extra-curricular education in comparison to female students (m = 2.70, SD = 1.45). Whereas, male students use internet more intensely for social (m_m = 3.16, SD_m = 1.51, m_f = 2.75, SD_f = 1.33) and recreational (m_m = 3.26, SD_m = 1.60, m_f = 2.24, SD_f = 1.36) purposes than their counterparts. Also, the male students (m = 5.37, SD = 1.81) use internet more intensely than females (m = 4.27, SD = 1.60) in terms of overall use.

Table 5: Comparison of purposes of internet use between male and female students

Purposes of internet usage	First phase (2018)			Second phase (2021)		
	Male (N = 229) Mean (SD)	Female (N = 165) Mean (SD)	t-value	Male (N = 212) Mean (SD)	Female (N = 164) Mean (SD)	t-value
Curricular educational	1.70 (1.46)	1.62 (1.42)	0.556 (NS)	4.57 (1.05)	4.43 (1.19)	1.170 (NS)
Extra-curricular educational	0.82 (1.31)	0.73 (1.10)	0.751 (NS)	2.27 (1.55)	2.70 (1.45)	-2.691[b]
Social	1.76 (1.43)	1.73 (1.40)	0.204 (NS)	3.16 (1.51)	2.75 (1.33)	2.728[b]
Recreational	2.00 (1.42)	2.11 (1.35)	-0.738 (NS)	3.26 (1.60)	2.24 (1.36)	6.644[a]
Overall	4.02 (1.85)	2.66 (1.46)	8.132[a]	5.37 (1.81)	4.27 (1.60)	6.173[a]

Differences in the intensity of internet use among the students across phases

For calculating whether there are any statistically significant differences among the students in the two phases of the study conducted in 2018 and 2021 respectively, we have again employed Student's t-test for independent groups. As table 6 demonstrates, there is a statistically significant increase in the intensity of internet use for curricular educational purpose among males (m_I = 1.70, SD_I = 1.46, m_{II} = 4.57, SD_{II} = 1.05), females (m_I = 1.62, SD_I = 1.42, m_{II} = 4.43, SD_{II} = 1.19) and all the respondents (m_I = 1.67, SD_I = 1.44, m_{II} = 4.51, SD_{II} = 1.11). Also, there is a statistically significant increase in the intensity of using internet for extra-curricular educational purpose among males (m_I = 0.82, SD_I = 1.31, m_{II} = 2.27, SD_{II} = 1.55), females (m_I = 0.73, SD_I = 1.10, m_{II} = 2.70, SD_{II} = 1.45) and for overall participants (m_I = 0.78, SD_I = 1.23, m_{II} = 2.46, SD_{II} = 1.52). Similarly, there is a statistically significant increase in intensity of internet use for socializing among males (m_I = 1.76, SD_I = 1.43, m_{II} = 3.16, SD_{II} = 1.51), females (m_I = 1.73, SD_I = 1.40, m_{II} = 2.75, SD_{II} = 1.33) and overall participants (m_I = 1.75, SD_I = 1.41, m_{II} = 2.98, SD_{II} = 1.45). Moreover, there is a statistically significant increase in intensity of internet use for recreational purposes among males (m_I = 2.00, SD_I = 1.42, m_{II} = 3.26, SD_{II} = 1.60) and overall participants (m_I = 2.05, SD_I = 1.39, m_{II} = 2.82, SD_{II} = 1.58), however the difference among the females (m_I = 2.11, SD_I = 1.35, m_{II} = 2.24, SD_{II} = 1.36) in the two phases was not found to be statistically significant. The intensity of overall internet use was found to be significantly increased across the phases among males (m_I = 4.02, SD_I = 1.85, m_{II} = 5.37, SD_{II} = 1.81), females (m_I = 2.66, SD_I = 1.46, m_{II} = 4.27, SD_{II} = 1.60) and all participants (m_I = 3.45, SD_I = 1.82, m_{II} = 4.89, SD_{II} = 1.80) unanimously.

Table 6: Comparison of purposes of internet use across phases

Purposes of internet usage		First phase (2018) (n_1 = 394) Mean (SD)	Second phase (2021) (n_2 = 376) Mean (SD)	t-value
Curricular educational	**Males**	1.70 (1.46)	4.57 (1.05)	23.800[a]
	Females	1.62 (1.42)	4.43 (1.19)	19.471[a]
	Total	1.67 (1.44)	4.51 (1.11)	30.504[a]
	Males	0.82 (1.31)	2.27 (1.55)	10.694[a]

Extra-curricular educational	**Females**	0.73 (1.10)	2.70 (1.45)	13.832[a]
	Total	0.78 (1.23)	2.46 (1.52)	16.816[a]
Social	**Males**	1.76 (1.43)	3.16 (1.51)	10.003[a]
	Females	1.73 (1.40)	2.75 (1.33)	6.788[a]
	Total	1.75 (1.41)	2.98 (1.45)	11.971[a]
Recreational	**Males**	2.00 (1.42)	3.26 (1.60)	8.748[a]
	Females	2.11 (1.35)	2.24 (1.36)	0.922 (NS)
	Total	2.05 (1.39)	2.82 (1.58)	7.177[a]
Overall	**Males**	4.02 (1.85)	5.37 (1.81)	7.766[a]
	Females	2.66 (1.46)	4.27 (1.60)	9.497[a]
	Total	3.45 (1.82)	4.89 (1.80)	11.021[a]

Notes: [a] significant at .001 level; NS not significant

Quality of parent-child relationship

The quality of the parent-child relationship was measured through the combination of attributes. The scores obtained for each attribute were collected on a 5-point scale. As depicted in Table 7, the difference in mean scores of all the attributes was very small as it varies between 3.00 and 3.81 during the first phase. However, in the second phase, the scores seem to drop off as the mean scores were ranging between 2.75 and 3.60. The affection among males seems to be depreciated over time as it drops from 3.32 to 3.05 among males, 3.66 to 3.45 among females, and 3.46 to 3.22 for all the participants during the initial and final phases respectively. Similarly, the mean scores of perceived intimacy with parents also dropped from 3.48 to 2.75 among males, 3.73 to 3.15 among females, and 3.59 to 2.93 among all the respondents during the initial and final phases respectively. The companionship also appears to be withered as the mean scores drop from 3.61 to 3.16 among males, 3.81 to 3.41 among females, and 3.69 to 3.19 among all the participants. Also, the decrease in mean scores regarding guidance suggests the perceived level of guidance provided by the parents to students as they decreased from 3.64 to 2.87 among males, 3.75 to 3.36 among females, and 3.68 to 3.09 among all the participants of the study in the initial and final phase respectively.

Moreover, the perceived worth among the students also seems to be slumped as the mean scores among males (3.48 and 3.15), females (3.70 and 3.60), and overall participants (3.57 and 3.35) were slightly reduced. Also, the satisfaction level among students regarding their relationships with parents seems to have deteriorated in an almost similar manner among the males (3.22 and 2.83), females (3.56 and 3.01), and all the participating respondents (3.36 and 2.90) across the two phases of the study. However, the mean scores of conflict (that were reverse coded) also decreased which shows the increase in conflicts as the mean scores dropped for males (from 3.00 to 2.87), females (from 3.12 to 2.93), and all the respondents (from 3.05 to 2.89) during the two phases respectively. As a result of the decrease in mean scores regarding all the attributes the overall mean scores regarding the parent-child relationship among the participants suggests a slightly negative shift in the quality of their relationship as the mean scores decreased from 3.39 to 2.93 for males, 3.62 to 3.27 for females and 3.49 to 3.08 for all the respondents.

Table 7: Descriptive statistics regarding different attributes of the parent-child relationship

Attributes	**Subgroups**	**First phase (2018) (n_1 = 394)**		**Second phase (2021) (n_2 = 376)**	
		Mean	**Standard deviation**	**Mean**	**Standard deviation**
Affection	**Male**	3.32	1.17	3.05	1.25
	Female	3.66	1.11	3.45	1.20
	Total	3.46	1.15	3.22	1.24
Intimacy	**Male**	3.48	1.09	2.75	1.17
	Female	3.73	1.07	3.15	1.20
	Total	3.59	1.09	2.93	1.20
Companionship	**Male**	3.61	1.13	3.16	1.51
	Female	3.81	1.06	3.41	1.19
	Total	3.69	1.10	3.19	1.21
Guidance	**Male**	3.64	1.12	2.87	1.23
	Female	3.75	1.06	3.36	1.17
	Total	3.68	1.10	3.09	1.23
Enhancement of worth	**Male**	3.48	1.15	3.15	1.25
	Female	3.70	1.13	3.60	1.17
	Total	3.57	1.14	3.35	1.23
	Male	3.00	1.30	2.87	1.27

Conflict (Reverse coded)	**Female**	3.12	1.26	2.93	1.22
	Total	3.05	1.28	2.89	1.25
Satisfaction	**Male**	3.22	1.27	2.83	1.24
	Female	3.56	1.23	3.01	1.28
	Total	3.36	1.26	2.90	1.26
Overall	**Male**	3.39	1.19	2.93	1.23
	Female	3.62	1.15	3.27	1.22
	Total	3.49	1.18	3.08	1.24

Differences in parent-child relations between male and female students

For finding the differences in parent-child relations between male and female students and to establish whether these differences are statistically significant or not, the researchers have employed Student's t-test for independent groups.

Table 8: Comparison of purposes of internet usage and the parent-child relationship within phases

Aspects of the parent-child relationship	First phase (2018)			Second phase (2021)		
	Male (N = 229) Mean (SD)	Female (N = 165) Mean (SD)	t-value	Male (N = 212) Mean (SD)	Female (N = 164) Mean (SD)	t-value
Affection	3.32 (1.17)	3.66 (1.11)	2.932[b]	3.05 (1.25)	3.45 (1.20)	3.122[b]
Intimacy	3.48 (1.09)	3.73 (1.07)	2.283[c]	2.75 (1.17)	3.15 (1.20)	3.266[b]
Companionship	3.61 (1.13)	3.81 (1.06)	1.772 (NS)	3.01 (1.19)	3.41 (1.19)	3.179[a]
Guidance	3.64 (1.12)	3.75 (1.06)	0.965 (NS)	2.87 (1.23)	3.36 (1.17)	4.253[a]
Enhancement of worth	3.48 (1.15)	3.70 (1.13)	1.826 (NS)	3.15 (1.25)	3.60 (1.17)	3.540[a]
Conflict (Reverse-coded)	3.00 (1.30)	3.12 (1.26)	0.925 (NS)	2.87 (1.27)	2.93 (1.22)	0.454 (NS)
Satisfaction	3.22 (1.27)	3.56 (1.23)	2.659[b]	2.83 (1.24)	3.01 (1.28)	1.381 (NS)
Overall	3.39 (1.19)	3.62 (1.15)	4.958[a]	2.93 (1.23)	3.27 (1.22)	7.011[a]

Notes: [a] significant at .001 level; [b] significant at .01 level; [c] significant at .05 level; NS not significant

From the data provided in table 8 showing the results of these tests, we can comprehend that the differences between the two groups are statistically significant for affection (m_m = 3.32, SD_m = 1.17, m_f = 3.66, SD_f = 1.11), intimacy (m_m = 3.48, SD_m = 1.09, m_f = 3.61, SD_f = 1.13), satisfaction (m_m = 3.22, SD_m = 1.27, m_f = 3.56, SD_f = 1.23) and overall relationship (m_m = 3.39, SD_m = 1.19, m_f = 3.62, SD_f = 1.15) during phase I whereas for affection (m_m = 3.05, SD_m = 1.25, m_f = 3.45, SD_f = 1.20), intimacy (m_m = 2.75, SD_m = 1.17, m_f = 3.15, SD_f = 1.20), companionship (m_m = 3.01, SD_m = 1.19, m_f = 3.41, SD_f = 1.19), guidance (m_m = 2.87, SD_m = 1.23, m_f = 3.36, SD_f = 1.17), enhancement of worth (m_m = 3.15, SD_m = 1.25, m_f = 3.60, SD_f = 1.17), and overall relationship (m_m = 2.93, SD_m = 1.23, m_f = 3.27, SD_f = 1.22) during phase II. It is also significant that all of these differences indicate female students have better relationships with their parents in contrast to male students.

Differences in the parent-child relationship across phases

The Student's t-test was employed to find whether the differences in mean scores regarding the attributes of the parent-child relationship were statistically significant or not. The results of these tests are tabulated as shown in table 9.

Table 9: Comparison of parent-child relationship across phases

Aspects of the parent-child relationship		First phase (2018) ($n_1 = 394$) Mean (SD)	Second phase (2021) ($n_2 = 376$) Mean (SD)	t-value
Affection	Males	3.32 (1.17)	3.05 (1.25)	2.365[c]
	Females	3.66 (1.11)	3.45 (1.20)	1.693 (NS)
	Total	3.46 (1.15)	3.22 (1.24)	2.797[b]
Intimacy	Males	3.48 (1.09)	2.75 (1.17)	6.767[a]
	Females	3.73 (1.07)	3.15 (1.20)	4.629[a]
	Total	3.59 (1.09)	2.93 (1.20)	7.984[a]
Companionship	Males	3.61 (1.13)	3.01 (1.19)	5.355[a]
	Females	3.81 (1.06)	3.41 (1.19)	3.191[b]
	Total	3.69 (1.10)	3.19 (1.21)	6.053[a]
Guidance	Males	3.64 (1.12)	2.87 (1.23)	6.851[a]
	Females	3.75 (1.06)	3.36 (1.17)	2.706[b]
	Total	3.68 (1.10)	3.09 (1.23)	6.847[a]
Enhancement of worth	Males	3.48 (1.15)	3.15 (1.25)	2.927[b]
	Females	3.70 (1.13)	3.60 (1.17)	0.786 (NS)
	Total	3.57 (1.14)	3.35 (1.23)	2.715[b]
Conflict (Reverse-coded)	Males	3.00 (1.30)	2.87 (1.27)	1.077 (NS)
	Females	3.12 (1.26)	2.93 (1.22)	1.422 (NS)
	Total	3.05 (1.28)	2.89 (1.25)	1.784 (NS)
Satisfaction	Males	3.22 (1.27)	2.83 (1.24)	3.294[b]
	Females	3.56 (1.23)	3.01 (1.28)	3.983[a]
	Total	3.36 (1.26)	2.90 (1.26)	5.025[a]
Overall	Males	3.39 (1.19)	2.93 (1.23)	10.517[a]
	Females	3.62 (1.15)	3.27 (1.22)	6.997[a]
	Total	3.49 (1.18)	3.08 (1.24)	12.313[a]

Notes: [a] significant at .001 level; [b] significant at .01 level; [c] significant at .05 level; NS not significant

The results demonstrate that the difference in affection across the phases of the study among males ($m_I = 3.32$, $SD_I = 1.17$, $m_{II} = 3.05$, $SD_{II} = 1.25$), and all participants ($m_I = 3.46$, $SD_I = 1.15$, $m_{II} = 3.22$, $SD_{II} = 1.24$) are statistically significant whereas the difference among females ($m_I = 3.66$, $SD_I = 1.11$, $m_{II} = 3.45$, $SD_{II} = 1.20$) is not significant. It means that the affection seems to be declined among the males and all participants over time. The differences in mean scores regarding intimacy are decreased across the phases signifying perceived decrease in intimacy between child and parents similarly among males ($m_I = 3.48$, $SD_I = 1.09$, $m_{II} = 2.75$, $SD_{II} = 1.17$), females ($m_I = 3.73$, $SD_I = 1.07$, $m_{II} = 3.15$, $SD_{II} = 1.20$) and all participants ($m_I = 3.59$, $SD_I = 1.09$, $m_{II} = 2.93$, $SD_{II} = 1.20$). Similarly, the differences in mean scores regarding companionship also declined across the phases indicating deterioration in companionship between child and their parents likewise among males ($m_I = 3.61$, $SD_I = 1.13$, $m_{II} = 3.01$, $SD_{II} = 1.19$), females ($m_I = 3.81$, $SD_I = 1.06$, $m_{II} = 3.41$, $SD_{II} = 1.19$), and all respondents ($m_I = 3.69$, $SD_I = 1.10$, $m_{II} = 3.19$, $SD_{II} = 1.21$). When it comes to guidance a similar trend is established indicating the withering of guidance in parent-child relationship across phases in parallel among the males ($m_I = 3.64$, $SD_I = 1.12$, $m_{II} = 2.87$, $SD_{II} = 1.23$), females ($m_I = 3.75$, $SD_I = 1.06$, $m_{II} = 3.36$, $SD_{II} = 1.17$) and all participants ($m_I = 3.68$, $SD_I = 1.10$, $m_{II} = 3.09$, $SD_{II} = 1.23$).

However, in terms of enhancement of worth, the mean scores reveal that there is a decrease in worth among male ($m_I = 3.48$, $SD_I = 1.15$, $m_{II} = 3.15$, $SD_{II} = 1.25$) and overall participants ($m_I = 3.57$, $SD_I = 1.14$, $m_{II} = 3.35$, $SD_{II} = 1.23$) while among females ($m_I = 3.70$, $SD_I = 1.13$, $m_{II} = 3.60$, $SD_{II} = 1.17$), no statistically significant difference was observed. The mean scores regarding conflict among the child and parents are not statistically different indicating there is no change in conflict over the period either for males ($m_I = 3.48$, $SD_I = 1.09$, $m_{II} = 2.75$, $SD_{II} = 1.17$), females ($m_I = 3.48$, $SD_I = 1.09$, $m_{II} = 2.75$, $SD_{II} = 1.17$) or all participants ($m_I = 3.48$, $SD_I = 1.09$, $m_{II} = 2.75$, $SD_{II} = 1.17$). The mean scores regarding satisfaction level entails that the satisfaction level among the students has also deceased over time as the mean scores have seen a statistically significant drop in a similar manner among males ($m_I = 3.22$, $SD_I = 1.27$, $m_{II} = 2.83$, $SD_{II} = 1.24$), females ($m_I = 3.56$, $SD_I = 1.26$, $m_{II} = 3.01$, $SD_{II} = 1.28$) and all participants ($m_I = 3.36$, $SD_I = 1.26$, $m_{II} = 2.90$, $SD_{II} = 1.26$) respectively. As we can see the majority of the aspects have seen significant downgrading of parent-child relationship among students across phases, the overall relationship scores also confirms the fact as the mean scores among males ($m_I = 3.39$, $SD_I = 1.19$, $m_{II} = 2.93$, $SD_{II} = 1.23$), females ($m_I = 3.62$, $SD_I = 1.15$, $m_{II} = 3.27$, $SD_{II} = 1.22$) and all participants ($m_I = 3.49$, $SD_I = 1.18$, $m_{II} = 3.08$, $SD_{II} = 1.24$) have all decreased over time.

Correlations between durations of internet use for different purposes among students and different aspects of their relationship with their parents

The correlation between the duration of internet use and their relationships with their parents was calculated for each purpose of internet use and each aspect of parent child-relationship. Since the data regarding both the variables were measured on the ordinal level and there was a significant number of ties along with the unequal number of levels for each variable (as the intensity of internet use was measured on a 6-point scale for each purpose and the 9-point scale for overall internet use, and the 5-point scale for relationship) therefore, Kendall's Tau-c (τ_c) was calculated. The coefficients have been tabulated in Table 9 for the first and second phases of the study, and all the results were found to be significant at $\alpha = .05$ with $p < .05$. From Table 10, it is evident that there is a negative correlation ($\tau_{cI} = 0.539$, $\tau_{cII} = 0.559$) among the dimensions of the two variables. Also, the correlation coefficients were found to be almost similar in both phases indicating the reliability of the tool.

Table 10: Correlations between purposes of internet use and different aspects of the parent-child relationship in phase I (N_1=394) and phase II (N_2=376)

Aspects of the parent-child relationship	Purposes of internet use				
	Curricular educational	Extra-curricular educational	Social	Recreational	Overall
Affection	- 0.227 - 0.281	- 0.313 - 0.293	- 0.394 - 0.421	- 0.789 - 0.776	- 0.473 - 0.503
Intimacy	- 0.203 - 0.178	- 0.324 - 0.359	- 0.219 - 0.264	- 0.643 - 0.617	- 0.438 - 0.458
Companionship	- 0.197 - 0.214	- 0.254 - 0.207	- 0.417 - 0.493	- 0.526 - 0.574	- 0.501 - 0.569
Guidance	- 0.183 - 0.241	- 0.362 - 0.319	- 0.491 - 0.531	- 0.537 - 0.598	- 0.497 - 0.537
Enhancement of worth	- 0.243 - 0.234	- 0.324 - 0.297	- 0.367 - 0.403	- 0.732 - 0.702	- 0.591 - 0.618
Conflict (Reverse-coded)	- 0.217 - 0.234	- 0.298 - 0.276	- 0.642 - 0.694	- 0.771 - 0.736	- 0.653 - 0.672
Satisfaction	- 0.173 - 0.249	- 0.264 - 0.295	- 0.649 - 0.627	- 0.683 - 0.664	- 0.618 - 0.621
Overall	- 0.192 - 0.208	- 0.299 - 0.306	- 0.454 - 0.497	- 0.686 - 0.673	- 0.539 - 0.559

The results signify that strong correlations ($\tau_{cI} = 0.686$, $\tau_{cII} = 0.673$) exist between the recreational use of the internet and the parent-child relationship among the participants. Internet use for social purposes ($\tau_{cI} = 0.454$, $\tau_{cII} = 0.497$) is found to be moderately correlated to the parent-child relationship among them. Whereas the use of internet for extra-curricular educational purposes ($\tau_{cI} = 0.299$, $\tau_{cII} = 0.306$) and curricular educational purposes ($\tau_{cI} = 0.192$, $\tau_{cII} = 0.208$) demonstrate weak correlations with participants' and their parents' relationship. Similarly, the correlations of internet use with conflict ($\tau_{cI} = 0.653$, $\tau_{cII} = 0.672$), satisfaction ($\tau_{cI} = 0.618$, $\tau_{cII} = 0.621$) and enhancement of worth ($\tau_{cI} = 0.591$, $\tau_{cII} = 0.618$) are found to be strong, whereas, that of affection ($\tau_{cI} = 0.473$, $\tau_{cII} = 0.503$), intimacy ($\tau_{cI} = 0.438$, $\tau_{cII} = 0.458$), companionship ($\tau_{cI} = 0.501$, $\tau_{cII} = 0.569$) and guidance ($\tau_{cI} = 0.497$, $\tau_{cII} = 0.537$) are found to be moderate.

DISCUSSION

According to the literature, given that excessive internet use to the point that it interferes with functioning is a key symptom of addiction (Beard & Wolf, 2001; Griffiths, 2005; Kraut et al., 1998; K. Young, 1998a), there is a substantial correlation between the amount of time spent online every day and internet addiction. Excessive

internet usage causes sleeping issues, extreme exhaustion, employment and academic performance problems, bodily issues, relational issues associated with the overuse of computers, and online addiction (K. S. Young, 1999). Excessive internet use, on the other hand, does not result in internet addiction in every person. Overuse of the internet might be an element of risk for developing internet addiction. Thus, overuse of the internet that impairs functioning is a distinguishing criterion for addiction (Savci & Aysan, 2017a). The purpose of using the internet is more crucial than how long you use it. Internet users, both those addicted to it and those who are not, utilize the internet for a variety of reasons (S. Kim & Kim, 2002). Internet addicts browse websites with pornographic content, play computer games, watch movies, listen to music, and chat through the internet; non-addicts utilize the internet for acculturation and communication. As a result, the motives for using the internet help better explain the relationship between the amount of time spent online and internet addiction. As a result, it can be inferred that a child who uses the internet for a longer time is more prone to internet addiction than a child who uses the internet for a shorter time. Furthermore, it can be deduced that a child who uses the internet for recreational purposes is more prone to internet addiction than a child who uses the internet for socializing and communication. According to the current study, male students are more likely than female pupils to develop an internet addiction, and the likelihood of internet addiction increases with time.

Individuals from generations before the internet preferred actual social contexts to cope with bad emotions. Today, however, virtual surroundings are regarded as an alternative coping strategy. In this regard, the internet provides a new socializing option: virtual socialization (Ogel, 2014). As they assist the individual in isolating from issues and conflicts, virtual environments are viewed as safe havens for fleeing from everyday life stress and bad emotions. As a result, the likelihood of the person developing an addiction to the internet or engaging in problematic, pathological, compulsive, or obsessive internet use increases. In this scenario, technology addictions erode social connectivity (Savci & Aysan, 2017b). Negative affection lengthens the time spent on the internet. Negative affection may also lead to internet addiction by raising the total amount of time per day spent online. However, every person who uses the internet cannot be deemed to have negative affection. An internet addict, on the other hand, is anticipated to have negative feelings (Griffiths, 2005; K. Young, 1998a). The diagnosis of internet addiction includes negative affection (Savci & Aysan, 2017a). Following previous research, the current study finds that affection is adversely associated with the length of time spent online. Higher internet usage also corresponds with lowering parental intimacy, as it is impacted by the increased propensity of alienation from social contexts and proximity to virtual environments, which also diminishes companionship and increases conflict between children and their parents.

Teaching children to regulate their emotions, thoughts, and behaviors is one of the parents' most important roles for their kids to develop self-control (Finkenauer et al., 2005). They must also demonstrate that they have considerable value and are unique to them. Adolescence, specifically, complicates both favorable and unfavorable interactions between parents and children (Hafen & Laursen, 2009). Furthermore, it must be noted that a child's future might be adversely impacted by poor family relationship management during a time of abrupt changes in the family system. Nowadays, children may share less information with their parents and expose themselves to greater risk as a consequence of the parental efforts to protect their children or to retain them under charge for any reason (Cetinkaya & Sutku, 2016; Christakis et al., 2011; Hawk et al., 2009; Segatto & Dal Ben, 2013). Individual acts of parents to shield their children from potential harm are becoming increasingly crucial as internet technologies improve. As a result, parents must maintain a balanced approach to their children and avoid putting them in circumstances over which they have no control. Furthermore, achieving such a balance may have a good impact on young people's satisfaction with their relationship with their parents and their education through the use of technology. Additionally, parents must possess the wisdom and competence to nurture their kids, who have been born into the digital age, against the problems of this milieu and advise them on how to respond to it (Cetinkaya, 2019).

Overall internet usage, regardless of the reason, had a detrimental effect on the penchant for using the internet. According to Davis' (2001) 'cognitive-behavioral model of pathological internet use,' an internet usage experience or psychopathology might lead to incorrect cognition, such as a propensity for using the internet. Takahira et al. (2008) presented a causal relationship wherein using the internet promotes one's affinity for online communication, which was following the causal relationship anticipated by this model (2001). However, they found a probable link in the opposite direction: kids who appreciate online over offline interactions make use of the internet for whatever purpose they can. Internet usage among children often rises as a result of their choice of online over offline activities. Due to this vicious cycle, routine internet use may turn pathological, leading to undesirable behaviors like failing classes and avoiding events. However, the use of the internet may not necessarily have a harmful influence on kids' social skills and psychological health. Positive effects have also been demonstrated (McKenna & Bargh, 2000). Internet usage might therefore affect a child's social life in both negative and beneficial ways. As

a result, just forbidding or restricting internet use would not always have positive effects. A better strategy would be to devise ways for mitigating negative consequences while encouraging positive ones.

IMPLICATIONS

This study broadens the corpus of knowledge on internet use. It also verifies and expands upon prior findings. The findings establish a link between internet use and parent-child relationships in the Indian setting. It gives insights and underscores the growing concerns over teenagers' uncontrolled internet use. To preserve a balance between the actual and virtual worlds, teachers, educators, parents, technology developers, and politicians must all play an equal role. The study's findings also indicate the critical need for curricular and pedagogical innovation to reduce internet use.

LIMITATIONS AND DIRECTIONS FOR FUTURE RESEARCH

The purpose of this article is to enhance knowledge of the link between internet use and parent-child relationships. A small number of studies on the subject have been conducted, and they all used nearly distinct dimensions of the variables internationally, however, there is a scarcity of such data in the Indian context. The current study does, however, have certain drawbacks. The proposed questionnaire has demonstrated potential reliability and validity; nevertheless, it has to be further validated by extending its application to different situations. One of the primary limitations of the current study, which may be used to compare internet users to non-internet users, is the lack of a control group. Furthermore, qualitative investigations with a big enough sample size might provide some novel findings. Furthermore, qualitative investigations with a big enough sample size might provide some interesting discoveries. Furthermore, the current study only looked at group differences and correlations; however, future research might look at the moderating and mediating impacts of other characteristics such as group culture and peer pressure. The bidirectional causation between internet use and parent-child relationships may also be investigated. Furthermore, while the current study solely collects data from kids, parents may be added in future studies.

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ATTITUDE OF HIGHER SECONDARY SCHOOL STUDENTS TOWARDS ONLINE EDUCATION IN THE DISTRICT OF DAKSHIN DINAJPUR, WEST BENGAL

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ABSTRACT:
In the present study an attempt has been composed by the investigators to investigate the attitude level of higher secondary level school students towards online education in Dakshin Dinajpur district, West Bengal. To fulfil this study the researcher adopted descriptive survey research method. The researcher collected the data from 250 samples selected through simple random sampling based on the self-made five-point Likert scale. Mean, SD and t-test have used for data analysis with the help of SPSS 2.0. Finally, the results have been seen that, the overall attitude level of higher secondary level students in Dakshin Dinajpur district towards online education is moderate. Male-female, rural-urban and arts-science students have shown their same level attitude towards online education, they did not significantly different from each other. But obtained by the mean scores of students it has found that, female students have comparatively more favourable attitude towards online education than the male students, urban students have comparatively more favourable attitude towards online education than the rural students and arts students have comparatively more favourable attitude towards online education than the science students.
Keywords: Attitude, Online Education, Higher Secondary School Students.

1. Introduction:

Online education is a form platform where teaching and learning both are taking place with the help of internet and technology. It creates a flexible transactional teaching-learning environment. Students can easily participate to the online classes from anywhere. Online education can be defined as "learning that takes place partially or entirely over the Internet" (U.S. Department of Education, 2010). Online learning as the delivery of instruction to a remote audience using the web as an intermediary. Khan (1997). Online education: A domain of learning that delivers various kind of instructions and course materials over the Internet connectivity and other computer-mediated communication tools. (Abramenka, 2015). "I cringe at the thought of online education for these students. We don't have the appropriate scaffolding in place for these folds" (Oswal & Meloncon, 2014, p. 283). Online education, according to Harasim (1989), is a new domain of learning that combines distance education with the practice of face-to-face instruction utilizing computer-mediated communication.

The word online education is often amalgamated with virtual education, cyber-learning, internet education, and asynchronous learning (Office of Sustainable Development, 2000). Kearsly (2000, p. 4-10), listed the following major components which shape online education: connectivity, community, authenticity, exploration, student-centeredness, shared knowledge, collaboration, unboundedness and multisensory experience. (Pasha and Gorya, 2019), Online education is a type of educational instruction that is delivered via the internet to students using their home computers. (Basilaia and Kvavadze, 2020), Online education, where the information technologies and communications are used to help in the development and acquisition of knowledge from the different remote locations. It uses the internet and video/audio and text communication and software to create the learning environment. "Students are taking online courses for content not for social interaction" (Thomson, 2010, p. 37). In the research literature, online education is variously termed as "distance education" "e-learning," "online learning," "blended learning," "computer-based learning," "web-based learning," "virtual learning," "tele-education," "cyber learning," "Internet-based learning," "distributed learning," etc. (Sun and Chen, 2016). Online education has the following features: (i) it provides a learning experience different than in the traditional classroom because learners are different. (ii) participation in classroom by learners are different. (iii) discrimination and prejudice are minimized. (iv) the social dynamic of the learning environment is changed, and (v) the communication is via computer and World Wide Web. (Ascough, 2002).

2. Need and Significance of the Study:

This present study will help to know the attitude level of the student towards online education. Research tool that has been developed by the investigator will help many researchers further conducting in the field of online education. The paper will inform us what opinion or how students think about online education in Dakshin Dinajpur district with regards gender, locality and their stream of education.

3. Review of Related Literature:

According to Best (2008)- A familiarity with the literature in any problem area helps the student to discover what other have attempted to find out, what method had been promising and what problems remained to be solved. Anderson and Arsenault (2002), "Successful research is based on all the thinking, knowledge and research that preceded it, and that's why review of literature is very essential step in the process of research.

Butnaru, Nit, Anichiti and Brinza, (2021), have tried to explored the perceptions of high school students and academic students towards online education in Romania and also highlight the effectiveness of online education during covid-19 pandemic. After completed the study they have showed the results that there is negative relationship between perception of online courses and face-to-face courses regarding their effectiveness. They also react differently based on their proficiency towards online education. **Baczek, Zaganczyk, Czek, Szpringer, Jaroszynski & zakowska-Kap, (2021),** have conducted a survey on polish medical students during covid-19 pandemic regarding their perceptions towards online learning. From the study the results outcome that they were less active of online classes (M=2.72) compare with traditional classes (M=3.82) (P<.001). The respondents also stated that e-learning not only increases the knowledge but also clinical and social skills and it is highly accepted. **Pasha & Gorya (2019),** have examined a study on students' perception and preference towards online education in Hyderabad City. The results indicate that most of the people are aware about online education and still a small portion of people in this study are unaware about online education. Only 26% people preferred offline education and 74% people preferred the mode of e-learning/virtual learning/ online learning and they think it is an effective way of learning. **Jindal & Chahal (2018),** have identified some key factors towards the growth of online education, i) ease of doing course, ii) initiated by government, iii) low cost of online education, iv) self-pace, v) employer's recognition and bridging gap, vi) no boundaries irrespective caste, class, time and location, vii) very fast process etc. **Eric and Loeb (2017),** observed that the online system of course, instead of face-to-face course increases the tendency of dropout rate of the students from school and also the negative impacts of online course produce the lowest performing students. **Herman & Banister (2017),** have carried out research to compare the cost and learning outcomes of online course and traditional learning. Their study revealed that, the online course saves cost and efforts, having engages online course students have strong learning outcomes. **Fahad (2016),** investigates the attitude and perceptions of university students towards effectiveness of online learning in their studies. The findings directed that online learning through mobile and other ICTs as interesting and effective tools that improves their communication, technological knowledge as well as learning. **According to Stack & Steven (2015),** online education has proliferated in the last decade. His research has not found any major difference in the scores of the students taking online course and face to face classes. **Abramenka (2015),** has conducted a study to know the effect of online education regarding the LPGAT & CP classes students, and also revealed that their participation in the online session of review did not significantly enhance the rate of percentage of pass on the CP & LPGAT class. **Yang, Linda & Cornelius (2010),** "Students' Perceptions towards the Quality of Online Education: A Qualitative Approach". The findings revealed that cost-effectiveness, ease of connection to the Internet, flexibility, electronic research availability, and well-designed class interface were students' positive experiences. **Rovai, Wighting & Lui (2005),** studied the medium of delivery, such as face-to-face versus technology classroom settings. The results indicates that it does not make any huge difference of the learning outcomes and also asserted that the quality of instruction or the medium of delivery impacts learning outcomes. **Donlevy (2003),** stated that, the lack of least peer interaction can negatively effect on some aspects of learning process. "Social and emotional aspects of learning are as important as the technical information" instruct to the students.

4. Objectives of the study:

1. To assess the level of attitude of higher secondary school students towards Online education in the district of Dakshin Dinajpur.

2. To find out the difference between male and female higher secondary school students regarding their attitude towards Online education in the district of Dakshin Dinajpur.

3. To find out the difference between rural and urban higher secondary school students regarding their attitude towards Online education in the district of Dakshin Dinajpur.

4. To find out the difference between arts and science higher secondary school students regarding their attitude towards Online education in the district of Dakshin Dinajpur.

5. Hypothesis of the study:

H01. There would not have favourable attitude of higher secondary school students towards Online education in the district of Dakshin Dinajpur.

H02. There is no significance difference between male and female higher secondary school students regarding their attitude towards Online education in the district of Dakshin Dinajpur.

H03. There is no significance difference between rural and urban higher secondary school students regarding their attitude towards Online education in the district of Dakshin Dinajpur.

H04. There is no significance difference between arts and science higher secondary school students regarding their attitude towards Online education in the district of Dakshin Dinajpur.

6. Operational Definitions of the terms:

Attitude: In this study, the term 'attitude' has been used as state of mind or opinion of students towards online education and how they feel about it.

Online Education: It is a form of education where transaction process between teachers and students have been made via internet.

Higher Secondary School Students: In this study, students who are studying school in class XI & XII under the W.B.C.H.S.E. board.

7. Methodology of the study:

7.1. Methods of the study:

Descriptive survey research methods have been used by the researchers for conducting this study. Naturally the researchers have used different research tools, strategies and other methods of survey research for collecting, analysing and interpretation of the data.

7.2. Population of the study:

All the higher secondary level students (class XI and XII) studying in the district of Dakshin Dinajpur, West Bengal as selected population for the present study.

7.3. Sample of the study:

250 higher secondary level school students comprising class XI & XII were selected as sample for the present research.

7.4. Sampling technique:

Simple random sampling technique has been adopted to select the samples from the population in this study.

7.5. Tool of the study:

The investigator developed a self-made research tool followed by five-point Likert's scale i.e., strongly agree (SA), agree (A), undecided (UD), disagree (D), strongly disagree (SD) and applied for collecting the data for conducting this current research. The tool consists total 26 statement with combination positive (15) and negative (11) items based on the 8 dimensions such as flexibility, communication and relationship, academic activities, autonomy, understanding of imparted subject, class system, extra-curricular activities, evaluation system. Only academic activities dimension has 5 items or statements and other each dimensions have 3 items. The scale has

been validated by expert validity and test the reliability by Cronbach alpha through SPSS 2.0. The result has shown .602 and we can say that the test is okay and good.

7.6. Techniques of data analysis:

Present study the researcher has used Mean, S.D, and t-test for analyzing the data with the help of SPSS 2.0.

7.7. Data collection procedure:

As per previous planning, the investigator collects the data from the higher secondary level students during covid 19 pandemic situation. The researcher has visited various tuition centre and nearby schools during the vaccination time and also visited the home of the students as much as possible. The constructed tool has been administered on 250 students and it has been seen that there were participated total 8 schools student combination with rural and urban area. First attempt with students, the investigator introduced himself and what purpose behind the collection of data. After complete the introductory section, the researcher told them about the instruction of the tool and process to response the tool. The tool was fully English version and for the better understanding of the respondents the researcher has translated each statement wherever required. There was no time limitation to the rating of the scale. After completion the response all questionnaire collected very carefully and thanks them by the investigator.

After collecting the data from samples, the researcher scoring each questionnaire and each item based on the pre-selected method. In case of positive item, the scoring technique was 5-4-3-2-1 on the other hand reverses scoring technique 1-2-3-4-5 was applied by the researcher. The total process of data collection and scoring has been done very carefully and sensitively.

8. Analysis and interpretations:

H01. There would not have favourable attitude of higher secondary school students towards Online education in the district of Dakshin Dinajpur.

Table no-1. Shows the Number, Mean and SD of the total students.

Group	Number	Mean	SD
Students	250	76.08	8.97

M ±σ

M + σ = 76.08 + 8.97= 85.05

M - σ = 76.08 - 8.97= 67.11

Table No-2. Shows the level of attitude of students towards Online Education on the basis of cut-off point.

Scores	Frequency	Percentage	Level of Attitude
Above- 85.05	70	28%	Favourable
Between- 67.11 to 85.05	130	52%	Moderate
Below- 67.11	50	20%	Unfavourable
Total	250	100%	

From the table no-2, on the basis of cut-off point it has been seen that, out of total 250 students 28% have scored above 85.05, between 67.11 to 85.05 have scored 52% and 20% have scored below 67.11 on attitude measuring tool constructed by the researcher for the students. Therefore, it has clearly seen that the maximum percentage (%) of students have scored between 67.11 to 85.05, which indicates the level of attitude of the higher secondary level students towards online education in the district of Dakshin Dinajpur, West Bengal is Moderate.

H02. There is no significance difference between male and female higher secondary school students regarding their attitude towards Online education in the district of Dakshin Dinajpur.

Table-3: Shows the Difference between Male and Female Higher Secondary Level School Students Regarding Their Attitude towards the Online Education

Groups/ Variables	N	Mean	SD	Mean Difference	SED	Df	t-value	Level of Significance
Male	136	75.361	9.959	1.587	1.948	248	0.815	Not significant at 0.05 and 0.01 level
Female	114	76.948	7.663					

From the table no-3, it is evident that, the calculated 't'-value (0.815) is less than the table value both at 0.05 (1.97) and 0.01 (2.60) level of significance with df 248. Therefore, the result indicates that the male and female higher secondary level student's attitude did not differ significantly. Hence, it is stated that, there is no significance difference between male and female higher secondary school students regarding their attitude towards Online education in the district of Dakshin Dinajpur, West Bengal. The null hypothesis is accepted. But on the basis of obtained mean score we can say that female student's attitude towards online education is comparatively more favorable than male students in the district of Dakshin Dinajpur, West Bengal.

H03. There is no significance difference between rural and urban higher secondary school students regarding their attitude towards Online education in the district of Dakshin Dinajpur.

Table-4: Shows the Difference between Rural and Urban Higher Secondary Level School Students Regarding Their Attitude towards the Online Education

Groups/ Variables	N	Mean	SD	Mean Difference	SED	Df	t-value	Level of Significance
Rural	132	75.476	8.667	1.183	1.943	248	0.609	Not Significant at 0.05 and 0.01 level
Urban	118	76.659	9.323					

From the table no-4, it is evident that, the calculated 't'-value (0.609) is less than the table value both at 0.05 (1.97) and 0.01 (2.60) level of significance with df 248. Therefore, the result indicates that the rural and urban higher secondary level student's attitude did not differ significantly. Hence, it is stated that, there is no significance difference between rural and urban higher secondary school students regarding their attitude towards Online education in the district of Dakshin Dinajpur, West Bengal. The null hypothesis is accepted. But on the basis of obtained mean score we can say that urban student's attitude towards online education is comparatively more favorable than rural students in the district of Dakshin Dinajpur, West Bengal.

H04. There is no significance difference between arts and science higher secondary school students regarding their attitude towards Online education in the district of Dakshin Dinajpur.

Table-5: Shows the Difference between Arts and Science Higher Secondary Level School Students Regarding Their Attitude towards the Online Education

Groups/ Variables	N	Mean	SD	Mean Difference	SED	Df	t-value	Level of Significance
Arts	155	76.446	8.390	1.494	2.260	248	0.661	Not Significant at 0.05 and 0.01 level
Science	95	74.952	10.740					

From the table no-4, it is evident that, the calculated 't'-value (0.661) is less than the table value both at 0.05 (1.97) and 0.01 (2.60) level of significance with df 248. Therefore, the result indicates that the arts and science higher secondary level student's attitude did not differ significantly. Hence, it is stated that, there is no significance difference between arts and science higher secondary school students regarding their attitude towards Online education in the district of Dakshin Dinajpur, West Bengal. The null hypothesis is accepted. But on the basis of obtained mean score we can say that arts student's attitude towards online education is comparatively more favorable than science students in the district of Dakshin Dinajpur, West Bengal.

9. Major findings of the study:

Donlevy (2003), stated that, the lack of least peer interaction can negatively effect on some aspects of learning process. "Social and emotional aspects of learning are as important as the technical information" instruct to the students.

The following findings are come out from the present study:

i. It has seen that, most of the student's attitude in the Dakshin Dinajpur district, West Bengal towards online education is moderate level.

ii. The attitude of male and female students of higher secondary level in Dakshin Dinajpur district did not differ from each other regarding their attitude towards online education. But it has found that female students have comparatively more favourable attitude towards online education than the male students on the basis of their obtained mean scores.

iii. The attitude of rural and urban students of higher secondary level in Dakshin Dinajpur district did not differ from each other regarding their attitude towards online education. But it has found that urban students have comparatively more favourable attitude towards online education than the rural students on the basis of their obtained mean scores.

iv. The attitude of arts and science students of higher secondary level in Dakshin Dinajpur district did not differ from each other regarding their attitude towards online education. But it has found that arts students have comparatively more favourable attitude towards online education than the science students on the basis of their obtained mean scores.

Conclusion:

Online education is one of the interesting educational stations, where teachers and students are enjoying with full autonomy according to their own pace. Because it creates an atmosphere based on the principle of barrier free classroom. In this system of education students and teachers are allow to connect either synchronously or asynchronously. The present study concludes that, online education system is one of the alternative interesting educational platforms in the time of covid 19 pandemic and also it is easily accessible. Students of Dakshin Dinajpur district have shown their moderate attitude and irrespective their gender, location and stream also they have presented the same level attitude towards online education. But female students, urban students and arts students have comparatively more favourable attitude towards online education than the male students, rural students and science on the basis of their obtained mean scores.

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ATTITUDES AND EXPERIENCES OF UNDERGRADUATE COLLEGE STUDENTS IN INDIA REGARDING ONLINE LEARNING- A CROSS- SECTIONAL STUDY

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ABSTRACT

Educational sector has suffered massive setbacks following the onset of Covid-19 pandemic. Educational institutions have been closed for varying periods of time and switched to online mode of learning. This study aimed at exploring the current practices, experiences, attitudes and perceptions of online learning and teaching among college students using a comprehensive online survey.

Of the 617 students who participated in the survey 84% were females. Most (69.7%) of them belonged to the age category 20 to 30. 69.7% were from a rural background. 65.8% were aware of online teaching methods before the pandemic but only 30.8% had used it before. 62.7% had experience of using smartphones for a period of 1 to 5 years. The online platform used by around half the participants was Google meet. 561 (90.9%) used smartphones to attend classes. Majority (259, 42%) of participants are able to concentrate only for about 30 minutes at a stretch while attending online classes. 57.3% students reported online learning methods easy or very easy to use and 97.4% students found the sessions useful in general. Majority of the participants (450, 73%) are happy with the overall experience of online learning. Most of the students are in agreement that internet-based meetings are useful, easy to use and provide effective learning environment. Majority also reported that when compared to face-to-face meetings, online meetings are less effective and there is less interaction in online teaching. 129 (33.3%) are definite they would use internet based learning and related facilities regularly in the future.

To the best of our knowledge this is one of the first comprehensive studies which closely looked at the experience of college students in attending online classes. Having known the benefits of online learning, it is highly likely this approach continues to play a significant role in the future and a hybrid learning method may be the way forward. These findings assume great importance on the back of how prepared and ready are learners to accept this new form of education.

Keywords: online education, Covid 19, pandemic, India

INTRODUCTION

Covid- 19 pandemic had negatively impacted all aspects of our life including physical health, mental health and financial status. Educational sector is an area which has suffered massive setbacks. Educational institutions all over the world have been largely closed for varying periods of time since March 2020 owing to the spread of Covid-19 infections. It was reported that 186 countries have initiated countrywide closures which affected more than seventy percent of the enrolled learners towards the end of April 2020 (UNESCO, 2020). Traditional class room-based face to face interactive teaching by teachers were put on hold to reduce the risk of infections and related complications. Educational systems have quickly moved to virtual teaching methods with teachers mostly conducting classes on online platforms and students attending them from the comforts of their own homes. Though virtual learning methods are not new in India, the pandemic has brought it widespread and common. It replaced the traditional classrooms and was predicted to continue in some form in the future too. Hence it is important to understand the experiences and attitudes of all stakeholders involved in online learning and teaching. This is essential to incorporate changes and refine methods, processes and experiences of online pedagogy to make it more effective.

The need for flexible learning to be embedded in institutional structures and procedures has been proposed for many years now (Casey &Wilson, 2005). Educational institutions all over the world have been investing manpower and resources to address the unprecedented disruption in education and address the related challenges amongst the massive chaos. Flexible learning has been proposed as the way forward from various quarters. Flexible learning can be defined as a "set of educational approaches and systems concerned with providing learners with increased choice, convenience, and personalization to suit their needs. In particular, flexible learning provides learners with choices about where, when, and how learning occurs, by using a range of technologies to support the teaching and learning process." (Lee & McLoughlin, 2010). Advancements in Information and Communication Technology (ICT) in the recent decades have prepared us to take on this challenge and find effective solutions to a large extent. Social media, audio and videos based educational content, videoconferencing platforms, online testing facilities etc have replaced traditional classroom activities to some degree. In India, there have been several supportive measures from the Ministry of Human Resource Development (MHRD) and University Grants Commission (UGC). Innovative interventions based on digital technology have been the main focus of alternatives to teacher led class room-based education.

Learning methods which use a computer connected to a network, which allows to study without any restriction of time, place or rhythm with any means (Cojocariu et al, 2014) are described variously as eLearning, online learning, open learning, web-based learning, computer assisted learning, blended learning, internet-based learning etc. This approach can be broadly divided into synchronous learning which is generally structured where the students attend live lectures and have real-time interactions with instructors; in asynchronous learning the educational material is not available in the form of live lectures or classes. Several benefits of online learning have been proposed which include easy accessibility even from rural and remote areas, flexibility where the learner can plan the schedule to their convenience less expensive owing to lower cost of transportation, accommodation, and cost of institution-based learning (Dhawan, 2020). Using various devices (e.g., mobile phones, laptops, etc.) for online learning is viable in synchronous or asynchronous environments. Students can learn and also interact with instructors and other students wherever they are (Singh and Thurman, 2019). Readiness for online learning (Warner et al, 1998) is an important determinant of effectiveness of online learning which consists of the students' preference of medium of delivery, their confidence, competence, self-reliance and trust in the application of newer technologies.

Seven factors have been proposed for an effective online education system which are reliable communication infrastructure, appropriate digital learning resources, friendly learning tools, effective learning methods, instructional organizations, effective support services for teachers and learners, and, close cooperation between governments, organisations and institutions (Huang et al, 2020). Effective online instruction is dependent upon well-designed course content, motivated interaction between the instructor and learners, instructors who are well-prepared and supported; perception of being an online learning community; and rapid technological advancements (Sun & Chen, 2016). Jena (2020) summarises the reasons for encouraging online learning during the pandemic. It allows learning at home by helping to maintain social distancing, provides effective learning environments, tenders complementary interactive support, permits learners study at their own pace, flexible scheduling, accessible from any location, with an internet connection and students can attend using their devices, provides real-time student monitoring and reporting, improving the image of institution by offering technological solutions that solve real problems. But there is little relevant information about the preparedness of the students to embrace new mediums of education and the effectiveness of these mediums. Flexibility and convenience are often cited as advantages of online learning platforms while internet connectivity issues and non-accessibility to suitable devices are the barriers. The curriculum has to be restructured to make it suitable for digital platforms but equally important is how the content would be delivered by the tutors and received by the learners which emphasises the importance of the processes involved in online learning, the perception, attitudes and preferences of the participants. In this background this study was undertaken aiming at exploring the current practices and experiences of online learning and teaching among college students who participated in a comprehensive online survey. Assessing their attitudes and perceptions regarding online learning also formed part of this study.

MATERIAL AND METHODS

An online survey was conducted using a comprehensive questionnaire which was prepared after review of relevant literature with feedback from students, teachers and educational experts. The questionnaire consisted of various sections and questions covered the following areas demographic information of participants, background knowledge, experience and skills to use online class facilities, current experiences of using online classes, technical problems encountered and security concerns in relation to online classes, level of engagement during classes,

interaction with presenter and feedback, attitudes and beliefs in relation to online classes The survey link for the specially designed google form posted in closed social media groups was open for those who consent to respond. Statistical analysis was done using SPSS statistical package version

RESULTS

Demographic Information of Participants

There were 617 students who participated in the survey. Majority (84%) were females. Most (69.7%) of them belonged to the age category 20 to 30. Around 94% participants were single and from middle socioeconomic background. 69.7% were from a rural background. 31.1% students were pursuing a course in social work, 27.7% were dong other degree courses and 18.8% were nursing students. *(Table 1)*

Background knowledge, experience and skills to use online classes

Vast majority of students (97.4%) reported their knowledge of English to be average or better. 99% students reported their confidence to use smartphones as average or better. A slightly fewer students (89.7%) reported their confidence to use computers as average or better. 65.8% were aware of online teaching methods before the pandemic but only 30.8% had used it before. 62.7% had experience of using smartphones for a period of 1 to 5 years. 33.2% had experience of using computers for a period of 1 to 5 years. 26.1% students reported that they have attended around 6 to 20 online sessions in the previous three months. *(Table 2)*

Current experiences of online classes

The online platform used by around half the participants was Google meet (309, 50.1%) followed by Zoom (206, 33.4%). 48 (7.8%) used Microsoft Teams, 11 (1.8%) students each used Webex or Whatsapp. 8 (1.3%) used Go to meeting. Regarding the devices participants used to access online classes, 131 (21.2%) used multiple devices and the proportions are as follows: smartphone 561 (90.9%), laptop 170 (27.6%), desktop 20 (3.25%) and only two use Tablet. *(Table 3)*

Technical problems encountered and security concerns in relation to online classes

495 (80.2%) encountered technical problems in relation to online classes at least 'sometimes'. When the participants encountered any technical problems, most of them (464, 75.2%) managed the problem themselves. 44 (7.1%) got help from the organisers, and 72 (11.7%) got help from people who were with them. 17 (2.8%) could not solve the problems at all. 324 (83.8%) feel they are either good or moderate in their own abilities to solve these technical problems. 424 (68.8%) worry about the safety of data and security while using internet-based platforms and 93 (15.1%) have a history of avoiding attending such meetings for fear of threat to security. *(Table 4)*

Level of engagement during online classes

Majority (259, 42%) of participants are able to concentrate only for about 30 minutes at a stretch while attending online classes. 222 (36%) are able to concentrate for 30 to 45 minutes and 83 (13.5%) for 45 minutes to 1 hour. Only 37 (6%) can concentrate at a stretch for 1 to 2 hours and very few (7, 1.1%) can do it for more than two hours. *(Table 5)*

The average duration of sessions attended by most (49.5%) of students was 30 minutes to one hour. 57.3% students reported online learning methods easy or very easy to use and 97.4% students found the sessions useful in general. 74.2% were engaged or very engaged during the classes while 23.8% were distracted or very distracted. 73% get up and do other things during classes, 32.7% eat during classes and 62.7% get disturbed sometimes by others during classes. 13% always get distracted.

83.5% got opportunities to interact with the presenter while 9.9% did not get an opportunity to do so even when they wanted. 90.6% got opportunities to give feedback. 89.3% liked to give feedback. *(Table 6)*

Attitudes and Beliefs in relation to online classes

Majority of the participants (450, 73%) are happy with the overall experience of online learning while 151 (24.5%) are not. Most of the students are in agreement that Internet based meetings are useful, easy to use, provide effective learning environment, offer real advantages over traditional face to face methods, increase access to people, are easy to learn, provide rich resources to participants than face to face meetings and are viable alternatives to face

to face meetings and teaching. However majority also report that when compared to face to face meetings, online meetings are less effective and there is less interaction in online teaching. *(Table 7)*

129 (33.3%) are definite they would use internet based learning and related facilities regularly in the future while 17 (4.4%) would not. Majority (212, 54.8%) report they may use it and 16 (4.1%) have marked 'don't know'. When asked what would the participants prefer if online teaching and direct face to face teaching by the same teacher presenter are offered, majority 339 (54.9%) reported that they prefer 'Direct face to face' teaching. 83 (13.5%) will choose online teaching over face to face teaching. 166 (26.9%) prefer both teaching mediums equally. 14 (2.3%) marked 'don't know' as their response.

DISCUSSION

To the best of our knowledge this is one of the first comprehensive studies which closely looked at the experience of college students in attending online classes, their attitudes, perceptions and future plans. 617 students participated in the survey and the sample predominantly (84%) consisted of women. Most (69.7%) belonged to the age group 20 to 30 years. Majority (94%) of the participants were single, from middle socioeconomic background and from a rural background. Most of the sociodemographic characteristics of the participants in this study are similar to the large nationwide survey of 10,000 students across 400 cities conducted by Vidyasaarathi in 2020 (promoted by NSDL e-Governance) published in 'India Lockdown Learning' report, except for a male predominance of 62% in their study.

WhatsApp and Zoom Calls were the most preferred medium of 59 percent students for online classes; followed by 30 percent of students using their school's or college's online platform to attend online classes in the survey by Vidyaasarathi. In this study, the online platform used by around half the participants was Google meet (50.1%) followed by Zoom (33.4%). 7.8%) used Microsoft Teams, and 1.8% students each used Webex or Whatsapp. Most (34.2%) of those who responded among college students (34.2%) in a sample from West Bengal used the Zoom app for online learning, followed by Google classroom (33.4%) and YouTube live (14.7%). Sharing study materials than attending online lectures was done by many students due to poor internet connectivity. Whatsapp group was used by 39.4% of students, for getting study the materials from teachers and friends and 31.8% of students used Google Classroom for this purpose (Kapasia et al, 2020). In the study by Muthuprasad et al. (2021) majority of the respondents (62%) said that WhatsApp was the best way to communicate class updates. These findings demonstrate the wide variety of video conferencing platforms accessible for online learning, many of them providing free to use features. Skills to effectively use these platforms have become essential for successful participation in online learning and course organisers should be sensitive to the needs of the participants to provide adequate training to use all the useful features of these platforms.

Regarding the devices participants used to access online classes, 131 (21.2%) used multiple devices and the proportions are as follows: smartphone 561 (90.9%), laptop 170 (27.6%), desktop 20 (3.25%) and only two use Tablet. The findings from our study compare with that of Muthuprasad (2021) who reported the devices used by the students included smartphone (57.98%), laptop (35.83%), tablet (4.89%) and desktop (0.65%). In the nationwide survey, majority of students (79 percent) used smartphones to study online while 17 percent of students used laptops and computers and rest 4 percent students attend it through mediums like tablets. Though the figures are largely comparable between the two surveys, it is quite striking that 21.2% use multiple devices in this study sample which may be indicative of non-possession of a personal device which had to be shared between personal members. Kapasia et al (2020) highlighted in their study, 5.3% of students had to get devices from family members to attend classes at the time of their learning while 0.9% students hired them from neighbours. It would be appropriate to provide subsidised or free gadgets to selected students to ensure their learning; and the college, university and government should make necessary provisions for this. Preferential use of smartphones by students to attend online classes necessitate the learning platforms should be compatible for used in smartphone interface with full functionality.

Background experience, technical skills and data breach concerns

English has often been considered the universal language of the internet though the situation has been changing with internet content in several regional languages becoming more easily available. However knowledge of English language is one of the determinants of effective internet use (Al-Hammadany & Heshmati, 2011). In this study vast majority of students (97.4%) reported their knowledge of English to be average or better. Technology is no longer innately innovative or new (Gordon, 2014). Technical skills form an integral part of internet use

competency (Mota & Cilento, 2020) which is essential for effective digital learning. 99% students reported their confidence to use smartphones as average or better. A slightly fewer students (89.7%) reported their confidence to use computers as average or better. 62.7% had experience of using smartphones for a period of 1 to 5 years. 33.2% had experience of using computers for a period of 1 to 5 years.

Technical problems arising while using online platforms are very common. 80.2% encountered technical problems in relation to online classes at least 'sometimes'. Most (75.2%) of the participants are able to manage these issues themselves. The teachers should be mindful there are students who have difficulties in solving these problems themselves and do not have the necessary skills to do so. There should be a clear plan as to what needs to be done in such situations including technical help which is easily accessible. It is encouraging to note that vast majority (83.8%) of students are confident in their abilities to solve any technical glitches associated with online classes. This reflects the tech-savvy nature of younger generation which should hold them in good stead in their future career related goals. Ideally we would want all students to be fairly confident and skilled in solving commonly occurring technical difficulties so that they do not miss on the classes sometimes due to easily solvable issues. Educational institutions should provide the students and teachers necessary training to address them and easy to use resource materials. Availability of easily accessible technical help should also be considered if the above measures fail. Familiarity with online teaching is an important factor which determines the readiness of the students. 65.8% of the students were aware of online teaching methods before the pandemic. 30.8% had used these facilities before which is in comparison with the findings of a study from West Bengal (Kapasia et al, 2020).

It has become clear there are students who are worried about data breach and online security. 68.8% worry about the safety of data and security while using internet based platforms and 15.1% have a history of avoiding attending sessions for fear of threat to security. With the clear possibility online mode of learning will continue in the near future, it would be the responsibility of those who organise the classes to allay the fears of these students with authentic information and ways to be safe while accessing online platforms. Data breach is a real worry among students which is not unfounded going by the news reports of hacking, phishing etc. Youngsters should be made aware of safe online behaviours and protecting their personal information. Though informal attempts at educating on safe internet practices are plenty, we suggest there should be a formal module by the educational institutions periodically on various aspects of being safe and diligent with Information Technology and Communications focusing on practical aspects and possibly an evaluation of their understanding on these broad issues.

Engagement in online classes

26.1% students reported that they have attended around 6 to 20 online sessions in the previous three months. The average duration of sessions attended by most (49.5%) of students was 30 minutes to one hour. In the study by Muthuprasad et al. (2021) 46% respondents preferred 45 minutes duration for each class. In this survey, 78% of students reported they were not able to focus on their classes for more than 45 minutes at a stretch. This emphasises the importance of periodic short breaks and mixing up of learning activities instead of continuous lectures. The instructors should be innovative enough to incorporate various stimulating activities small group discussions, instant projects etc. An overwhelming majority of students are able to concentrate only for less than an hour at a stretch during online sessions. This has to be factored in by the organisers and teachers while scheduling sessions to ensure maximum attention by the students. This calls for regular breaks to improve the effectiveness of the sessions. .

In this study, 57.3% students reported online learning methods easy or very easy to use. 97.4% students found the sessions useful in general. The effectiveness of online teaching greatly depends on the level of engagement students have with the content of presentation. In this study 74.2% reported themselves to be engaged or very engaged during the classes while 23.8% were distracted or very distracted. 73% get up and do other things during classes, 32.7% eat during classes and 62.7% get disturbed sometimes by others during classes. 13% always get distracted. 83.5% got opportunities to interact with the presenter while 9.9% did not get an opportunity to do so even when they wanted. 90.6% got opportunities to give feedback. 89.3% liked to give feedback. Research has shown that receiving summaries at the end of the class, availability of online class recordings for future use and taking screenshots significantly affect the effectiveness of teaching. Allocating time for questions and answers during the online class, posting regular announcements, and emailing reminders are also important factors. Group chat for questions and answers, diversifying means of content provision eg. case studies, providing and receiving feedback from students are also proposed as effective engagement strategies. (Abou-Khalil et al, 2021). There is a close interrelationship between the perception of online learning of students and interaction with their instructors (Hay

et al, 2004; Kim et al, 2005). The opportunity to interact with the instructor and the intensity and quality of such interactions play an important role in the quality of online education.

Attitudes and beliefs in relation to online classes and its future use

Majority of the participants (73%) are happy with the overall experience of online learning. Most of the students are in agreement that internet-based meetings provide effective learning environment, offer real advantages over traditional face to face methods, increase access to people, are easy to learn, provide rich resources to participants than face to face meetings and are viable alternatives to face to face meetings and teaching. However, majority also report that when compared to face-to-face meetings, online meetings are less effective and there is less interaction in online teaching which is comparable to another study where 60% of respondents agreed that the effectiveness to interact with the instructor is less in online classes when compared with face-to-face teaching (Muthuprasad et al, 2021).

33.3% of the participating students are definite they would use internet based learning and related facilities regularly in the future, 54.8% report they may use it while 4.4% would not. When asked what would the participants prefer if online teaching and direct face to face teaching by the same teacher presenter are offered, 54.9% reported that they prefer 'direct face to face' teaching. 13.5% will choose online teaching over face to face teaching. 26.9% prefer both teaching mediums equally similar to findings from another Indian study (Muthuprasad et al. 2021). In another study from India, 62.2% respondents preferred the blended form of learning, followed by 22.7% online and 15.1% off line learning (Bordoloi et al. 2021). The students surveyed were in favour of online education but they were uncertain if the quality of online education matches the traditional setup (Buzatu et al, 2020). Vidyasaarathi reported 75 percent of the students prefer attending real classrooms over online learning the reasons being, poor internet connection, difficult to focus and difficult to get doubts clarified while studying online. As discussed by several other researchers, the attitudes of students vary from study to study (Gaur et al, 2020). In this study most (88%) of the participating students report a favourable attitude in using online learning in the future. This brings in the need for educators to be sensitive and responsible in what they provide. However, as Camacho & Legare (2021) point out, for online teaching to be effective teachers ought to shift their approach from transmitting knowledge to sharing data and guiding learners. Transmitting knowledge to learners was considered to be the aim of traditional teaching methods while inspiring and guiding students need to be the hallmarks of current educational system.

It is encouraging the students and the instructors perceive online teaching methods as mostly positive but it has to be understood, along with several benefits there are several challenges too. Opportunities to access national and international experts on their respective subjects even in remote areas and availability of digital recordings for future use along with better use of time and pacing according to one's needs, cost effectiveness etc are some of the merits of online education Jena (2020). The demerits of online learning include; students from low-income families and disadvantaged groups suffer as they may not have high speed internet connection and devices, being at home may not be productive due to lack of self-discipline, inter personal relationship between students and teachers may be affected, lack of security of personal data (Jena 2020). It has been noted that there exists a digital divide and inequitable access to internet quality and data speed between urban and rural students and technological constraints are the biggest barriers to online learning (Muthuprasad et al, 2021)

Having experienced the benefits of online learning it is highly likely this approach continues to play a significant role in the future and a hybrid learning method may be the way forward. These findings assume great importance on the back of how prepared and ready are learners to accept this new form of education. For these flexible learning approaches to be effective and successful the learners need to be more responsible. Considerable efforts should be put in appropriate goal setting with self- monitoring.

LIMITATIONS

This study has the natural limitations of a self-reported survey. The social desirability factor is self-reported surveys is an inherent challenge which we have tried to minimise by making it anonymous.

CONCLUSIONS

The transformation has been sudden which happened in the midst of serious challenges occurring in all aspects of life. It is natural to assume this must have had a huge impact on their lives especially with no end date of the pandemic in sight. Instructors and students had to adapt to huge changes in the educational system in a short span

of time in the midst of uncertainties which is generally stressful which has to be borne in mind during planning processes. Any change introduced should take into consideration the digital divide between various groups of students; as it is well known that the poor and marginalised students would be further discriminated in this changed situations. There should be funding specifically for developing digital capabilities of educational institutions including training of instructors. Capacity building to take this initiative forward and effectively should be planned. There is scope for increased flexibility and convenience in online learning, but the teachers should mindful to incorporate the interactive nature of teaching and studying which would have happened in real classrooms.

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DIDAKTIK FOR DISTANCE EDUCATION IN SECONDARY AND ADULT EDUCATION

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ABSTRACT
This article presents secondary and adult education teachers' perceptions of their distance teaching practice in Sweden. The teachers participated in a professional development program from 2019–2022. A Didaktik theory was used to analyse factors for distance education on structural (e.g., content, intentions, methods, media, students, sociocultural contexts) and faculty (e.g., organisational, curriculum) levels. The primary empirical material is group interviews with distance teachers and coordinators during a Design-Based research process. The analysis suggests that the teacher groups developed professionally as distance teachers by reflecting on and testing different ways to communicate (synchronously, asynchronously) and teach online. The article suggests Didaktik principles to improve distance education at structural and faculty levels.
Keywords: Distance teaching, Didaktik, Design-Based research, professional development

Introduction

There is a growing interest in developing distance education in secondary and adult education (Corry et al., 2017; Barbour & Reeves, 2009; Lindfors & Pettersson, 2021; de la Varre et al., 2014). Reasons for this interest include opportunities to expand educational access and provide high-quality learning and more student study choices. Previous research claim that successful professional development processes address distance teachers' different views, experiences, and needs and offer them opportunities to collaborate on developing curriculums in online distance education settings (Baran et al., 2011; Bradshaw, 2002; Hicks, 2014).

Baran et al. (2011) studied how to transform the online teacher role in a review of 11 studies. Their results suggest that online teachers should be encouraged to pursue pedagogical inquiry and creative solutions while being introduced to new technologies. Teachers need faculty support to transform their teaching practice by collaboratively reflecting on and questioning their past experiences and beliefs. Baran et al. (2011) confirm that teachers need time to reflect on previous teaching experiences while learning about and testing new teaching methods (cf., Bradshaw, 2002; Hicks, 2014).

According to Miyazoe and Anderson (2010), distance education theories focus on different interactions relevant to instructional design and distance education delivery. Anderson (2003) based the theory called *Interaction Equivalency Theorem* on previous models by Moore (1989) and Anderson and Garrison (1998). The theory suggests that student learning is supported by one of three interactions (student-content, student-student, student-teacher). Anderson and Garrison (1998) drew upon the possibilities with digitally networked environments. Digitally networked environments may provide different ways for teachers to collaborate with other teachers by sharing or developing materials. Teacher collaboration in digital spaces may improve distance teaching as teachers can share and learn from colleagues facing similar issues (cf., Baran et al., 2011; Bradshaw, 2002; Hicks, 2014; Miyazoe & Anderson, 2010). Digital content that automatically updates itself without teacher involvement could reduce the teacher's workload and, thus, the cost of delivering distance courses (Miyazoe & Anderson, 2010). Information about student learning can be collected digitally, further supporting distance teachers in analysing and evaluating effective instructional designs (ibid.).

The current study explores teachers' perceptions of developing distance teaching practices in Swedish secondary and adult education. The study aims to develop theoretically and empirically based principles for online distance education, sometimes referred to as e-learning (Guri-Rosenblit & Gros, 2011), through a theory of Didaktik and Design-Based research as a methodology. It is a qualitative inquiry into a research and development program in Sweden and Finland during 2019–2022. The organisations and the teachers wanted to develop high-quality distance education to offer education to upper secondary school students in rural areas and adult students who could not or did not want to attend onsite study programs for different reasons. The teachers raised questions about planning distance courses, structuring content in digital learning environments and establishing relationships with distance students to avoid dropouts. However, the teachers also addressed faculty issues when developing distance

teaching practices. These instructional and faculty topics made us consider a theory of Didaktik, which enable the analysis of the empirical material on several layers.

Didaktik is a German and Nordic concept that refers to different theories for teaching and studying (Hopmann, 2007; Uljens & Ylimaki, 2017). Didaktik assumes autonomous teachers who reflect on different factors (e.g., aims, content, methods) concerning the students and contextual matters when teaching (Jank & Meyer, 2006). Teaching takes place within specific organisations, societies and cultures that shape the conditions for teaching; therefore, Didaktik also addresses normative (e.g., the curriculum) and sociocultural (e.g., the context of the school) factors of teaching (Uljens & Ylimaki, 2017). The Didaktik theory provided a structure for analysing the empirical material on two levels: structural (i.e., instructional) and faculty. The research questions are as follows: *What didactical factors are highlighted by the teachers? How do the teachers didactically describe how they have developed their distance teaching? What needs to be considered when organising distance education on a structural and factor level?*

The six schools in this study worked with variations of synchronous (in real-time) and asynchronous (delayed) distance education (Hrastinski, 2008; Watts, 2016). Three schools offered distance courses that students individually completed asynchronously or synchronously online. Three schools offered synchronous courses to other schools via a video conference system[1]. Some teachers were physically present with one group of students, and the rest of the students joined the lesson from their school. Some teachers taught all students synchronously online. The teachers all taught secondary level courses. Three organisations were upper secondary schools. Three schools were adult education providers offering upper secondary courses. All six schools followed the same curriculum, although contexts and student populations varied.

Findings from this study contribute to the knowledge about distance education didactics as it offers theoretically and empirically based principles that can support future teachers, faculties, and school leaders. The theories of Didaktik offer frameworks for reflecting on and developing teaching practises (Hopmann, 2007; Jank & Meyer, 2006; Uljens & Ylimaki, 2017). The teachers in this study expressed a lack of teaching and learning principles (i.e., Didaktik) specific to distance education which further supported the theoretical and methodological decisions.

Teaching-centred Didaktik as a theoretical framework

Paul Heimann (1901–1967), Gunter Otto (1927–1999) and Wolfgang Schulz (1929–1993) developed the Didaktik theory used in this study (Jank & Meyer, 2006; Keiding, 2013). We refer to it as teaching-centred Didaktik, as Keiding (2013) suggested. Heimann et al. developed the theory to help teachers analyse teaching structures and conditions on two levels (Keiding, 2013). The first level of reflection and structural analysis (see figure 1) includes six interrelated factors (Jank & Meyer, 2006, p. 203–210): the *intentions* of the teacher, the chosen *contents*, *methods*, *media*, and relevant information about the *participants* (for example, age, special needs, expectations) and the *sociocultural conditions* for teaching and learning (for example, school culture, social relations within a group). Teaching-centred Didaktik separates teaching methods from the chosen media, something other similar models do not (Jank & Meyer, 2006; Keiding, 2013). In this study, media covers different modes of digitally networked distance education (e.g., synchronous and asynchronous technologies).

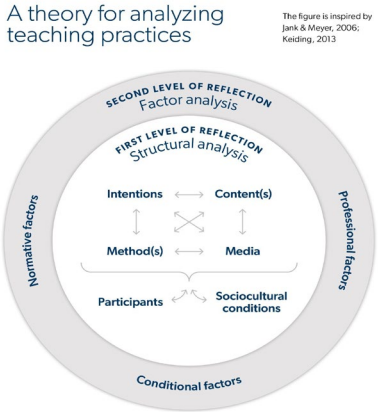

Figure 1. The model was used to analyse the empirical material. The model is inspired by Jank & Meyer (2006) and Keiding (2013).

[1] In Sweden this form of distance education is referred to as remote teaching in legal and policy documents (Lindfors & Pettersson, 2021)

Reflections on the second level are called *factor analysis* and include contextual and sociocultural aspects of teaching. These are *normative, conditional,* and *professional factors* that affect teaching. All teaching is *normative* because it strives for specific goals (e.g., democratic citizenship). Teachers also carry implicit or explicit values (e.g., view on students, philosophical approach to teaching) (Keiding, 2013). In Sweden, the national curriculum offers normative guidelines regarding content, but teachers execute the curriculum autonomously. *Conditional factors* may include political decisions, funding, and faculty decisions that affect teaching. Only a few upper secondary schools legally may offer distance courses in Sweden. Adult education providers can choose how they deliver their studies, such as 100% distance, partly distance or onsite courses (The education act, 2010, Chapters 21 & 22). Professional *factors* include teachers' subjectively perceived possibilities and challenges in organising and developing the teaching practice when considering relevant research, personal experiences, normative and organisational factors, and structural factors.

Heimann et al. developed the theory in response to other traditions of Didaktik, namely Bildung oriented Didaktik and activity oriented Didaktik (Jank & Meyer, 2006; Keiding, 2013). Bildung-oriented Didaktik, as Wolfgang Klafki initially developed it, was concerned with the aims of teaching and content to be learned and possible self-cultivation processes (i.e., Bildung) among students (Klafki, 2010). Klafki suggested five questions for teachers related to the content (for example, why is the content chosen, and what future relevance does the content hold for the student?). Heimann et al.'s critique was that Bildung-oriented Didaktik was too abstract compared to the practical realities in the classroom, nor was it empirical. Klafki has developed the theory since and now calls it critical-constructive Didaktik by including empirical studies and highlighting different interactions during teaching (e.g., teacher-student, student-student) (for an elaboration on this, see Klafki, 2010).

Heimann et al. were also critical of the ideologically informed and activity-oriented traditions of Didaktik that highlighted student activity to create meaningful learning situations that, among others, John Dewey represented (Keiding & Wiberg, 2013). These strands of progressive pedagogies often focus on teaching methods to educate competent citizens, products that students produced, and potential competencies gained through these, often collaborative, processes. Other debates include the relationship between the traditions of Didaktik and Curriculum and how they have influenced each other (Hopmann, 2007; Tahirsylaj, 2019), but that is beyond the scope of this article.

The contributions from Wolfgang Schulz and Gunter Otto after Heimann's death lessened the differences between teaching-centred Didaktik and critical-constructive Didaktik (Keiding, 2013). Arnold and Koch-Priewe (2011) have combined the approaches into one. Keiding (2013) references Gündüz (2011) when discussing why the successor to teaching-centred Didaktik, Hamburger-Didaktik, did not establish itself the same way as Klafki's critical-constructive Didaktik. Schulz and Otto made Hamburger-Didaktik more normative and Bildung-oriented. They also included interactions and collaboration between teachers and students. They made it learner-centred to the point that students should be actively involved in the teaching practice. Something that may be utopian when other factors are considered, such as the national curriculum's contents and aims. Teaching-centred Didaktik provides a straightforward structure to analyse relevant factors for this study.

Design-Based research as a methodology

A design-based research (DBR) approach (Barab & Squire, 2004) was used to increase knowledge about distance teachers' practises. In the research and development program that informs this study, the researchers wanted to support and create conditions for teachers to develop their teaching and strengthen them professionally as distance teachers. The researchers worked closely with the participants in an iterative process to design and develop areas of development that the teachers themselves have described as challenging. DBR offers the opportunity to work closely with the teacher's practice and create a partnership (Anderson & Shattuck, 2012; Mor & Winters, 2007). In this partnership, the teachers and the researchers have different roles where the researchers lack knowledge about the complexity of the practice, technologies used and the local organisation. The teachers often lack time to research rigorously (Anderson & Shattuck, 2012). In this study, the teachers have defined problems, themes, and issues; they have been involved in designing themes in the program and their teaching practise.

A total of ten groups of teachers were followed while they developed distance- and remote teaching between 2019 and 2022. In this study, six groups were selected. The approach was deemed relevant as the organisations that participated in and funded the program *Digital learning environments* were interested in an iterative process to develop the schools' distance and remote education. The teachers expressed an interest in networking with others in similar situations, and they frequently asked for research and support from the program leader and researcher (author 2) and the program researcher (author 1). Design-based research inspired the program in the following

ways. The researchers established specific topics the teachers deemed essential through a survey in the Spring of 2019, which focused on social relationships in digital learning environments as a first focus area.

The research and development program Digital learning environments

The presented study was part of a more extensive research and development (R&D) program, *Digital learning environments* (2019–2022). The R&D program was led by the Swedish non-profit organisation Ifous. Eight municipalities in Sweden and Finland participated in and funded the program, including around 65 participants from fifteen different units and schools (K-12 and adult education). The participants were organised in process groups led by a process leader. Four researchers were involved in the program.

The overarching aim of the R&D program was to find ways and develop methods to use digital learning resources and create and enhance equal education opportunities in rural areas through providing remote- and distance education. During the program, the participants focused on challenges in their practises, formulated as three themes during the three years. The three themes that have been in focus were 1) social relations in distance education, 2) digital learning environments and 3) assessment in distance education. Twice each year, the participants were invited to participate in a two-day seminar to discuss and share ideas and experiences and receive lectures from researchers in the program or guest lecturers related to one of the themes. The seminars were held both physically and digitally. Between the seminars, the process leaders meet regularly in Zoom[2] to discuss their work and get input from the researchers (cf., Ifous, 2022). Webinars (Åkerfeldt & Hilli, 2021) and literature seminars have also been arranged. The work on social and teaching presence was presented in an article by Hilli and Åkerfeldt (2020). Additional material has been developed, such as a guide on working with and developing social presence and two surveys that explore student perceptions of social presence in remote and distance education.

In 2020 the Covid-19 outbreak challenged the schools and their teaching. The schools were closing, and there was much pressure on the teachers who regularly taught online. Due to the pressure, the teachers' development work was slowing down, and in 2020 the program was prolonged by three months to make room for the process groups to further work with the development. Interviews during 2019 were done at the schools by one or both researchers. The interviews were planned to be digital during 2020 and 2021 despite the Covid 19 outbreak.

The contexts of the participating schools

The groups of teachers interviewed were from six different schools. The teachers taught upper secondary school courses, albeit in different contexts. School A worked in a distance organisation with upper secondary school students from different parts of Sweden. They offered synchronous online lessons with asynchronous assignments on the school's digital platform (Google classroom), and students chose if they wanted to participate in synchronous activities (Google Hangout). School A did not meet their students face-to-face or offer onsite introductions. Before the program, the school had developed different support systems for their students; mentors introduced new students to the digital platforms used and the general outline of the courses. Schools B, C and D offered upper secondary school courses to adult students. They worked with combinations of synchronous and asynchronous distance courses. Students met the teachers onsite during a course, or they could participate in synchronous online lessons or watch recordings of the lessons later. Students completed assignments asynchronously on digital platforms (itslearning, Teams) and could take part in courses partly or entirely online. The teachers had developed distance courses to offer adult students flexible study options as most of their students worked full or part-time. Schools E and F comprised upper secondary school teachers who taught courses offered at several schools. The teachers and one group of students were physically located in one school, while the other student group was in another school. Schools D, E and F, offered synchronous lessons transmitted via video link (Zoom, Teams) between two locations. Students completed assignments on the schools' digital platforms (Teams, Moodle).

We chose to study these schools because they worked with similar issues during the program and taught the same curriculum content. They struggled with planning distance courses that supported social relationships (teachers-students, student-student) and content knowledge among students. The adult education providers had flexible course outlines and asynchronous aspirations related to how and when they communicated with students, structured course content, and provided feedback. The organisations had developed their distance education depending on legal restrictions and the needs of students and faculty. Schools A, B, C and D were free to deliver distance education in any way they wanted if they followed the curriculum. Schools E and F had national laws and regional guidelines that affected the outline of their courses; for example, they were obliged to offer synchronous lessons.

[2] Zoom is a videoconference system that allows parallel sessions to be created (breakout rooms). Breakout rooms were used for discussions in smaller groups during the process leader meetings.

The schools shared a worry about declining student populations, and distance education became a way to maintain the school. All schools had developed distance education for years before the program and had relevant digital infrastructure. Most of the teachers had previous distance education experiences as distance students themselves, and many were inspired by what their teachers had done. They had not taken part in professional development in distance teaching. The program Digital learning environments was necessary because it offered them networks of practitioners and research to support their teaching practises. The participating researchers suggested the Five Stage Model by Gilly Salmon (2013), and the groups used it as a basis to support digital competence and social relations early on in their courses.

Empirical material and ethical considerations

Focus group interviews with the teacher are the primary data analysed. Interviews with the teacher groups once a year during the R&D program (2019–2022) were conducted. In the first year (2019), the researchers (authors 1 & 2) visited the schools and interviewed the teachers at the schools. In the following years (2020 & 2021), interviews were conducted through Zoom. The number of participating teachers varied through the years, as shown in Table 1. Some teachers had left, and some new teachers joined the groups. In the first year, 28 teachers and three coordinators participated. In the two following years, there was a decrease in the number of teachers to 18. The drop was since School C did not participate in the 2020 interviews, and the following year the teachers in the group were reduced to four. Over the three years, 64 teachers and ten coordinators participated in the focus group interviews. We constructed a thematic interview guide that consisted of three sections 1) background, 2) reflection about the current situation 3) looking ahead. Depending on the theme they were working on, the focus shifted slightly during the interviews, especially in section 2. The interviews lasted for approximately 1 1/2 hours. The longest was 115 minutes, and the shortest lasted 53 minutes.

Table 1. * Interviews were conducted at the schools. ** Interviews were conducted via Zoom.

School	No. of teachers (T) and coordinator (C)						Subjects
	2019*		**2020****		**2021****		
	T	C	T	C	T	C	
A	7	0	6	0	6	0	Social science, Mathematics, Media studies, Science
B	6	1	7	1	3	1	Swedish, Mathematics,
C	10	0	0	0	4	0	English, History, Science, Mathematics, Social science
D	1	1	1	1	1	0	Swedish
E	2	1	2	1	2	1	Natural science, Modern languages
F	2	0	2	0	2	0	Psychiatry, Health and Social care
Total:	28	3	18	3	18	2	

All participants in the program signed an informed consent form to participate, and the materials they produced or collected about them were to be used for research purposes. The participants could retract their informed consent at any point. The data is analysed on a group level to avoid the identification of specific teachers. Even so, the program schools were public on the program web page and given the structure of the organisations, the schools can still be identified. The teachers shared their development processes in webinars that became public after the program, further complicating anonymization.

Analysis

The systematic analysis occurred during the Fall of 2021. The material was transcribed verbatim and read through as a whole. We removed information that could identify the schools or the teachers. All interviews were conducted in Swedish, and quotations used in the article were translated to English by the researchers. After the first reading, the Didaktik theory discussed above was decided upon as it allowed analysis on two interconnected levels (Jank & Meyer, 2006; Keiding, 2013). The *structural analysis* identified concerns in digital learning environments regarding content, intentions, methods, media, participants, and sociocultural contexts when teaching. The *factor analysis* identified possibilities and challenges with developing distance courses in digital learning environments, the importance of faculty support, and the teachers' workload. Normative and subjective factors were curriculum guidelines and previous subjective experiences among the teachers.

Findings

The following section presents excerpts from the data and answers the research questions of the study: *What didactical factors are highlighted by the teachers? How do the teachers didactically describe how they have developed their distance teaching? What needs to be considered when organising distance education on a structural and factor level?*

Conditional, professional, and normative factors were: *Digital technologies and faculty support as conditional factors, digital technologies as professional factors, and the curriculum as a normative guideline*. Structural factors were: *Content and timely digital communication, intentions and structures in digital learning environments, digital media, methods and intentions, participants' needs as distance students, and sociocultural contexts of the schools*.

Factor analysis

Digital technologies and faculty support as conditional factors

The digital technologies used for distance teaching were conditional factors for several reasons. Schools B and C developed asynchronous communication strategies with distance students (email, comments, chats). Schools A, D, E and F developed synchronous (videoconferences, onsite meetings) and asynchronous (email, comments, chats) communication with students. These developments on a structural level had bearings on an organisational level. The teacher groups expressed concerns about how time-consuming communication with students was. Their organisations did not recognize asynchronous communication outside class. These comparisons with onsite teaching were difficult as teachers did not have fixed class time when communicating with distance students. Some teachers answered emails and chats during their free time to keep up efficient communication with students when they needed to communicate with them. The teachers managed the time spent individually communicating with distance students after school hours. Some groups expressed a need for faculty decisions on time frames for communicating with students (for example, between hours 8–18). The flexible outlines of distance courses made the workload of the teacher unpredictable. Schools B and C decided that teachers should communicate each week with students, which was a significant development to lessen dropouts. It also created new digital administration as teachers had to follow up on the communication and keep track of students who replied and those who did not.

The digital platform allowed sharing and comparing of different teaching practises within the faculty. Teachers from schools B and C used the digital platform itslearning. They discussed course structure and communication on that platform with colleagues—new updates on itslearning created incentives for faculty discussions and didactical reflections.

> *Let us put it like this; we never saw any updates on our old digital platform. We can see that itslearning adds new functions. We might not be able to apply them all straight off, but we can tell that it creates discussions, like "have you seen this? How can we use this?" (Teacher from school B, first interview in 2019)*

Faculty support was vital for developing teaching practises in digital learning environments. Organising distance courses meant that most teacher groups developed joint course outlines on the digital platform to make it coherent for the students. This process required the faculty to discuss several questions relating to course outlines to avoid, for example, chaotic course structures, complicated outlines or too many digital features. In school C, one of the teachers had time allocated to create introductory materials for itslearning that all teachers could use to let the other teachers focus on teaching their courses. Joint decisions on how to teach on the digital platform were perceived to reduce teacher workload and create better distance courses. The teacher groups generally described a lack of faculty discussions about digital platforms as problematic when developing digital courses.

> *Moreover, many things need to be implemented and established here. We are in the middle of implementing Microsoft Office 365, which we thought would be joint, collegial work, and now we have been told to watch instructional videos on our own. It will not be a joint work to develop courses according to what supports learning or building structures in courses. (Coordinator from school E, second interview in 2020)*

Digital technologies as professional factors

The schools' digital platforms were considered professional factors as they prompted what the teachers could develop, how they communicated and how they structured their courses. Knowledge about digital platforms was professionally significant for teaching and developing the teaching practice.

> *We do not have professional training. When itslearning came, we had to learn how to use itslearning. Moreover, that became a start for us to find a joint vision of how to teach online. It is straggly but still more unified than when we were using Fronter. (Teacher from school B, first interview in 2019)*

Distance teaching seems to require an initial focus on digital technologies before didactical questions come into the foreground. When the program started, many teachers were less focused on developing their digital competence and more on how to establish social relationships with distance students. Teachers new to distance teaching spent more time learning how to use digital technologies provided by the organisation. The teachers acknowledge that they were focusing on how to use digital technologies before they could professionally reflect on student learning on a structural level.

> *When you start working here, you know many new things to learn, professional training or competence development is needed even if you know some things. Now, it's not as important to know how I use the microphone or a specific technology. Instead, how do I reach the students when teaching at a distance? What kind of assignments are best? Or how do I engage them? (Teacher from school A, first interview in 2019)*

Schools D, E and F offered synchronous courses in two locations meaning that the teachers could face issues with the digital infrastructure in the classrooms that they could not solve at a distance leading to feelings of frustration and unprofessionalism.

> *As a distance teacher, you can feel pretty unprofessional. And that is the worst feeling. You can have a good plan; you know how you want to execute it, and then you are stopped by, "oh, they can't see your shared screen because they have the wrong cable connected, and I can't see where the cable goes because I'm here." It's frustrating because you want to share your great ideas. However, it is something to work on. I believe it truly that open doors and open discussions will better the quality of our courses. It's what we should be known for. (Teacher from school D, first interview in 2019).*

The R&D program provided research and collegial discussions for three years that affirmed what the teachers had struggled to verbalise before about teaching in digital learning environments. The teachers developed a professional capacity by combining their previous distance teaching experiences and research in distance education. They could discuss issues and possibilities professionally and felt empowered by this.

> *My most significant stress factor as a teacher has been students you can't reach. Students who fail and drop out are an ongoing frustration. I have gained much knowledge about how important social relations are, which means I have been able to give that my full attention without a guilty conscience and feel much more content as a teacher. (Teacher from school B, third interview in 2021)*

The teachers deepened and nuanced how they expressed themselves about didactic considerations and technology used in the last interviews. An explorative way of using technologies was not predominant. The teachers reflected more about functions in the digital systems, how to teach on the digital platform and how it might affect the student's enrolment in the course. One teacher emphasised that she gained increased insight into the student's individual needs. The teachers made conscious didactic choices based on how the digital system worked and the effect a function might have on the students and teaching. In some cases, teachers started to override a function in itslearning where the students could automatically enrol in courses. The teachers in School C chose to enrol students manually after first contact. This way, they also established first contact with the student and from the start, they could build a stronger relationship.

The curriculum as a normative guideline

Many teachers referred to the curriculum when reflecting on their roles as distance teachers. In schools A, E and F, the curriculum was one reason to develop collaboration among students in their upper secondary programs to enhance social and collaborative skills necessary in a democratic society. The curriculum also stipulated specific knowledge requirements students were supposed to gain. The teachers reflected on ways to include collaboration in their courses and digitally assess student knowledge.

> *In religion, I test students on all knowledge requirements at least once, and they receive a kind of formative assessment, and at the end of the course, they write something I call a final exam. All knowledge requirements are tested in the final exam, including ethics, science, religion, and world religion. They turn it in either in written, oral, or video format. (Teacher from school A, third interview in 2021)*

School C struggled with competition from other local adult education providers, and the teacher group expressed concerns about assessing students' content knowledge at a distance because of the demands in the curriculum. The teachers' professional values and the knowledge requirements stipulated in the curriculum clashed with the sociocultural realities of the school. It was challenging to demand onsite assessments when competitors offered students online assessment methods. It forced the teacher group to consider other options for assessment to attract students.

> *We still maintain that students must come to school for exams. However, other distance education providers in our municipality allow students to write tests and assignments at home. We lose quite a few students because of this; the students say, "thanks and goodbye!" and leave. Furthermore, that forces us to discuss what we demand compared to what the Swedish National Agency for Education[3] expects us to teach and assess. What are our options to keep our students, and what can we expect of them? (Teacher from school C, third interview in 2021)*

Structural analysis

Content and timely digital communication

The teacher groups reflected on the content they taught and communication with the support of the Five Stage Model developed by Gilly Salmon (2013). The model suggests that digital competence, communication with the teacher and students being at ease in the digital learning environment are basic requirements when starting a new course; otherwise, students may have difficulty studying the content. All five teacher groups described this as an essential part of their professional development process as they previously focused on immediately teaching content in courses.

> *I invite students to the lessons immediately to get a good start and ensure every student can get on with their courses. I am very quick in the chat; immediately, when I get a question, I answer it, just to establish a relationship in the beginning. I know that the questions will become less with time. Nevertheless, you need to be alert at the beginning of the course. (Teacher from school A, third interview in 2021)*

During the last interview in 2021, teachers in School C reflected on how they, systematically and sustainably, could establish a way forward in their teaching, depending on their conditions and students. The group discussed how their teaching conditions change due to technologies being updated, replaced, and added to their working environment. Depending on the students, digital technologies used, subject and assignment, the teachers need to adjust their course and teaching. The teachers concluded that they tried things out and quickly adjusted the courses according to the student's needs. They learned while developing distance courses that there is not one solution but many different solutions. They expressed a need to find ways to do these changes more systematically and sustainably. It was a collaborative reflection in the teacher groups towards the end of the R&D program. They started to question structural and conditional factors and the need to develop didactic toolboxes for distance education. The focus kept shifting between factors like content, students, methods, digital media and contextual conditions, and the future of their distance education.

[3] The Swedish National Agency for Education oversees the education systems in Sweden, prepares policy documents on, for example, knowledge requirements and visits schools to evaluate them. For more information see, https://www.skolverket.se/andra-sprak-other-languages/english-engelska

Intentions and structures in digital learning environments

The teacher groups expressed professional drawbacks of teaching distance courses online. According to them, uploading study materials to a digital platform was not teaching. They explained that actual teaching occurred in the relationship between teacher and student. Many teachers described it as challenging to identify knowledge gaps or misunderstandings among students at a distance. Following the students' course work asynchronously or synchronously became a conscious intention among many teachers during the program. The teacher groups reflected on becoming more visible and creating a sense of presence as teachers on digital platforms. At the same time, they transformed the intentions of the course into a digital platform to make them coherent for students. Two teachers from school A reflected on the intentions of distance teachers and course structures online:

> *T1: As a teacher in an onsite school, you plan for lessons every week. We must plan the whole module from the start. All parts need to be in place. The movie needs to be ready.*
> *T2: It's not just one lesson a week; it's five lessons a week.*
> *T1: I can use videos from YouTube, but you have an idea of what the students should learn, and it's important to plan. You need to think it through in detail. "Okay, what do I need to record? What kind of assignments do I need to create?" Then you need to consider how to evaluate so you don't get 15 000 pages from the students. (Two teachers from school A, second interview in 2020).*

The teachers expressed a lack of spontaneity when teaching asynchronously, and their engagement was harder to convey digitally. During the program, some teachers started creating short introductory videos to welcome students to courses or to introduce new themes to the course. They realised that they could be less formal in the videos. The teachers accepted that the short videos might not be perfect, but they were good enough as complements to getting information across to students and establishing a casual relationship with them. Creating digital teaching content like videos meant the teachers produced them all through the courses. They adapted them to the different groups they taught and their intentions with different themes. Although the teachers felt the videos served didactic purposes, it was a time-consuming teaching method focused on content production rather than teaching content.

> *Nevertheless, creating digital material is ongoing all the time. It's not like you have a set of ready materials. You are never done. You need to add materials all the time. Make movies constantly. (Teacher from school B, first interview in 2019)*

Digital media, methods, and intentions

During the R&D program, the teacher groups started to didactically reflect on their teaching methods, digital media, and intentions. They developed asynchronous digital feedback (video feedback) and intentional teacher-initiated communication (comments, chat sessions, video conferences) to follow the student's course work and, at the same time, maintain relationships with students. Before the program, many teachers had waited for the students to get in touch about their studies and inquiries. Now the teachers systematically contact the students. For example, school C had planned how and when they should contact the students in the first weeks of the course. It was also a development toward making them more visible as teachers on digital platforms.

The upper secondary school teachers wanted students to collaborate and considered what digital technologies they could use to support synchronous communication between students. Teachers from schools E and F also started considering asynchronous teaching methods.

> *We want to understand how to use asynchronous activities more. We feel it's tricky. How do you create practical asynchronous activities? Moreover, we have discussed that we want to continue reading Gilly Salmon's book and test a concrete asynchronous activity together. (Teacher from school E, second interview in 2020)*

Many teachers began to reflect on why and how they used digital media during the R&D program. Their intentions varied depending on the functions of digital apps and the needs of the course participants.

> *The aims I had with using Padlet[4] have been achieved sometimes, and sometimes it's gone completely wrong, which is also helpful to know. We became inspired to use Padlet from this program. I felt it was an excellent way to promote it to our faculty. Students who are quiet or do not dare to express much otherwise dare to write there. Sometimes they can write anonymously and sometimes use their names.*

[4] Padlet is an interactive discussion board where people can add content like questions or comments and other users can reply or add reactions. Padlet was used during the program several times to support collaboration between teacher groups during onsite and online seminars.

> *Sometimes they should comment on each other's posts. If I ask too complicated questions, the answers are too long, and no one reads them, so I have had to think about how to formulate myself. (Teacher from school F, second interview in 2020)*

Participants' needs as distance students

The teachers spent most of the R&D program developing didactical methods to strengthen communication with distance students synchronously or asynchronously online. Through introductions, onsite or online the schools tried to learn more about the participants' backgrounds and interests. Most teachers developed asynchronous communication with students, which benefited all students, especially those who rarely spoke during synchronous lessons.

> *As a teacher, I have thought about communication via Teams; by chatting, I get in touch with students that usually are quiet in the classroom. They write to me much more now, and it's first, second and third-year students. Not just the students that had to do distance learning last Spring due to covid-19. (Teacher from school F, second interview in 2020)*

The teacher groups grappled with getting to know participants' needs as distance students. The students represented a heterogeneous group. Some students had good study strategies and completed distance courses with little help from the teachers. Other students required more support from the teacher, but what kind of support was difficult to establish since these students often did not communicate with the teacher.

> *The spectrum of distance students is quite broad. Many are excellent distant learners, self-sufficient, and staying in touch with them through Skype[5], writing or feedback works. However, we also have a group of students with whom it does not work and who do not want to apply for onsite courses. Moreover, I would like more tips on this. How can I improve my teaching practice to support these students? (Teacher from school C, first interview in 2019)*

During the last interview in 2021, a teacher from School C said that she had changed her view of the students. Therefore, her teaching had changed. Before, she viewed students as self-sufficient persons who managed their studies independently, leading to many dropouts. Today she saw the students as persons with individual needs and therefore communicated differently and more frequently with these students. She, as a teacher, became more visible in distance courses. In turn, this has led to more students passing their courses.

In schools B and C, the covid-19 pandemic forced them to close onsite meeting opportunities for adult students. The teacher groups reflected on if onsite meetings were necessary. During the pandemic, they noticed a positive change in the distance students' digital competence due to prolonged emergency online courses. The teachers were inclined to adapt course introductions to student needs. They had started to use asynchronous assignments or synchronous online meetings depending on if the student started the course as planned or if the teachers had difficulties getting in touch with the student.

The sociocultural contexts of the schools

During all the group interviews, the teacher groups kept returning to questions relating to the sociocultural contexts of the schools. In school A, a school objective was to establish relationships with students and ensure students succeeded in finding their place in the world. The systematic work resulted in a change in the study culture among distance students. New students were introduced to student collaboration in different distance courses. Many students started showing up for synchronous lessons and actively participating in collaborative tasks when they realised it supported their studies. It was an important professional development for the teachers as they put a lot of time and effort into planning and supporting students during synchronous lessons.

> *Now that we have started a new school year, many students say, "no, I won't be able to attend lessons; I will do everything on my own". And then, when they have been in a few lessons, they say, "Can I change groups? I want to come to all of the lessons, but the lesson time does not work for me". And then we solve that. Perhaps they realised they had gained something from the lessons. I work a lot with group discussions and breakout rooms[6]. (Teacher from school A, third interview in 2021)*

[5] Skype is a video call and chat software that teachers from school C used for synchronous and individual supervision sessions with distance students.

[6] Breakout rooms make it possible to invite participants during a video conference to separate synchronous sessions like small-group discussions.

Teachers from schools B, C and D explained that many students were unfamiliar with adult education and did not know what was expected of them. Many students had busy schedules that made them less interested in synchronous or onsite arrangements. The schools needed to support students individually for them to succeed and provide coherent digital course structures and flexible digital support. In a sense, the adult education providers were trying to develop individualistic school cultures in relation to adult students' expectations and the flexibility expected from them as digital adult education providers.

> *Perhaps we should invest in, from now on, to individualise distance education even more than we do today. Make a real effort to support each student so they can continue their studies. Moreover, we must share with all our colleagues how to structure courses clearly and remove excess content. Many students struggle with knowing what to do and what not to do. I see that in many of our courses. (Coordinator from school B, third interview in 2021)*

Discussion

This study has investigated secondary and adult education teachers' perceptions of their digital teaching. Initially, the teachers struggled to establish themselves as distance teachers on digital platforms, which is not uncommon among distance teachers (cf., Baran et al., 2011). New communication strategies made them redefine their professional role as distance teachers. The teachers adapted their communication strategies to student needs and became more active with students. Most teachers developed diverse ways to communicate with distance students to establish social relationships and support students' studies. Most teachers also started using digital platforms and resources intentionally, realising that different platforms and resources could support different aims and intentions. They used faster asynchronous communication to answer questions from students (email, chat) and follow students' study processes (comments, video feedback). They included intentional synchronous communication (video calls, chat, interactive discussion boards) to support students' studies, address questions, and identify knowledge gaps among students.

Before the covid-19 pandemic, teachers often included onsite meetings to support distance students' study strategies and digital competence. During covid-19, onsite meetings were impossible, which prompted the teacher groups to question other ways to support students. In many cases, synchronous online meetings or introductory asynchronous assignments worked well. This study confirms that relevant and flexible use of synchronous and asynchronous communication can support teachers and students in distance courses (cf. Hrastinski, 2008; Watts, 2016).

Many teachers started creating digital content to structure courses better and establish social relationships with students. However, it required time and energy throughout the course, adding to the already heavy workload of most teachers. The workload associated with digital content production would be essential to address in distance organisations and future research. Digital content that can be re-used or updated automatically may reduce the distance teacher's workload by better using the digital learning environments (cf., Miyazoe & Anderson, 2010). However, more standardised content may conflict with the creativity and autonomy of teachers from a Didaktik perspective that requires them to reflect on the content, aims, methods, digital media, and participants (cf., Jank & Meyer, 2006; Keiding, 2013).

The digital teaching platforms (itslearning, Microsoft 365 and Teams, Google Classroom) were identified as organisational and professional factors; how the platforms were implemented within the faculty affected teachers' professional development and competence to teach online. This study suggests distance teachers require professional competence development that allows them to test different online teaching strategies and reflect didactically on possibilities and challenges with the digital platform, which is in line with previous research (cf. Baran et al., 2011; Bradshaw, 2002; Hicks, 2014). In this study, faculty discussions were fruitful ways to learn more about recent updates or new features of the digital platforms while effective instructional strategies and course structures could be discussed (cf., Anderson & Garrison, 1998; Miyazoe & Anderson, 2010). The curriculum was identified as a normative factor through the nationally stipulated assessment criteria. The teachers deemed these criteria challenging to assess online. The analysis suggests that distance teachers need a curriculum that acknowledges onsite and online knowledge assessments.

The R&D program supported a dynamic and non-linear process in line with Didaktik traditions that emphasise autonomous teachers considering different teaching factors in relation to the students (Hopmann, 2007; Jank & Meyer, 2006). Relevant research (cf. Salmon, 2013) confirmed aspects the teachers had previously felt were essential and challenged them to consider new teaching methods on digital platforms. The sociocultural contexts,

changes in the instructional practices and organisational visions of the schools had implications for some development work. One of the upper secondary online schools transformed an individualistic school culture into a more collaborative one by including more student collaboration in many courses. Two adult education providers identified sociocultural factors specific to them and worked towards individualistic school cultures to provide students with coherent course structures, individual support, and flexible studies.

The R&D program offered the teacher groups time to reflect on and develop distance teaching practises relevant to their contexts for three years, something previous research confirms is important (cf. Baran et al., 2011; Bradshaw, 2002; Hicks, 2014). The teachers were more inclined to address critical issues with school leaders, and they could also identify future issues. Flexible communication strategies were necessary for student retention and course completion rates during the program. However, asynchronous communication with students was time-consuming as it was hard to plan for and could take place after school hours. In most organisations, asynchronous communication was not perceived as important as synchronous communication in the classroom. An organisational factor that the teacher groups underlined was important to address. Previous research confirms that digital educational processes on the classroom level often become administrative processes that must be handled on organisation levels to address issues with, for example, teachers' workload (cf. Pettersson, 2021).

Limitations and future research

The Didaktik theory used in this study was developed for classroom teaching and during a period before digital media (Keiding, 2013). Digital media, communication and platforms would need to be added as conditional and structural factors to make the theory relevant in digitally networked distance education (cf. Miyazoe & Anderson, 2010; Watts, 2016). Digital platforms affected how the teachers structured content, designed assignments, and communicated with students. The theory (see figure 1) links many important factors when teaching. It helped identify normative, organisational, sociocultural, and subjective factors for teaching without creating rigid linearity or hierarchies. It proved crucial when analysing the data covering many aspects of distance teaching. As far as we know, research in distance education lacks Didaktik theories to analyse empirical material and professional development among teachers. Future research could evaluate the theory in different cultural and contextual (for example, primary school) settings. Teacher autonomy and conditions for teaching might be similar or different in other contexts.

Didaktik principles for distance education

This study suggests didactical principles to improve distance education quality based on the Didaktik-model (see figure 1), findings from this study and previous research.

The structural factors include student's digital competence and needs, course content, intentions, methods, digital media, interactions, and communication:

- Consider supporting distance students' digital competence and online study strategies
- Consider designing synchronous/asynchronous introductions for students to a) the digital platform(s), b) the course structure, c) the teacher(s)
- Consider relevant digital content and assessment methods (length of texts, audio files, video clips)
- Consider teacher visibility and activity (timely feedback, comments, responses) during courses
- Consider and plan for what, when and how communication between teacher and student occurs (frequency, form, media, mode)
- Consider using both synchronous and asynchronous interactions during courses
- Design for recurring student-content interactions
- Design for recurring student-student interactions if student collaboration is possible

The conditional factors include teachers' professional development, faculty support and organisational structure for distance education:

- Support teachers' didactical knowledge to structure distance courses
- Include recurring faculty discussions about distance teaching on the school's digital platform(s)
- Consider the workload of the teacher (communication strategies, administration)
- Provide coherent course outlines that support students' studies and reduce teachers' workload
- Consider the sociocultural context of the school (curriculum, policy documents, legal restrictions, visions and resources for distance education)
- Establish an online learning climate in the school that is open and responsive to participants' backgrounds, needs and expectations

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EMBRACING DIGITAL TRANSFORMATION OF ACADEMIC LEARNING DURING AND POST COVID PANDEMIC ENVIRONMENT

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ABSTRACT
This study examines the major challenges in digital transformation of learning content and how to overcome those obstacles for smooth delivery of classes in fully online mode in the post COVID pandemic environment. It has been found that among other factors the logistic supports such as availability of learning tools, equipment, and software, etc., which is crucial for successful online learning delivery, plays an important role in effective digital transformation of learning content. Especially the digital divide among the student population is a major challenge as it hinders the availability of learning tools, equipment, and software for students. Instructors' extra work load can also be a significant issue. Another important factor to ensure effective online learning is its quality. The design and development of improved online courses must be based on the criteria of online learning quality standards. Also, the active communication and interaction between instructors and students in class is an important factor. Finally, the collaboration among faculty members, administrators, and e-learning technologists play vital role in the success of the digital transformation of academic learning process.
Keywords: Digital transformation of academic learning, Post COVID-19 pandemic online learning,

INTRODUCTION

This study examines the challenges in digital transformation of academic learning content and recommends how to overcome those obstacles for effective delivery of successful classes in fully online mode in post COVID pandemic environment. On January 30, 2020, the World Health Organization (WHO) declared a public health emergency of international concern because of global COVID pandemic (Wu, 2021) that quickly spread around the world with no country left untouched. Consequently, most of the countries around the world established quarantine and lockdown measures with a direct impact on people's work, education, mobility, freedom, health, economy, and social life (Pe´rez-VillalobosID, 2021). The emergence COVID-19 pandemic with its unprecedented challenge for every segment of the society has drastically affected all spheres of everyday life including the education. The educational institutions were forced to disrupt the education of 89% of students, which is more than 1.5 billion students of all ages in 188 countries (UNESCO, 2020). The educational institutions canceled in-person classes and regular on-campus activities immediately. Thus, the pandemic forced millions of students and instructors in higher education all over the world to move to new formats of instruction and learning on an emergency basis. In addition to disrupted regular academic delivery methods, all kinds of on-campus events including conferences, workshops, sports activities had been suspended or canceled as faculty, administrators, and staffs were compelled to work remotely. In that context, the only solution to continue the academic process was the transition of in-person classes to online using learning platforms and other digital technologies. Without adequate preparation 220 million college students' education had to transferred from in-person to online learning using around the world (Pe´rez-VillalobosID, 2021, Wu, 2021).

DIGITAL TRANSFORMATION OF ACADEMIC LEARNING DURING COVID

Although most higher education institutions actively had the online learning environment before the pandemic, the main challenge was the sudden implementation of online learning delivery mode irrespective of faculty and students' lack of ability and/or willingness to conduct classes online. Different factors, especially the limitation of available technology for transition of in-person classes to online classes in short time was a significant challenge in smooth delivery of online learning. The situation was more challenging for the lab-intensive classes, where hands-on learning requires students and instructors' in-person presence in the on-campus labs where all tools, equipment, and software were already set-up to provide students real physical learning experience (Gonzalez et al., 2020, Tropea1 & Rango, 2020).

Actions Taken in the Beginning of Pandemic

To continue the learning process in sudden unprecedented situation, following steps were taken by the educational institutions (Nogales-Delgado et al., 2020):

- Cancel all in-person class activities, replacing it by online learning, eventually for rest of the 2019–2020 academic year.
- Provide online training to instructors and students for online classes.
- Provide students opt-out for Pass/Fail rather than latter grade.
- Give students the opportunity to withdraw from their class at late semester without any financial or grade penalty.
- Adapt online setting for meeting, advising, workshop, seminar, conferences, etc.
- Ensure full online library service for students, faculty members and researchers.

Learning Delivery Method

As shown in Table 1, there are three main modes of learning delivery – in-person, hybrid, and fully online. The fully online mode can be sub-categorized into asynchronous and synchronous modes. During the beginning of COVID pandemic, all classes offered fully online synchronous and asynchronous mode with very few exceptions of hybrid mode. The selection of online learning mode depended on the course content and knowledge of the subject matter that the students require to learn. Combination of synchronous and asynchronous online mode was also applied, if it fits better for a course in a specific program such as engineering and technology (Pregowska et al., 2021).

Table 1. Learning Delivery Modes

Delivery Mode	**Class Meeting Method**	
In-Person	Meet 100% in-person on-campus physical class room	
Hybrid	Meeting in-person physically in class room, but significant percentage of the class content delivered online	
Fully Online	Asynchronous	Synchronous
	Meet from anywhere, anytime	Meet from anywhere, but in a specific time

Deployment of Technology

The online learning platforms, applications software and tools were being used to continue the classes during pandemic. Zoom, Skype, Microsoft Team, Web Ex and other video conferencing platforms became the new classroom for collaborations between instructor and students. Learning management platforms such as Canvas, Blackboard, Adobe Connect, Google Drive, Google Workspace, etc. were used for course content delivery (Nworie, 2021). As shown in Figure 1, students benefitted from fully online learning in different ways.

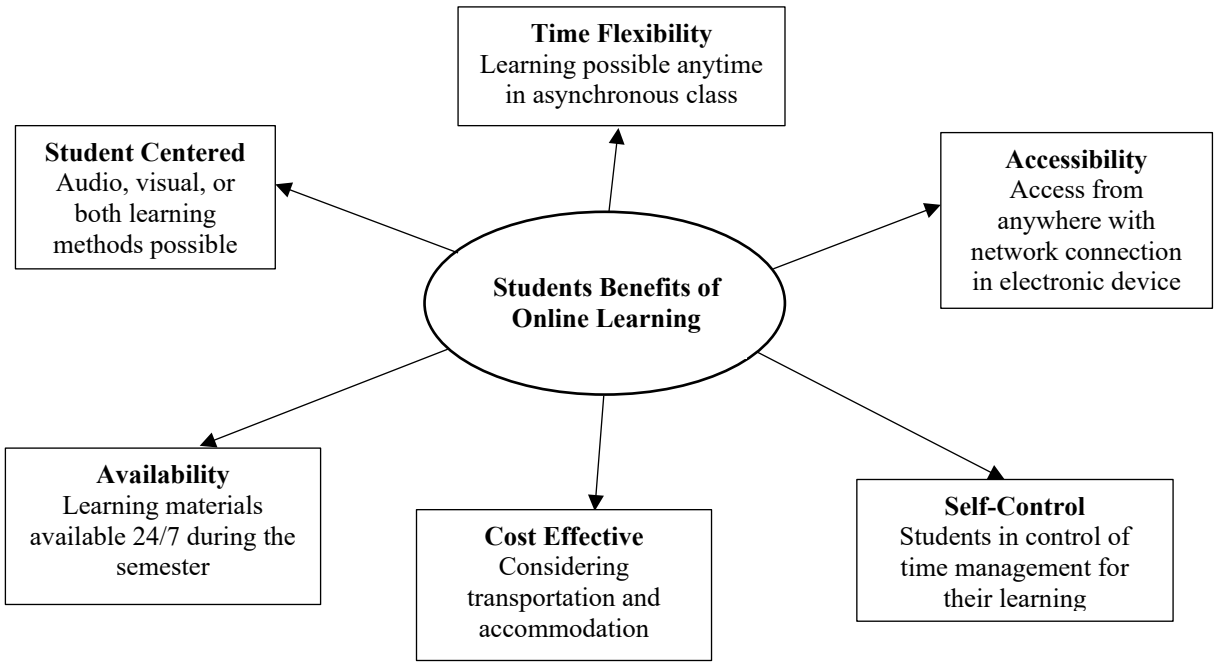

Figure 1. Benefits of fully online learning from students' perspective

Obstacles to Achieve Learning Objectives Online

There are the obstacles that created barriers preventing the achievement of effective quality learning objectives using the e-learning system, especially for the first few semesters during COVID-19 pandemic (Bashitialshaaer et al., 2021). The general concern regarding the complete implementation of online learning, especially in lab-intensive classes, was the sudden development of the pandemic events with little room to maneuver, with the limited availability of technology and tools. The smooth transformation to online learning delivery mode was challenging because of faculty and students' prior expertise and experience with online learning, and the nature of the class that requires logistic support (Nogales-Delgado et al. 2020). A significant challenge to successful online learning with feasible learning technologies has been access to labs, studios, and other specialized learning environments for hands-on experiences (Nworie, 2021). Thus, the fundamental issues that mainly affected the successful transformation of learning to online delivery mode was the lack of preparedness, which highlights on two critical factors: 1) *Logistic support* - the availability of learning tools, equipment, and software to meet learning objectives of the course, 2) *Faculty and students' preparedness* based on their level of prior experience and expertise with e-learning systems.

Logistic Support for Online Learning

Availability of Learning Tools, Equipment, and Software

There are a variety of learning tools available to overcome the challenges of online class development. Using those tools, the learning contents of in-person classes were transformed in digital delivery mode on an emergency basis after the COVID-19 outbreak (Gonzalez et al., 2020). The digital learning content delivered in learning management platforms using devices such as laptop, tablet, smartphone, desktop, or Virtual Reality goggles. All these devices, tools, and software made online learning delivery increasingly viable and accessible to the students for learning and to the instructors for instruction (Pregowska et al., 2021). However, the adequate availability of those tools required for specific classes, especially in lab intensive undergraduate classes, was not guaranteed during the beginning of unprecedented COVID situation (Nogales-Delgado et al., 2020).

Students' Digital Dividedness

Many students were unprepared for online classes that require technology and tools to fulfill the learning objectives of their course. One of the main challenges students faced was the lack of logistic support such as inadequate internet connections, hardware and software compatibility, lack of knowledge and expertise of installing and using those technologies and tools for their learning purposes. Students who were consequently unable to afford those technology, were being left behind academically without the access to those resources (Bassett, 2020). The lack of access to digital devices and internet with sufficient bandwidth highlighted the serious issue of ***digital divide*** in the student population. Depending on where they are living, having secure high-speed internet connection is significantly important for students' quick and timely access to their course content and materials in class. They must have secured network connection, especially during the exams, lab assignments, and live class (Bashitialshaaer et al., 2021). A study shows that 65% of instructors and 77% administrators of higher academic institutions reported that students without access to required learning technologies or to internet connections with adequate bandwidth, are deprived from effective learning opportunities (Nworie, 2021).

A study on students in engineering programs shows that students' unequal access to technology resources, which represents *digital divide,* plays a significant role in their success in online learning. The students' socio-economic background affects the inequality of access to digital devices and technology required for online classes. About 30% of students with lower-income backgrounds did not have the necessary tools and equipment for online learning (Goncharova & Zaitseva, 2020). In another study, 41.3% of the engineering students reported that the internet speed was the major online problem they have faced in their using e-learning platform (Alkhalil et al., 2021). The internet connectivity and other technology constraints were significant concern for students access to the e-learning platforms, especially during live online synchronous classes. Many students do not have the infrastructure nor adequate connectivity in their homes or off-campus. Students from more vulnerable demography face greater challenge of access to the required tools, equipment, and necessary connectivity for online classes (Pe´rez-VillalobosID, 2021).

Instructors' Work Load

In terms of instructors, the lack of individual approach, lack of their control on the digital transformation of some hands-on learning activities, such as lab and project work, into an online learning platform increased their workload to design and develop effective digital instructions. In addition, during the COVID pandemic many instructors did not have the logistic support of tools and technology needed for their class that created significantly extra workload for them. The instructors indicate three levels of support that they would like to get from their academic

institutions: 1) Organizational with more autonomy, 2) Material with computer equipment and services, and 3) Communication (Goncharova & Zaitseva, 2020).

Faculty and Students' Preparedness

Prior Experience and Expertise with E-Learning

Instructor and students' prior experience and expertise with developing online classes using e-learning management tools and equipment play an important role in designing and developing effective online learning delivery. A study in engineering programs shows that the less digitally competent instructors are, the more unwilling they are to shift to new online learning delivery modes (Goncharova & Zaitseva, 2020). During COVID-19, both instructors and students, especially with no or minimal experiences, have to adapt to the new online learning environment with online training, webinars, or tutorials on learning management systems (Nogales-Delgado et al. 2020).

A well-planned online class experience is meaningfully different from online classes designed in emergency basis in middle of the semester in response to a crisis like COVID-19 (Hodges et al., 2020). Usually, it requires six to nine months to design, prepare and develop an online class. When COVID pandemic first outbreak, instructors had to have their online classes ready in weeks, if not days. Many instructors, especially with no or minimal experience or expertise of online learning delivery fell back to the trial-and-error situation. Although they feel more comfortable in teaching the same or similar course online in the following semesters, but it was very difficult and stressful for them for the first time. Consequently, they were then more focused in providing the instructional service rather than in the students' learning as they tended to struggle in transforming their course content digitization. The stress of having to familiarize with new technology and use it in innovative ways replacing their familiar practices of instruction under the pressure against time was overwhelming for instructors without experience and expertise. While those inexperience instructors were more challenged by the drastic change in their instructional method, the instructors with experience and expertise in online instruction carried out this transition more easily and smoothly because they had already used the e-learning management platform before this unexpected COVID pandemic (Pe´rez-VillalobosID, 2021).

ADDRESSING THE CHALLENGESS IN POST COVID DIGITALIZATION OF ACADEMIC LEARNING

Well-designed online courses using emerging technology have been found as effective as in-person traditional classroom instruction. The benefits gained from online instructional delivery strategies during unexpected emergency COVID situations can lead to wider applications in post COVID learning delivery. Therefore, those innovative strategies can be applied as regular instructional practices in post COVID academic environment. With a thoughtful and creative approach, the courses designs can be planned, improved, and best delivered online (Nworie, 2021). For that purpose, as shown in Figure 2, following issues need to be addressed:

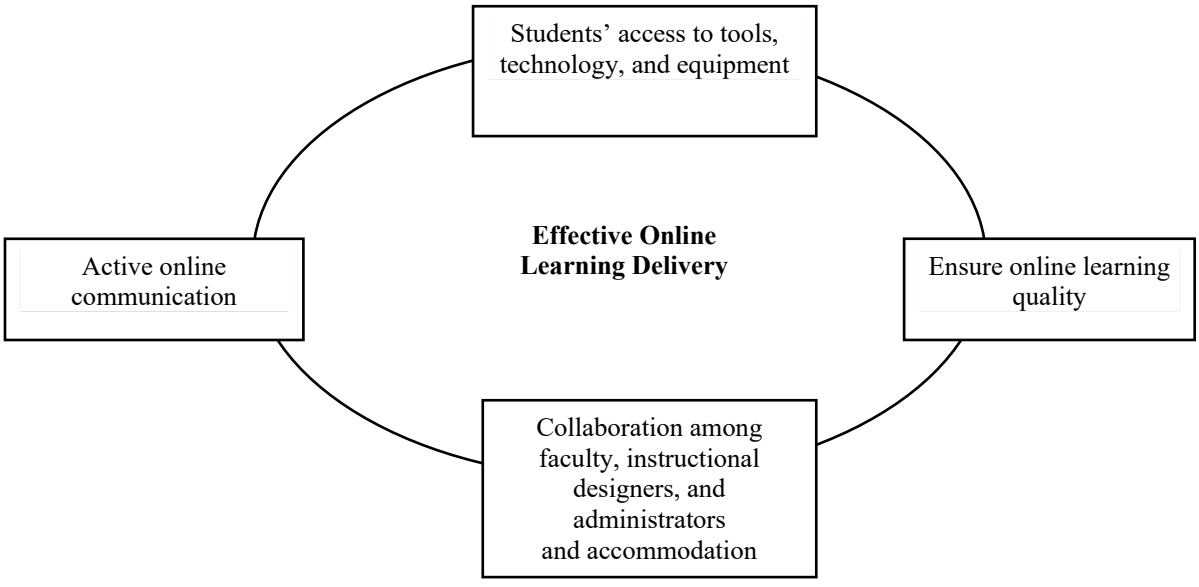

Figure 2. Addressing the challenges in digitalization of academic learning

Students' Access to Tools, Technology, and Equipment

From the online learning experience during COVID, it can be suggested that although there is a significant difference between in-person experience and online experience in learning, especially in hands-on lab classes (Cuschieri & Agius, 2020), with proper access to the tools, technology and equipment, the unique experience of traditional in-person lab sessions can be offered to lab-intensive classes fulfilling the learning objectives. In synchronous or asynchronous online learning classes, well-developed digital simulations, video with learning content, augmented and virtual reality, interactive learning applications, etc. could be used to ensure the learning experience of in-person lab-based classes. For that purpose, academic institutions may consider to providing students with:

1) Remote access to their virtual computer labs
2) Free license to software application
3) Simulated labs environment

Also, for students with disadvantage background with lack of required technical resources, institutions may provide them learning materials and other resources through USB drives, e-books, etc. combining with printed learning materials (Nworie, 2021).

Ensure Online Learning Quality

The post-COVID-19 era offers an opportunity to ensure the effective online learning experience improving the quality of online learning for students. The design and development of improved online courses can be based on the criteria of online learning quality standards such as the *Quality Matters,* which establish benchmarking tools, checklists, and rubrics of online classes. Especially, instructors who are new to online learning can be benefitted from *Quality Matters* that measures the quality of online learning.

Active Online Communication

The interactive communication is more crucial in the hands-on lab-based classes in engineering and technology programs that mainly focus on developing rigorous technical expertise, often significantly focused on the development of engineering and technology skills, and the sophisticated complex problem-solving curricula where teamwork and communication skills are required to prepare students for the real-world workplace. To address this issue, instructors can use the discussion board in the e-learning platform as well as other communication platforms such as Zoom, Microsoft Teams, Google Suite, etc. for communication and collaboration among students in class. Using those platforms, students can share and get feedback on the progress of their group projects reducing the risk of failure (Schefer-Wenzl & Miladinovic, 2020). While before pandemic many instructors and students were not prepared or experienced with using those platforms for educational purposes, but now they are at least familiar with those, and some of them are become expert.

Collaboration among Faculty, Instructional Designers, and Administrators

In the post-COVID-19 environment, instructors in collaboration with instructional designers, e-learning technology staffs, and administrators of their academic institution, can identify and implement the learning technologies that best suit in development of their online class fulfilling students' learning objectives. To offer lab-intensive classes online, instructions need to classify and assess the inadequacy in technology, tools, and equipment that they had during their pre-pandemic learning technology infrastructure. With administrative support and collaboration to have the required technologies to design those online classes, instructors can develop effective hands-on lab-based classes. Faculty, administrators, and instructional designers all have to intended to adopt the innovative tools and technology for the effective learning process. In collaboration with the instructional designers and necessary support from the administrators, the instructors can apply their experience to transform the traditional classroom instruction to the digital form for effective synchronous and asynchronous online learning in post pandemic environment (Nworie, 2021).

CONCLUSION

E-learning has been adopted globally as the alternative learning delivery strategy during the COVID-19 quarantine time (Fawaz & Samaha, 2021). The sudden digital transformation of academic learning during covid pandemic environment created a variety of challenging experiences for students, and instructors had to adjust the delivery mode of their course curriculum for students' learning accordingly. However, even with such challenges, online learning environments have been an effective alternative to higher education institutions during the COVID-19. Not many institutions or faculty and students were prepared for entire transition of in-person classes to complete online classes in short notice. As a result, they faced challenges to deliver the learning content effectively online meeting the objectives of their course as curriculum. In particular, the mandated social isolation impacted the undergraduate courses that were designed to in-person class instructions, group project interactions, lab-intensive, and field studies for real world experience beyond the virtual world (Humphrey & Wiles, 2021).

Instructors and students, who had not no experience of online learning and many of them previously did not consider online learning as authentic as in-person learning**,** have had online learning experience during COVID. Institutions with minimal experience of online learning had to deliver a large number of online courses on an emergency basis. This experience can serve as an opportunity for the faculty to develop effective online classes and for the students to develop their collaborative skills, self-discipline, time management as well as resilience in learning environment (Cuschieri & Agius, 2020). The lessons learned during COVID can serve to improve instructors' instructional methods and students' learning achievements in future online learning. Instructors should embrace cutting-edge technology and deliver their instruction integrating it paying careful attention to students' experiences to make their online learning effective (Alkhalil et al., 2021).

In the post-pandemic environment, as the higher education institutions are moving forward to digital transformation of learning process; the faculty, administrators, and e-learning technologists play vital roles in the success of this process. More faculty are now seeking technology solutions to develop their online classes. They are willing to incorporate tools, apps, and other technology into their online class delivery to provide a better and successful digital learning environment for students (Malvitz, 2021).

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GENDER DIGITAL DIVIDE IN KERALA, INDIA- AN EXPLORATORY ANALYSIS AT MICRO-LEVEL

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ABSTRACT
The recent National Family, Household Survey-5 of India, reveals a stark discrepancy between men and women who use the Internet in 22 states and Union territories. The present study examines the existence and extent of the gender digital divide in Kerala, a region in India acclaimed for a unique model of social and economic development. A micro-level exploratory analysis using data collected from a sample of 200 households randomly selected from two strata viz: **Kudumbasree* (n_1=100) and *non-kudumbasree* (n_2=100) members from a Panchayat in the district of Ernakulam, Kerala, India. The data collected using a self-administered questionnaire were analysed using SPSS software. Multiple Logistic Regression predicts internet usage based on the socio-demographic profile. The study found that women who use the internet are more significant than men. Internet penetration among the *kudumbasree* homemakers is more than the *non-kudumbasree* homemakers in the panchayat. The micro-level findings that emerged from the study contradict the national and state-level patterns regarding the gender digital divide. The study identified a significant association between socio-demographic variables such as age, gender, education, family size, economic status and internet usage.
(*Neighbourhood Help Group comprise of women).
Keywords: *Gender digital divide, Kerala, socio-demographic factors, Kudumbashree.*

Introduction

Internet, the prominent among Information and Communication Technologies (ICTs), has evolved into an indispensable tool for humanity, particularly since the onset of the global pandemic that has confined people within four walls, and almost every service, from education to healthcare to business and governance, is now delivered online. Recognising the growing reliance on digital technologies, international organisations such as the United Nations (UN) acknowledged it as a fundamental human right in 2016. They framed it as a sustainable development goal. Individuals' fundamental rights are violated when they do not access the Internet (Reglitz,2020). However, most people are still barred from taking advantage of this opportunity, resulting in a digital divide. The digital divide refers to the differences between societies and nations and has four dimensions-geographic, demographic and socio-economic (Tapashi, 2018). Therefore, there can be various digital divides in a country, such as a gender divide, the age divide, and the income divide (Singh, 2010). The growing disparity in access rates between men and women is referred to as the gender digital divide.

With the continuous development of information technologies, the digital divide has become a dynamic problem (Saha and Zaman,2017). According to the UN, increasing digital access to women could improve the world GDP and reduce the wage and employment gap between men and women, otherwise exacerbating the prevalent gender inequality and adversely affecting the development of society. Among Sustainable Development Goals (SDGs), the fifth one encourages the international community to enhance the use of enabling technology, particularly ICTs, to empower women. (The World Bank, 2018). Digital participation of women enhances sustainable development (USAID, 2019).

India, a developing country with vast human resources and technological potential, suffers from the social issue, the gender digital divide, as evidenced by the latest NFHS -5 (National Family Household Survey, 2021) data in all 22 states and union territories chosen for the survey, posing a threat to the country's goal of becoming a US D 5 trillion economy by 2024-25. With the country remaining committed to this goal amid a ravaging pandemic, it should carefully plan to eliminate this social evil and promote gender-equal internet access in India through appropriate policies framed at the grassroots level. For this, the study explores the micro-level situation in Kerala, which is known for its unique socio-economic, industrial, and political environment conducive to promoting and attaining a knowledge society characterised by a high level of skilled and technically qualified human resources, a nearly 100 per cent literacy rate, a large NRI population and thus a considerable level of NRI remittances, high

level of social development and living standards comparable to advanced nations. Also, Kerala is more capable of embracing ICT than any other developing country. (Jacob and Manoj, 2019).

Women still have to struggle in order to attain a rightful place in accessing and using the Internet, and the new technologies remain the domain of men (Nair, et.al. 2020; Saha and Zaman, 2017). Scholarly studies have identified socio-demographic factors as the prime reasons for this digital divide in India (Tapashi, 2018; Agrawal et al.,2018; Guha, 2018; Singh,2010; OECD report, 2018). Micro-level studies would be more reasonable and inferential than generic studies to validate this argument in India, the world's most populous country after China. Furthermore, there is little research in Kerala due to the common misconception that Kerala has gender-equal internet usage, which the NFHS-5 data refutes. Most studies are state-specific and rely on primary data due to data scarcity. A micro-level analysis would be beneficial to investigate the prevalence and extent of the gender digital divide in a diverse community such as Kerala to expedite effective policies. Therefore, the present research focuses on gender as a barrier to ICT use in Kerala at the grassroots level, in a Panchayat, in the district of Ernakulam, known as the state's commercial capital and the IT hub.

Methodology

The NFHS-5 evidenced the gender digital divide in India and Kerala. The nature of the gender digital divide is further explored in the Kerala context at the micro-level in a Panchayat. The micro-level exploratory analysis is done using data collected from a sample of 200 households randomly selected from two strata viz: Neighbourhood Help Group called *Kudumbasree* (n_1=100) and *non-kudumbasree* (n_2=100) members from the *Valakom Panchayat* in the Ernakulam district, central Kerala is chosen for the grass- root level survey.

The ability to use ICT and navigate the Internet has become a requirement for living in today's society, also known as the Information Age (Elena et al.2016). The study measures the first-order gender digital divide (access to the internet) and the second-order gender digital divide (use of the internet). It is to be noted that 'access' later became synonymous with 'use', at which point opportunity and choice were unfortunately connoted, as studies have shown that more people have access to the Internet than actually use it (Antonio and Tuffley, 2014). The present study has taken the first-order digital divide is the gender difference in owning a smartphone. The second-order gender digital divide is the difference in using social media such as WhatsApp, Facebook, web browsing, watching YouTube, and checking E/Gmail.

Data Collection Instruments

The study relies on a self-administered survey schedule to gather primary data via telephone interviews. To determine internet usage and phone type, the study asked respondents if they and their spouses use WhatsApp, Facebook, watch YouTube, browse the web, or use e-mail. Household profiles, including age, gender, family size, educational attainment, social group, and economic status, of the respondents are also collected. The data collected were analysed using SPSS software. The percentage method, Chi-Square test and the multiple logistic regression were the Statistical techniques employed.

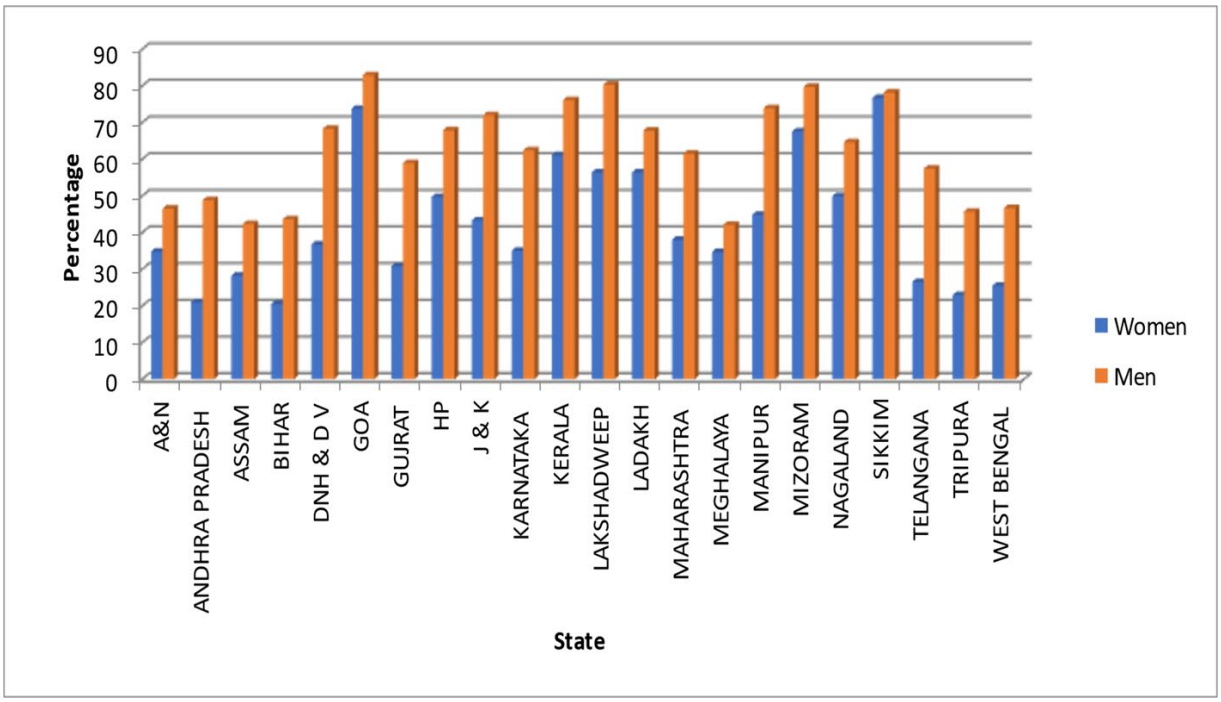
Analysis and Results

The launching of new digital technologies transforms society, and many of these provide new avenues for empowering people, especially women contributing obviously to gender equality. The Internet, digital platforms, mobile phones and digital financial services open up umpteen opportunities for all and move towards bridging gendered economic and social inequality that prevails in society by giving women the opportunity to earn additional income and increase their employment opportunities and access to knowledge and gather general information. This part of the study analyses NFHS-5 data to identify the gendered use of digital technologies in Indian society. From this national perspective, the study moves to a micro-level analysis. It verifies how the national pattern is different from micro-regions in India and the need for policy implications thereon. For this analysis, a panchayat from the Commercial capital and IT hub of the state of Kerala, which well acknowledged for its unique human development paradigm, has been taken.

In India, on average, only 42.6 per cent of women have ever used the Internet, compared to 62.16 per cent of men. In all the states surveyed, male users outnumber female users. Except for Sikkim, Goa, Kerala, Lakshadweep, Ladakh, and Mizoram, the rest of the states and union territories have less than 50 per cent of the women population using the Internet (Sarkar,2020). Despite more than 50 per cent of women internet users, these states are faced

with unequal gendered internet usage. The NFHS-5 data on the gender digital divide in 22 states and union territories of India are given in Figure 1.

***Figure 1*: National Pattern of Gender Digital Divide (in per cent)**



Source: NFHS-5 data

Given its unique and favourable human development context, Kerala necessitates a well-thought-out gender and development strategy at the micro-level (Baiju, Shibu, 2018). The study in the Valakom Panchayat seeks to explain the first and second-order gender digital divide, household-level predictors of internet usage and the difference in internet penetration among homemakers in *Kudumbashree* and those who aren't. The Internet is now a part of the globalisation process, eradicating old realities and certainties while creating new opportunities and challenges associated with living in a small world (Shrivastav and Agarwal 2013). Based on the data collected, the first-order and second-order gendered digital divide shows an unusual pattern in the Panchayat surveyed, as females outperform smartphones and internet usage ownership, as shown in Table 1. The data show that 35.94 per cent of women own 'basic' type mobile phones against 41.01 per cent of the men who own such a type of phone. According to the data, the percentage of women who own a smartphone is 64.06 per cent against 58.99 of men with a smartphone.

Table 1: Percentage distribution of mobile ownership and internet use

Type of mobile phone	Women		Men	
	Count	Percent	Count	Percent
Basic	69	35.94	73	41.01
Smart	123	64.06	105	58.99
Internet use	140	70	105	59

The percentage of women who are internet users is more significant than men. While 70% of the women surveyed are internet users, only 59% of the men are internet users. In contrast to the national and state patterns, the Panchayat reflects an unusual women-dominant distribution among internet users.

The Chi-Square test displayed a significant association between age, education, gender, economic status, family size, and internet use with a p-value of less than 0.05. These variables are included in the Multiple Logistic Regression to predict internet usage (see Table 2). The variable age is divided into four categories, with age >60 as the reference category. The analysis shows that the people below the age 40 and between 41-50 have a

significant association with internet usage but not age above 50. People below 40 years of age use the Internet 6.8 times more than the reference group, and those between 41 to 50 use it 8.09 times more. For gender, the male is selectedas the reference category. The variable gender significantly affects internet usage as the corresponding p-value is less than 0.05.

Table 2: Multiple Logistic Regression to predict internet usage

Variables with the reference category		*B*	*S.E.*	*P*	*Odds (95% CI)*
Age >60	<=40	1.92	0.86	0.026	6.8(1.25-36.93)
	41-50	2.09	0.68	0.002	8.09(2.14-30.58)
	51-60	0.50	0.56	0.378	1.64(0.55 - 4.95)
Size of family (1-2)	3-4	1.06	0.60	0.076	2.89(0.89– 9.35)
	>=5	-0.43	0.60	0.477	0.655(0.20-2.10)
Education-(Primary/Upper Primary)	Secondary	1.55	0.52	0.003	4.71(1.69-13.17)
	>Higher Sec.	3.13	0.75	0.000	22.91(5.24100.13)
Economic status (BPL)	APL	1.02	0.44	0.022	2.76 (1.16 - 6.59)
R^2	0.364				

Source: Primary data

The internet usage of females is 0.616 times higher than the internet usage of males. Though family size has a significant association with internet use, categories 1-2 and more than five do not significantly predict internet usage. Education, having a p-value of 0.00, is a significant predictor of internet usage. It is categorised as primary and upper primary, secondary, higher secondary, or above. Primary and upper primary education is chosen as the reference category for education. People with secondary education use the Internet 4.71 times more than the reference category and have a significant relationship with internet use. Respondents with higher secondary education and above were found to use the Internet 22.91 times more than those respondents with primary and upper primary education. The economic status of the respondents was taken from the Government authenticated document issued by the Department of Civil Supplies under the Revenue Division of the Government of Kerala. This document records the household profile as Above the Poverty Line (APL) and Below the Poverty Line (BPL) based on the household's annual income. Considering the BPL as the reference category, it is seen that the respondents who belong to the APL category use the internet 2.76 times more than the BPL category.

***Table 3*: Internet usage of *Kudumbashree* and *non-Kudumbashree* homemakers**

Category	**INTERNET USAGE**			
	'YES' count	**Percent**	**'NO' count**	**Percent**
Kudumbasree	**42**	**42**	**58**	**58**
Non-kudumbasree	**18**	**18**	**82**	**82**

Source: Primary survey data

Among the women users, the internet penetration among the *Kudumbashree* homemakers is more than *non-Kudumbashree* homemakers in the Panchayat. This is evident from the analysis, which shows that 42 per cent of the *Kudumbashree* members use the internet, while only 18 per cent of the *non-Kudumbashree* homemakers use it. It has been reinforced from this result of non-kudumbasree homemakers the argument of Hafkinn and Taggart (2001) that among the different factors, social and cultural norms seem to become the biggest obstacle in many developing countries with a tradition of a strongly patriarchal culture that marginalises women. See the details given in Table 3.

Discussion and Conclusion

The findings at the micro-level contradict the national and state-level pattern as women own a smartphone and use the Internet more than men in the Valakom Panchayat. The study identified a significant association between socio-demographic variables such as age, gender, education, family size, economic status, and internet usage at $p<0.05$. The Chi-Square test did not find any significant association between a social group and internet usage. Age less than or equal to 40 and 41-50 years of age was significantly associated with reduced odds of internet usage (OR 6.8 and 8.09 respectively, 95% CI). Though significantly associated with internet usage, family size is not found

as a good predictor in this regard. Those having educational qualifications higher secondary and above are found to use the Internet 22.7 times more than that women with primary and upper primary schooling. The odds ratio of secondary education is seen as four times more than those with primary and upper primary schooling. The family's economic status is also a significant predictor of internet usage as the odds ratio of the APL category is twice more than the internet usage of the BPL category. The study's findings comply with the existing studies that age, education, economic status and gender have a significant association with internet usage (Haight et al., 2014; Bala and Singhal, 2018; Singh et al., 2018; Tapashi, 2018; Agrawal and Asrani, 2018; Joshi et al., 2020; Nair et al.,2020; Das and Jain, 2020).

Based on the discussion of the results, it is suggested in consonance with the trend observed in the study area that improving education is crucial to address the disparity in access and use of mobile phones and the Internet among women. The Neighbourhood Help Group initiatives, such as the *Kudumbashree,* which is government-supported and gender-focused in Kerala, mainly emphasise the holistic empowerment of the women belonging to the socially excluded categories. The role of Neighbourhood Help Groups, especially Kudumbasree, as a means of social change for strengthening the socialisation process of women has been well documented (Rajagopal, 2020). The present analysis brings forth the capacity of *Kudumbashree* in promoting internet usage among women in the Panchayat under study convincingly. Such success models can be emulated in other states too. Women from the backward classes can effectively use the Internet if they are adequately supplemented with the technological skills and the logistics required to access it. The Social It has been proved that the Internet provides critical infrastructure for many essential activities in the covid pandemic. In the study area, most *Kudumbashree* activities are efficiently conducted over the Internet, especially during the pandemic, requiring members to use the Internet. Hence, women are intrinsically motivated and become self-oriented to use the internet for community/participatory activities when engaged in such groups. The Local Self Governments could conceive and rollout suitable schemes and programmes for enhancing ICT use based on a micro-level database of the identified beneficiaries and target groups.

Scope, Limitations and Further Study

The study focuses on the issue at the grassroots level and facilitates an effective policy. Kerala, a southern state known for its distinctive socio-economic, open, and women inclusive development, also has gender-biased Internet usage as per the NFHS-5 survey. The present microlevel analysis reveals that the *kudumbasree* women have more access to digital devices and have evaluated its efforts to penetrate Internet usage among its members compared to *non-Kudumbashree* homemakers. The reliance on self-reported data is a primary limitation of this research and admits the chances of variations in the study results if time, place, subjects, and sample size are altered. However, it has been well accepted and documented that *Kudumbashree,* the Neighbourhood Help Group (NHG), has been lauded as a success story of women's empowerment in Kerala. Hence, the role and initiatives of *kudumbasree* can be emulated in other parts of the state and the country to enhance digital literacy and access to digital devices, which is pertinent to achieving SGD. The study could be expanded to other Panchayats and municipalities, and comparative studies could be conducted to assess gender differences in internet usage.

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INFLUENCE OF SOCIAL MEDIA ON SOCIAL RELATIONSHIPS AND ACADEMIC ACHIEVEMENTS

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ABSTRACT
India is an active user county in the world in terms of using social media. We live in a socially networked period, where everyone is connected through a network of social media, and that too at a very low cost. Technology has evaporated the limits of social connections among friends and family staying far and even with strangers. The utilization of social media sites among young people has increased drastically and impacted their daily life.
This paper aims to study the pattern of use of social media sites and their correlation with university students' social relationships and academic achievements. Through random sampling 100 post-graduate students (50 boys and 50 girls) from MANUU (A Central University), Hyderabad (India) were selected. One standard tool named Social Relationship Scale (SRS-KPFNNT) and one self-developed tool named Social Media Usage Scale were used for data collection.
The researchers found that YouTube, followed by WhatsApp are the most liked social media site among the sample students. Students are having at least 2 social media site accounts. They found significant differences in usage of social media sites among students in relation to their type of families) and social relationships (among students in relation to their gender). Further, they found a remarkable correlation between usage of social media sites and social relationships.
Keywords: Social Media, Social Relationships, Academic Achievements

INTRODUCTION:

Social Media:

In the 21st century, the so-called digital age, computers and the Internet have undoubtedly taken a central place in human life, and social media site plays a significant role in this scenario. Social media sites attracted people because of their easy-to-use and affordable access to information via computers and the Internet, in addition to important features such as low-cost, high-speed access and expansion of the communication network. We are breathing in an age where there is an ocean of information everywhere and information is just a push of a button away.

Social media is defined as "a group of Internet-based applications that build on the ideological and technological foundations of Web 2.0, and that allow the creation and exchange of user-generated content" (Kaplan and Haenlein, 2010). Merriam Webster dictionary (2014) defined social media as "It is a form of electronic communities (as websites for social networking & micro-blogging) through which users create online communities to share information, ideas, personal messages, and other contents (video & audio)".

Social Media is a combination of the two words social and media. The first part of this term is social, which means to be social, which means to be a social being, to connect with other people in society or to share and exchange information with them. The second part is the media, which means a means of communication (with the possibility of the internet on the mobile phone or computer). By combining these two distinct terms, we can define a basic

definition of social media as a web-based (internet-based) communication platform that allows users to connect and communicate with other users and express and share information and ideas.

In recent years, social media has become an important means of social communication between individuals. It is a platform that not only connects people but also allows them to express their feelings and thoughts. It also offers features like receiving and sending messages, sharing photos, making audio and video calls, and connecting to the rest of the world. Because of this, it has become an essential part of an ordinary man's life. These networking sites have created virtual communities. Despite being physically separated, more than half of the population is connected through social media and people benefit from each other.

Social media sites are a boon for people as they can even connect with strangers. Social Media is a web-based technology that offers its users a technological connection to connect with others. Social media site allows users not only to build, maintain and improve their social connections but also to share their ideas and information, as well as to share their thoughts and emotions. Social media offer a platform to use their freedom of expression also.

Social Relationships:

A group of people is commonly referred to as a society. Society is not only the group of individuals or people but also the system of interactions and relations between them is called society. The Greek thinker Aristotle said that human beings are social creatures by nature and do not survive being cut off from society. Society is an organization of people and man only lives in society by becoming a part of society. Individuals and societies are inextricably linked. This society provides the necessary protection for the existence of the individual and meets the needs so that the necessary abilities of the individual can fully develop. This will not only make the individual a strong and developed person but also contribute to the well-being and development of his nation and country. In other words, we can say that society meets all the needs of the individual and also tells him that he is also a responsible member of it. Individuals form mutual or reciprocal relationships while living in a society called social relationships.

As a social being, a person has various types of relationships such as relationships with their family, relatives, colleagues, classmates, friends, etc. in society, and communication is the most important component of any relationship, but vital in all stages. Humans interact in a society with two or more individuals or groups through symbols, language, gestures, and the expression of ideas. Social interactions are the basis of society. There would be no group life without interaction. In a better way, we can say that interaction is the main process of socialization of an individual from birth to death that exists in every culture.

It is very important to communicate, but it is difficult to maintain relationships in society. People generally communicate with those they like or at least know. We know that relationships depend on regular meetings and interactions with others, but time is limited in fast-growing life and also not easily possible due to people's dispersion. But technology brought the ability to maintain and enhance social connections in the form of social media.

Academic Achievements:

Academic achievement occupies an important place in the field of education, which is regarded as an excellent stimulus for the development of students to promote educational development. It helps students, teachers, and institutions to achieve educational goals. Academic achievement is a term used to determine the level of academic performance or learning of students. This achievement includes all activities related to a subject or all subjects that students complete in school or college. It plays a key role in deciding the student's skills and qualifications in the education system.

Academic achievement is the level of understanding, acquisition of knowledge, and skills in a specific subject, usually described by teachers in terms of test scores and grades. The importance lies on the one hand in further education and on the other hand in the subsequent job search. We know that the current age is competitive, so education at this age is vital in determining students' futures. Chaplin's (1959) Dictionary of Psychology defines

educational or academic achievement as a specific level of achievement or ability in academic work, as assessed by teachers, by standardized tests, or by combining these two.

PREVIOUS STUDIES:

Manjunatha, S. (2014) concluded that "social networks have enabled better communication with their families. Social networking sites help to create positive interpersonal relationships between college students and their families and friends". **Rajiv M.M. & Jobilal (2015)** identified and emphasized enormous scope of social media in the development aspects, while the negative impacts of mobile phones and other related consumables are very high". **Nwazore, et. Al. (2015)** concluded that "Facebook activity among students has a negative impact on their academic performance and that most students spend a fair amount of time browsing Facebook". **Purinat & Gurusamy (2015)** found that "the use of social networking sites improves the interpersonal relationships of college students, especially with their family members, friends, and teachers, and due to the availability of social networking sites, the communication between college students and their family members and friends has increased". **Seabrook et al. (2016)** concluded that the use of social networking sites correlates with mental illness and well-being. **Murat Tezeret. Al. (2017)** found that "prospective teachers with social media accounts achieved better grades than prospective teachers without social media account experienced a negative impact on their overall emotional well-being and reduced quality of their relationships". **S.M. Azizi et.al. (2019)** found that "there is a negative and significant association between students' social media site addiction and their academic performance. **Ansari & Khan (2020)** found that "online social media used for collaborative learning had a significant impact on peer interactivity, teachers, and online knowledge-sharing behaviors. In addition, interactivity with teachers, peers, and online knowledge-sharing behavior has a significant impact on student engagement, which consequently has a significant impact on student academic performance".

RESEARCH GAP:

After going through various studies on the social relationships, academic achievements, and usage of social media sites for students at a national and international level, it is found that no study was conducted on the mentioned variables. Therefore, the present study is an attempt to study the usage pattern of social media and its influence on students' social relationships and academic achievements.

OBJECTIVES:

The objectives of the paper are as follows

1. To study the usage pattern of social media sites among students.
2. To study the difference between the means of usage of social media sites among students based on gender.
3. To study the difference between the means of usage of social media sites among students based on their type of family.
4. To study the difference between the means of social relationships among students based on gender.
5. To study the difference between the means of social relationships among students based on their type of family.
6. To study the difference between the means of academic achievements among students based on gender.
7. To study the difference between the means of academic achievements among students based on their type of family.
8. To study the correlation between usage of social media sites and social relationships of total sample students.
9. To study the correlation between usage of social media sites and academic achievements of sample students.

HYPOTHESES:

The hypotheses are in null form and are as follows

1. There will be no difference between the means of usage of social media sites among students based on gender.
2. There will be no difference between the means of usage of social media sites among students based on their type of family.
3. There will be no difference between the means of social relationships among students based on gender.
4. There will be no difference between the means of social relationships among students based on their type of family.
5. There will be no difference between the means of academic achievements among students based on gender.

6. There will be no difference between the means of academic achievements among students based on their type of family.
7. There will be no correlation between the usage of social media sites and the social relationships of total sample students.
8. There will be no correlation between the usage of social media sites and the academic achievements of total sample students.

VARIABLES:

Independent Variable: Social Media
Dependent Variables: Social Relationship, Academic Achievement
Demographic Variable: Gender (Boys and Girls), Type of Family (Joint and Nuclear)

METHODOLOGY:

To achieve the above-mentioned objectives, the descriptive survey method was adopted for the collection of data in this study. The sample of 100 postgraduate program students was selected by random sampling at Maulana Azad National Urdu University (MANUU), Hyderabad (India). From 100 students, 50 boys and 50 girls from postgraduate courses were selected for the present study.

Tools of the Study:

1. **Social Media Usage Scale:** This scale was developed by the researchers, and consists of 2-parts. Part-A consists of 7-Questions with multiple choices and Part-B consists of 24 statements (in both positive and negative) and reliability is 0.785
2. **Social Relationship Scale** (SRS-KPFNNT): It is a standardized scale that was developed by Pradeep K., Faheem N., and Neha T. This scale consists of 35 statements. It has 7 dimensions named Parents, Friends, Relatives, Siblings/Cousins, Peers/Classmates, Teachers and Strangers. Its reliability is 0.93.
3. **Academic Achievement:** The percentage of semester examination marks is considered as students' academic achievement.

Data Collection Procedure:

The researchers turned to the postgraduate students and asked them to fill out the response sheets. The researchers ensured to maintain the confidentiality of the data and then explained how to fill the response sheet. After the collection of data, they were scored and tabulated for analysis (both descriptive and inferential statistics).

Statistical Techniques:

For data analysis, the researchers used frequency, mean, standard deviation, t-test (to know the significance of the difference between the group of variables), and Pearson product-moment correlation (to know the correlation between the variables). The analyzed data are presented below.

ANALYSIS AND INTERPRETATION OF DATA:

Table-1: Distribution of Data

Variable	**Gender**		**Type of Family**	
Group	Boys	Girls	Joint	Nuclear
Frequency	50	50	41	59

Table-2: Usage Pattern of Social Media

favorite Social Media Site	**YouTube**	**Facebook**	**WhatsApp**	**Twitter**	**Instagram**
	43	9	35	4	9
No. of Social Media site accounts having	**1**	**2**	**3**	**4**	**4<**
	2	16	28	35	19
Overall Time Spent on Social Media site	**1-2 hrs.**	**2-3 hrs.**	**3-4 hrs.**	**4-5 hrs.**	**5 hrs.<**
	28	16	35	14	7
Access Social Media Account	**Sometimes**	**Weekly**	**Daily**	**During free time**	**Always online**
	10	7	47	34	2
Friends on Social Media Sites	**<50**	**50-100**	**100-150**	**150-200**	**200<**
	20	15	15	17	33

Purposes of Using Social Media Sites	Downloading Audio/Video	Uploading Audio/Video	Chatting/ Communication	Study Purpose	Entertainment
	21	5	55	71	79

Table 2 displays the usage pattern of social media sites among postgraduate students of the university. It can be seen that YouTube is most favorite social media site of 43 students among the selected students, followed by WhatsApp (35 students). Most of the students are having at least 2 or more social media site accounts. Out of the selected students, 35 students spend 3-4 hrs. on social media, followed by 28 students who spend 1-2 hrs. Most of the students are accessing social media sites either daily (47 students) or during free time (34 students). 33 students are having more than 200 friends on social media sites. Students' main purpose for using social media is entertainment and study followed by chatting/communication purposes.

Testing of Hypotheses:

$H_0$1: There will be no difference between the means of usage of social media sites among students based on gender.

Table-3: Means of Usages of Social Media Site of Boys and Girls Students

Gender	N	Mean	SD	df	t-value	Remark
Boys	50	85.52	9.078	98	0.780	Not significant
Girls	50	84.22	7.522			

From Table 3, It is evident that the t-value is 0.780, which is not significant. It shows that the mean score of social media site usage of boys and girls students did not differ significantly. Thus, the null hypothesis that "There will be no difference between the means of usage of social media sites among students based on gender" is not rejected. It may, therefore, be said that boys and girls students are using social media equally.

$H_0$2: There will be no difference between the means of usage of social media sites among students based on their type of family.

Table-4: Means of Usages of Social Media Site from Joint and Nuclear Family Students

Type of Family	N	Mean	SD	df	t-value	Remarks
Joint	41	83.27	7.402	98	2.36*	Significant at 0.05 level
Nuclear	59	87.17	9.094			

From Table 4, It is evident that the t-value is 2.36, which is significant at 0.05 level with df =98. It shows that the mean score of social media site usage of students from joint and nuclear families differs significantly. Thus, the null hypothesis that "There is no difference between the means of usage of social media sites among students based on their type of family" is rejected. It may, therefore, be said that students from nuclear families were found to use social media significantly more than their counterpart students from joint families. As their mean score is higher than students from joint families.

$H_0$3: There will be no difference between the means of social relationships among students based on gender.

Table-5: Means of Social Relationships of Boys and Girls Students

Gender	N	Mean	SD	df	t-value	Remarks
Boys	50	121.06	11.202	98	2.063*	Significant at 0.05 level
Girls	50	126.14	13.326			

From Table 5, It is evident that the t-value is 2.063, which is significant at 0.05 level with df =98. It shows that the mean score of social relationships of boys and girls students differs significantly. Thus, the null hypothesis that "There will be no difference between the means of Social Relationship among students based on gender" is rejected. It may, therefore, be said that girls students were found to have social relationships significantly more than their counterpart boys students. The mean score of social relationships of girls students is higher than boys students.

H_04: There will be no difference between the means of social relationships among students based on their type of family.

Table-6: Means of Social Relationships of Joint and Nuclear Family Students

Types of Family	N	Mean	SD	df	t-value	Remarks
Joint	41	124.51	13.526	98	0.606	Not significant
Nuclear	59	122.97	11.832			

From Table 6, It is evident that the t-value is 0.606, which is not significant. It shows that the mean score of the social relationships of students from joint and nuclear families did not differ significantly. Thus, the null hypothesis that "There will be no difference between the means of social relationships among students based on their type of family" is not rejected. It may, therefore, be said that students from joint and nuclear families are having social relationships equally.

H_05: There will be no difference between the means of academic achievements among students based on gender

Table-7: Means of Academic Achievements of Boys and Girls Students

Gender	N	Mean	SD	df	t-value	Result
Boys	50	78.43	5.75	98	1.437	Not significant
Girls	50	76.76	5.91			

From Table 7, It is evident that the t-value is 1.437, which is not significant. It shows that the mean score of academic achievement of boys and girls students did not differ significantly. Thus, the null hypothesis that "There is no difference between the means of academic achievements among students based on gender" is not rejected. It may, therefore, be said that boys and girls students are equal in terms of their academic achievement.

H_06: There will be no difference between the means of academic achievements among students based on their type of family.

Table-8: Means of Academic Achievements from Joint and Nuclear Family Students

Types of Family	N	Mean	SD	df	t-value	Result
Joint	41	78.13	5.238	98	0.763	Not significant
Nuclear	59	77.22	6.277			

From Table 8, It is evident that the t-value is 0.763, which is not significant. It shows that the means of academic achievements of students from joint and nuclear families did not differ significantly. Thus, the null hypothesis that "There is no significant difference between the means of academic achievements among students based on their type of family" is not rejected. It may, therefore, be said that students from joint and nuclear families are equal academically.

H_07: There will be no correlation between the usage of social media sites and the social relationships of total sample students.

Table-9: Correlation between Usages of Social Media Sites and Social Relationships of Students

Variable	Social Media Usage	Remark
Social Relationship	0.347**	P<0.01

From Table 9, it is evident that the correlation coefficient between usage of social media sites and social relationships of total sample students is 0.347 which is positive and significant at 0.01 level with df = 98. This shows that social media site usage and social relationships are positively and significantly correlated. Thus, the null hypothesis that "There is no correlation between the usages of social media sites and the social relationships

of total sample students" is rejected. Further, the percentage of commonness between usages of social media sites and social relationships is 12.04 which is low. It may, therefore, be said that social media usage and social relationships are found to be less related.

$H_0$8: There will be no correlation between the usage of social media sites and the academic achievements of total sample students.

Table-10: Correlation between Usages of Social Media Sites and Academic Achievements of Students

Variable	Social Media Usage	Remark
Academic Achievement	0.089	P>0.05

From Table 10, it is evident that the correlation coefficient between usage of social media sites and academic achievements of total sample students is 0.089 which is positive but very low and not significant. This shows that social media site usage and the academic achievement of students are not significantly correlated. Thus, the null hypothesis that "There is no correlation between the usage of social media sites and the academic achievements of total sample students" is not rejected. Further, the percentage of commonness between usages of social media site and academic achievement is 0.79 which is too low or negligible. It may, therefore, be said that usage of social media among students does not affect their academic achievement.

FINDINGS AND CONCLUSIONS:

- The researchers found that YouTube is the most popular and favorite social media site among students, followed by WhatsApp, and 71% of students use social media for study purposes. This may be due to the various videos readily available on YouTube that can be shared in WhatsApp groups created by the students as an educational group.
- Looking at the usage pattern (Table-4) of students' social media, they found that 35% of students use it for 3-4 hours. daily (47%). It can be concluded that they use it in a controlled and justifiable way in their studies as no significant difference in their academic achievements was detected.
- A significant difference in social relationships between the gender was found. Girls students show a higher level of social relationships than boys students. The reason may be that they prefer to stay connected with their family and friends. They follow customs and achieve more family celebrations.
- The researchers found a positive, moderate, and significant correlation between usage of social media sites and social relationships. It means that, as the usage of social media increases, so will their social relationships. The reason behind this could be their family type, as 59% of students belong to nuclear families and use social media to maintain their social connections.
- No correlation is found between usage of social media sites and academic achievements. From this, it can be concluded that they are enough mature to maintain social media usage and their study time.

SUGGESTIONS:

- YouTube and WhatsApp are the most popular social media sites among students. Therefore, students and teachers should make effective use of these sites.
- Students should make the best use of social media, as excessive use can lead to certain problems.
- Though 71% of students use social media in their studies, excessive use can have an adverse effect on health. Therefore, students must use it in a controlled and justifiable manner for their studies and their health.
- Don't keep talking to people and friends through various social networking sites of social media all the time, use it for your academic development as well, otherwise, it may harm your studies.
- Maintain social relations not only online but offline also. Therefore, students should take some time off to keep in touch with their friends and relatives.
- Students should maintain a balance in their social relationships and devote adequate time to activities of daily living. To improve social relationships through online mode, an educational group can be formed to share valuable ideas and information.

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ONLINE LEARNING AMONG THE STUDENTS OF FISHERMEN COMMUNITY DURING COVID 19

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ABSTRACT
COVID 19 outbreak has significantly and severely impacted the education system worldwide. As a means to cope with this unforeseen situation, all the academic activities were shifted to the online platform. However, simply converting offline content online is not enough to provide learners with a unified digital learning experience. Proper learning conditions are equally important as the content delivered. Therefore, in this study, we aimed to discover the acceptance of online learning among school students from the marginalised fishermen community in Kerala, India. The study's findings indicate that students lack interest in online learning. They are facing many problems that diminish the actual benefit of online learning. This study suggests that the government should take adequate measures to provide impartial delivery of education by enhancing students' online learning experience.
Keywords: COVID 19 Pandemic, online learning, fishermen community, social media.

Introduction

The catastrophic effect of the COVID 19 pandemic impacts almost all the domains in our society, with the educational sector being one of them. As a result, most governments around the globe imposed a lockdown to minimise the spreading of the pandemic. India implemented a nationwide lockdown from March 2020, which resulted in an ominous impact on the educational system; it has impacted the whole education system from pre-school to university. Entire academic activities shifted online, giving learners and educators little time to cope with the new shift. Although, mere conversion of offline content to online is not enough to blend into the online environment. Though children from the current generation are surrounded by digital technology from birth, they are not fully equipped for a technology-rich future. (Iivsri, Sharma & Olkkonen, 2020). The effectiveness of using educational technology is dependent not only on the technology but also on the educators, learners, and the learning process (Ma & Lee, 2018). While closing school during COVID 19 is necessary, they also cause many challenges, especially for marginalised students. Unequal access to technology is a major problem that can prevent a significant number of children from attending online education. Marginalised students often have parents who cannot be at home to support their children, which makes online education less effective even with technology access. Also, online education is not as effective as the one in school for many children with special needs (Hani Morgan, 2020). The success of online learning is determined by how well the content is orchestrated in the online environment and by successfully resolving learners' challenges (Muthuprasad et al., 2020). Online learning challenges and inequalities have become emerging realities in developing countries education sectors (Oyedotum, 2020). We all realise how essential digital literacy is to survive in this new world, where online services and social interaction may be the new normal (Bhagat & Kim, 2020).

The present study tries to shed light on the acceptance of online learning among school students from the fishermen community, a less privileged community in Kerala. The primary objectives of this study are to discover the awareness of online learning, perception about the quick transition of online learning during Covid 19, tools and techniques used for their learning and evaluation, preference of online learning, satisfaction and effectiveness of online learning. This paper also examines the benefits and challenges faced by the students while using the online method.

The Fishermen community form an essential fraction of the population of Kerala, India. Kerala is the eighth largest fisherfolk group of the 14 coastal states. However, somehow, this community remain neglected and marginalised, considering the state's overall socioeconomic advancement. For example, fisherfolk's literacy and educational achievement are much lower than the general population's (Kelker, 2012). There has been some progress in their living standards, but some fishermen community sections have yet to improve their living conditions significantly. The state fishing community has been largely excluded from the broader development experience. The study is relevant now since online education has never been implemented like this, such as a massive social experiment in India, where educational attainment is unequally distributed among urban and rural populations. Through this

study, we can understand whether students from marginalised sections are getting equal learning chances during the pandemic period and their acceptance of digital technology for learning.

Literature review

As an initial response to COVID 19, educators were rushed to change their conventional programs to fit in an online environment. However, transitioning content to an online learning environment is not enough to blend in with the new environment. More educational policymakers must understand the value of broadening their learner populations, course of study, and the need for new learning styles (Bhagat & Kim, 2020).

After transitioning conventional learning into digital learning, only technology usage has enhanced; students' motivation, cognitive engagement, and self-efficacy have reduced since the transition from face-to-face to virtual learning. More research is required to address these online learning barriers (Hermida, 2020). An enormous negative impact on students' current and intended outcomes occurred due to the COVID 19 pandemic. These effects have been exceedingly varied because of the existing socio-economic divides. Low-income students are most likely to decelerate their education due to COVID 19 pandemic (Aucejo et al., 2020). There exists an association between satisfaction and access and use of online learning. Students' satisfaction level is also influenced by residence, prior knowledge of online learning, and family or friend involvement in online learning (Qazi et al., 2020).

Kapasia et al. (2020) emphasise that college students from marginalised sections in west Bengal face numerous difficulties in learning during the pandemic, and deliberate measures are needed to create an efficient education system that gives equal learning chances for all the students during this pandemic period. According to Kundu and Bej (2020), Indian students are neither ready nor satisfied with the shift towards online learning. Students are fearful and hesitant about this sudden change and face all sorts of challenges. Students consider this online shift a temporary adjustment because of the lack of possible alternatives in this pandemic situation. By analysing the data collected from the students of India's north-eastern states, Debbarma & Durai (2020) revealed that several factors contribute to educational disruption among students. Those factors need to be adequately assessed to improve students learning quality. We do not have a clear picture of the issues related to the readiness, design and effectiveness of online learning, especially in a developing country like India, where there is a lot of technical constraints such as the availability of suitable device and bandwidth poses a significant challenge (Muthuprasad et al., 2020).

Azubuike, Adegboye & Quadri (2020) asserts that the digital divide and social and cultural replication of education inequality persist in Nigeria, especially during COVID 19 lockdown phase. There is a significant difference in access to online learning resources among government and private school students. A large proportion of school students may be unable to study at all during COVID 19 due to inadequate remote learning opportunities. Reimer et al. (2020) assess the inequality in students reading behaviour during the pandemic in Denmark. The results indicate that students' online reading behaviour considerably increased due to the COVID 19 lockdown. There is a socio-economic disparity in students' reading behaviour, and reading behaviour inequality is increased exclusively during the lockdown, where schools conducted their classes online. The students, teachers, families, school administration, and society require significant adjustments to overcome this quick, unforeseen digital evolution of children's primary education (Iivsri, Sharma & Olkkonen, 2020). COVID 19 outbreak resulted in a transition to online pedagogy that creates benefits, challenges, and inequalities, especially in a developing country (Oyedotun, 2020). Handel et al. (2020) say that educators and policymakers need to support higher education students more to handle emergency remote learning challenges more effectively. "There is a significant gap between the government's policy aspirations and the implementation of these online education policies at the fundamental level" (Charurvedi, Vishwakarma & Singh, 2020).

Methodology

A survey was conducted using a questionnaire instrument developed to understand and analyse the acceptance of online learning during the COVID 19 Pandemic. The study was carried out in the rural fishermen community in Calicut, Kerala, India. The questionnaire was bilingual (English, Malayalam) since some respondents were more comfortable in their native language than English and carefully drafted using simple words since they were less than 16 years.

Participants

The target population was high school students belonging to the rural fishermen community in Chaliyam, Calicut, Kerala. There are around 350 high school students in that community. A total of 130 questionnaires were distributed by applying the purposive sampling method and received back 105 questionnaires duly filled in by the

respondents. The questionnaires were self-administered and personally delivered. Of the 105 participants, 62.86 % of students were from class 10; 20.95 % and 13.33 % were from classes 9 and 8 simultaneously, and more than half of the respondents were female students (56.19 %). All the participants of this study were aged between 12 to 16 years.

Data Analysis and Results

Data was analysed based on the objectives of the study and represented in tables and figures.

Knowledge about COVID 19

Table 1 represents the time, and the medium respondents first heard about COVID 19 Pandemic. More than 35 % of students knew about COVID 19 from December 2019 onwards. It is clear from table 1 that more than 80 % of the students knew about COVID 19 before it was declared a pandemic by WHO in March 2020. The source of their information was mainly social media (43.81 %), television (33.33 %) and newspapers (23.81 %).

Table 1. Knowledge about COVID 19

Knowledge about COVID 19	Response	Frequency	Percentage
First time heard about COVID 19	Dec-19	38	36.19
	Jan-20	26	24.76
	Feb-20	24	22.86
	Mar-20	17	16.19
Medium through which knew about COVID 19	News paper	25	23.81
	Television	35	33.33
	Social media	46	43.81
	Radio	1	0.95
	Others	3	2.86

*The total is higher than the population as the question is multi optional.

Learning disruption and knowledge about online learning

As indicated in Table 2, Around 88 % of the respondents felt that COVID 19 pandemic affected their learning process. Less than 30 % of students knew about online learning before the outbreak of COVID 19, and only around 15 % of them used online learning tools before COVID 19. Table 2.1 represents the online learning tools they knew before COVID 19 outbreak. 9.52 % of students attended online classes and used digital textbooks (6.67%) before the pandemic.

Table 2. Learning disruption and online learning knowledge

Digital Learning	Response	Frequency	Percentage
Did COVID 19 affected your learning	yes	92	87.62
	no	13	12.38
Knew about online learning before COVID 19	yes	30	28.57
	no	75	71.43
*Used online learning tools before COVID 19	yes	16	15.24
	no	88	84.76

*The total is lower than the population as the question is not answered by a respondent.

Table 2.1. Use of online learning tools

online learning tools used before COVID 19	Frequency	Percentage
Video conference	4	3.81
Digital textbooks	7	6.67
Online classes	10	9.52
Blog	2	1.90
Digital library	1	0.95

Online learning experience and academic status during COVID 19 lock down

The respondents were asked numerous questions to identify the online learning experience and their academic status during the COVID 19 lockdown. Such as the learning methods, syllabus completion, evaluation techniques, exam conduction, the online class attended per week and devices used to participate in online learning. From figure 1, it is evident that students are mainly relying on the VICTERS channel (76.19%) for learning which provides only recorded classes with zero interaction, followed by WhatsApp/Telegram groups (57.14%) and YouTube (49.52%). About 40 % of respondents (Table 3) say that less than 50 % of the syllabus was completed during this lockdown period, and teachers mainly relied on the online exam to evaluate the student's performance (86.67%). It was also found that 40 % of students attended online classes 4 to 8 times a week (table 4), and 22.86 % attended less than 4 hours/ week. About 75 % of the students used a smartphone to participate in online classes and other online learning techniques.

Figure 1. learning methods

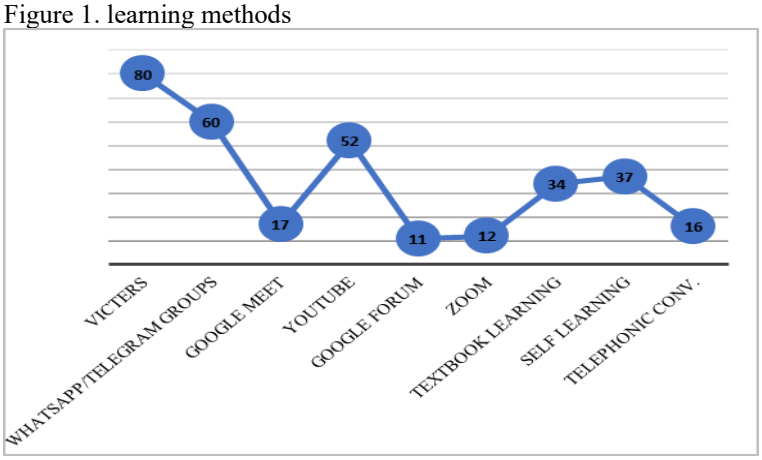


Table 3. Syllabus completion and evaluation techniques

Completion of Syllabus and Evaluation	Response	Frequency	Percentage
Syllabus completed	100	4	3.81
	75% more	26	24.76
	50% less	42	40.00
	25% less	17	16.19
	only exam conducted	7	6.67
	No response	9	8.57
***Evaluation techniques**	online exam	91	86.67
	online assignment	3	2.86
	online seminar	5	4.76
	video conference	4	3.81
	no response	9	8.57

*The total is higher than the population as the question is multi optional.

Table 4. Classes attended and devices used

Classes attended and devices used	Response	Frequency	Percentage
Online classes attended per week	12 to 15	8	7.62
	8 to 12	23	21.90
	4 to 8	42	40.00
	less than 4	24	22.86
	no response	8	7.62
***Devices used attend online classes and other techniques**	Pc/laptop	3	2.86
	Smartphone	79	75.24
	Tablet	1	0.95
	Television	35	33.33

*The total is higher than the population as the question is multi optional.

Online learning impact in respondents

Some questions were asked to understand the participants' online learning impact, including preference, self-learning ability, online learning effectiveness, and participants' satisfaction level. It is apparent from figure 2 that around 75 % of the respondents prefer face-to-face learning, and approximately 14 % of the respondents prefer online learning over face-to-face learning, while some students prefer (4.76 %) mixed methods over these two. Of the 101 who responded to the question, 68 respondents said online learning does not improve their self-learning ability. Students' satisfaction levels and the effectiveness of online learning were analyzed using the Likert scale. Table 5 shows that only a small number of respondents found online learning very effective (5.71%) during the lockdown period. Around 24 % of the students found online learning effective. In figure 3, it is evident that only a few students (9.52%) are fully satisfied. In contrast, most respondents point out that they are neither satisfied nor dissatisfied (37.14%) with the online learning facilities available during the pandemic.

Figure 2. Learning preference

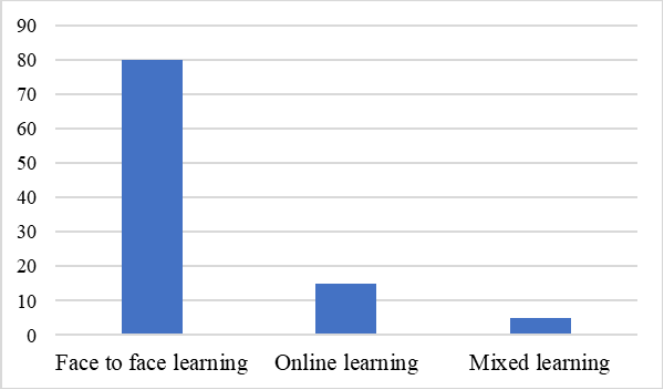
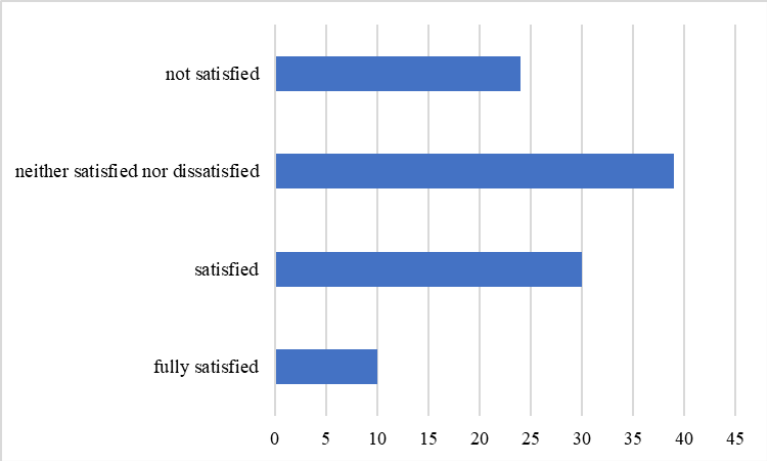


Table 5. Effectiveness of online learning

online Learning	Response	Frequency	Percentage
Effectiveness of online learning	Very effective	6	5.71
	Effective	45	42.86
	Moderately effective	21	20.00
	Not effective	25	23.81
	No response	8	7.62

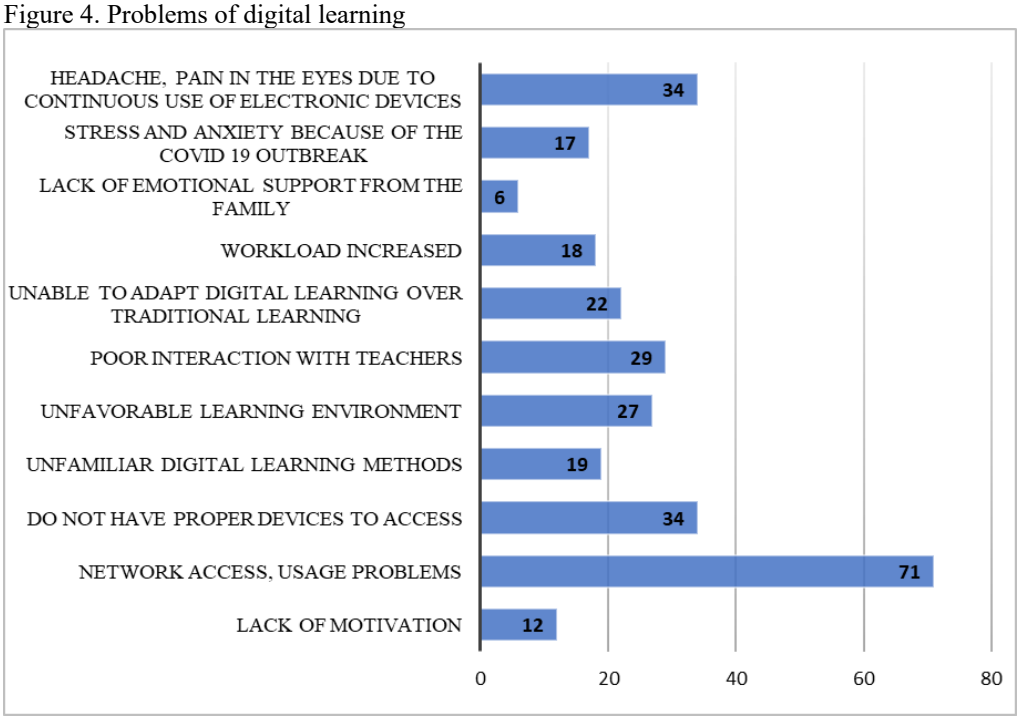
Figure 3. Satisfaction of online learning



Problems related to digital learning during COVID 19 lockdown

A query was asked to determine the respondents' difficulties while using the online learning facilities during COVID 10 lockdown. The data in Figure 4 shows that students faced various problems while using online learning facilities. Network access & Usage Problems (67.62%) are the most common among them; followed by health problems because of the continuous use of electrical devices (32.38%), absence of proper devices to access (32.38%), Poor interaction with the teachers (27.62%), unfavourable learning environment (25.71%), unable to adapt online learning over traditional learning (20.95%) etcetera.

Figure 4. Problems of digital learning

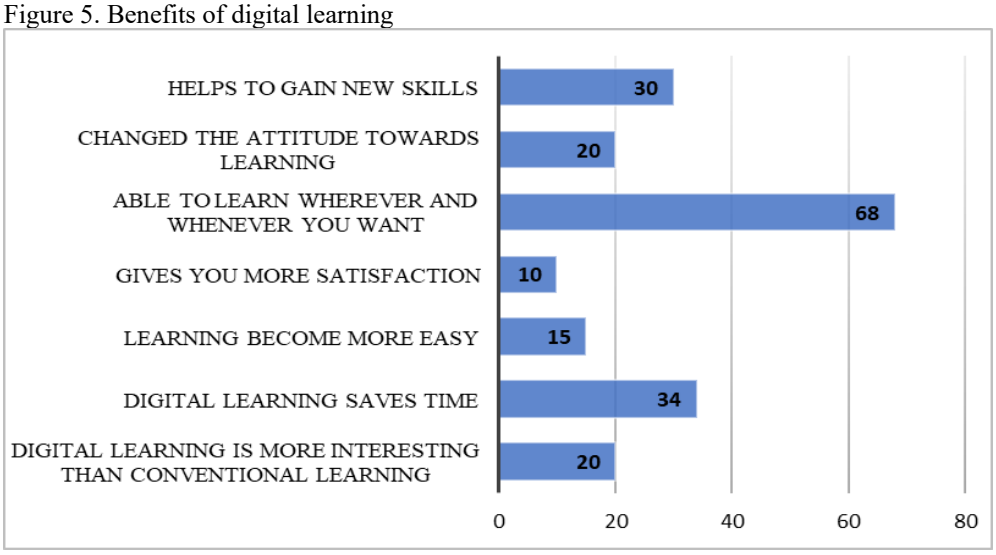


Benefits of Digital learning

When the participants were asked about the benefits of online learning, the majority commented that now they can learn wherever and whenever they want (64.76%). According to the respondents, online learning also saves their time (32.38%) and helps them to gain new skills (28.57%). Online learning also changed their attitude towards learning (19.05%), which is more interesting than conventional learning (19.05%).

Only a few respondents gave suggestions in the questionnaire, and they stated that it would be better if the schools were open by obeying COVID 19 protocols. They also commented that online learning does not give complete satisfaction and will never be able to replace the traditional method of learning.

Figure 5. Benefits of digital learning



Discussion

This study set out to evaluate the acceptance of online learning during COVID 19 by the school students from the fishermen community in Kerala. The study revealed that over 35% of the students knew about COVID 19 pandemic in December 2019. The majority of the students were aware of COVID 19 before being declared a pandemic by WHO. Interestingly, most students knew about the pandemic through social media, which shows the

social media influence on them. This finding corroborates the study by Kapasia et al. (2020), which shows students' high social media influence.

The majority of students' learning process was affected during the COVID 19 Pandemic. Only a few were aware of online learning before the pandemic; over 70% of students knew about online learning only after the outbreak of COVID 19. Only 16% of the students used online learning tools before the COVID19 outbreak, which shows the poor adoption of online learning among students before COVID 19. A minimal section of the respondents attended online classes and used digital textbooks for learning purposes before the strike of COVID 19.

We also asked questions to understand the academic status and online learning experience during COVID 19. Their response revealed that most students rely on the VICTERS channel for learning during the pandemic. VICTERS is an educational television channel by the government of Kerala. However, it only provides recorded classes with zero interaction, making it less efficient and ineffective. This finding shows students' lack of interest in interactive online learning methods. Students also use social networking sites such as WhatsApp, Telegram, and YouTube for learning, confirming the respondents' social media dependency. Nearly 40% of the students say that their syllabus finished less than 50%, and teachers mainly used online exams to evaluate their performance. The number of online classes attended by the majority of the students per week is only 4 to 8, showing their lack of interest in online learning. As seen in the study by (Muthuprasad et al.,2020), most respondents use smartphones to access online classes. Three-fourths of the students prefer face-to-face learning, and 68 students stated that online learning did not improve their self-learning ability which again proves the low interest among students in online learning. The Likert scale was used to trace the satisfaction and effectiveness of online learning. It is clear from the result that only a small number of students found online learning very effective. Most of them commented that they are neither satisfied nor dissatisfied with the availability of online learning facilities, which again shows, their disinterest in online learning.

During the COVID19 lockdown, students faced various problems while learning via digital technology. The more significant part of the students faced network access & usage problems, and they also faced health issues such as headaches and pain in the eyes due to the constant use of electronic devices. Many of them struggled because of the lack of proper devices to access online learning. They also faced difficulties because of the low interaction with their educators, unfavourable learning environments, and the inability to adapt online learning to traditional methods. From the response we got from the students, we also found out that online learning makes it possible to learn where ever and whenever they want, it saves much time for the students. It changed their attitude towards learning by making learning more exciting than traditional methods. Online learning has benefits and advantages over traditional learning, but mostly those benefits are overshadowed by the users' problems and difficulties. Educators must enhance the online learning experience by adequately assessing the student's learning quality and helping students be motivated to continue online learning.

Conclusion

The study's main aim was to analyse the online learning acceptance among students from the fishermen community, a marginalised community in Kerala where the learning environments are not ideal. The study concluded that students are not keen on online learning despite substantial social media influence. Online learning was a new idea to most students; it took them by surprise, giving them lots of new learning techniques and opportunities they had never heard of before. However, somehow it also comes up with lots of problems and barriers. The major issues they face are the lack of proper network access and devices. These problems can be resolved by giving them adequate internet facilities and devices and improving their interest in online learning. Suitable learning environments are equally important as the content we offer. It is of no use if the students lack proper learning conditions. We must ensure that barriers to online learning do not overshadow the advantages and benefits of online learning. Appropriate initiatives need to be taken by the Government to ensure the impartial delivery of education for every student and empower them to manage and master their digital future.

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REFLECTIONS OF UNIVERSITY STUDENTS TOWARDS ONLINE LEARNING: AN ANALYSIS

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ABSTRACT
Online learning is a kind of internet-based distance learning. The word e-learning can be exchanged as online learning. Online learning includes online classes, exams, game-based competitions, certification training etc. University students can use online learning to engage in digital programming and learning process at any time and they can easily connect to the web platform from home. The study examines the reflections of university students towards online learning.The study also assesses the reflections of university students towards teachers' skills and competencies. The present study follows descriptive survey research. This study is conducted in State University, Central University and Deemed University of West Bengal. Researchers have taken 91 social sciences students as sample of the study by using purposive sampling method. Online questionnaire is used in order to collect information from university students for the study. The study found that female students have better reflections towards online learning than male students. 56% of the university students have positive reflections towards teachers' skills and competencies regarding online classes. Only 44% university students have positive reflections towards online learning assessment.
Keywords: Online Learning, Reflections, University Students.

INTRODUCTION

Online learning has increasingly entered the world's education systems. High-tech technologies are used for online learning. The online curriculum preparation is a joint activity, with the teacher working with a team of individuals such as technicians and others who are interested with the online course. Students must be much more self-motivated, self-managed and self-disciplined during online learning. They have built their own framework so that they can frequently "attend online lectures", manage assignments and use the platform to fulfill their online activities (Mongan-Rallis, 2006).Online learning is a specific term. Computer-assisted curriculum and technological collaboration transform the pedagogical environment so that more and more university students can engage in online education. To meet the demands of students all across the world, universities are now working to improve the quality of web-based education and to adopt it as quickly as possible. Virtual instruction is a very successful way to consistently offer lessons. The learning resources are available everywhere and at any time because of their convenience and flexibility. It contributes to active and autonomous learning.Online learning has few benefits, such as: saves time, study from anywhere in the world, less boring and less repetitive, study materials readily available, adjustable schedules, etc. Despite this online learning has variety of other negative drawbacks, such as: Internet access challenges, requires a strong understanding of technology, lacks face to face comfort, not appropriate for each and every topic and not ideal for practical subjects or health issues.

RATIONALE OF THE STUDY

The description 'learning that takes place partially and completely through the internet' can be described as 'Online Learning' (U. S. Education Department, 2010). Online learning is attractive to a variety of students and is

increasingly prevalent in environments such as primary schools, secondary schools and post-secondary education. Some studies related to online learning are given below:

Loeb (2020) found that students have more distractions and less supervision in the online setting which can reduce the motivation of the students. The teacher allows students to engage in simulated dialogue, gives assignments and tracks students together. Zhu, Zhang & Yates (2020) revealed that online learning among university students was largely optimistic and increased when they finished their courses, and their continued aim to learn online through online social interactions was significantly expected. Peytcheva-Forsyth, Bradley, & Bradley (2018) highlighted that students at the university level had positive online learning experiences, and they were particularly pleased with the educational materials' clarity and arrangement. Halliday (2018) found that quality lectures of the university teachers through technology and individual attention of digital learners together can perform as crucial academic support for the development of higher education. Ullah et al (2017) has revealed that slow and inadequate web facilities, with less knowledge on online learning among students, frequently provide negative approaches to online learning. Sun & Chen, (2016) revealed that the promotion of social participation, engagement and cooperation between teachers, students, teacher-student can be happened through online learning. Fedynich et al (2015) reported that 90 percent of all female participants got teachers' help in online learning always or sometimes. Yuan & Kim (2014) revealed that online learning can enhance engagement between teachers and students and peer-students which helps to increase the performance of students. Bell & Fedeman (2013) indicated that online learning programmes improve students-teachers' engagement and increase students' contact. Tamajian, Chizari & Rad (2012) revealed that psychological readiness of university students towards online learning was higher, but their technical knowledge about online learning was lower. Kiran (2011) highlighted that adult learners can get maximum flexibility to learn through technology which is helpful for the improvement of higher education.

From the above discussion, it is clear that learners have both positive and negative reflections towards online learning. These contradictions motivate researchers to conduct the present study.

RESEARCH QUESTION

1. What are the reflections of university students towards online learning in response to teachers' skills and competencies and assessment system?

OBJECTIVES

1. To examine the reflections of university students towards online learning.
2. To assess the reflections of university students towards teachers' skills and competencies
3. To analyze the reflections of university students towards online assessment.

HYPOTHESIS

1. There is no significant difference between male and female university students in reflections towards online learning.

METHODOLOGY

Design: The present study used online descriptive survey method for data collection. The investigators had used quantitative research design to analyze the data.

Participants: The study was carried out among university students pursuing higher education at the State University, Central University, and Deemed University of West Bengal. Researchers had taken 91 social sciences students (49 female and 42 male) as sample of the study by using purposive sampling method.

Tool: The investigators used self made online questionnaire as tool in this study.

ANALYSIS AND INTERPRETATION

The investigators had formulated a hypothesis i.e. there is no significant difference between male and female university students in reflections towards online learning.

Table-1: Reflections of Male and Female Students towards Online Learning

Gender	Reflections towards Online Learning			Chi-Square (χ^2) (Calculated value)	Chi-Square (χ^2) (Tabular value)	df	Sig.
	Positive	Negative	Mixed				
Male	658	412	106	21.646	0.01 level= 9.21	2	.000*
Female	781	399	195				

In order to test hypothesis the investigators had used Chi-Square statistical method. Table-1 indicates that calculated value (21.646) is higher than tabular value (9.21) at 0.01 significance level. That means here null hypothesis is rejected at 0.01 level. Actually this hypothesis is significant at 0.01 level. So it can be said that female university students have better reflections towards online learning than male university students.

The objective of the study was to examine the reflections of university students towards online learning. For this the researchers had used self made online questionnaire.

Table-2: Online Platforms Used by University Students for Online Learning

Online Platforms	Frequency	Percentage (%)
Google Meet	66	72
Skype	09	10
Zoom	07	8
Webex Meet	02	2
Others	07	8
Total	91	100

Table-2 indicates that majority (72%) of the university students used Google Meet for online learning. 10% university students used Skype for online learning, 8% university students used Zoom foronline learning and 2% university students used Webex Meet foronline learning.

Table-3: Availability of Devices for Online Learning

Availability of Resources	Frequency	Percentage (%)
Own Mobile	51	56
Own Laptop	12	13
Own Computer	05	6
Own Tablet	02	2
Family Member's Mobile	21	23
Total	91	100

Table-3 indicates that majority (56%) of the university students used their own mobile for online learning. 13% university students used their own laptop for online learning, 6% university students used their own computer for online learning and 2% university students used their own tablet for online learning.Whereas 23% university students used their family member's mobile for online learning.

Table-4: Reflections of University Students towards Teachers' Skills and Competencies regarding Online Classes

Reflections	Frequency	Percentage (%)
Positive	51	56
Negative	29	32
Mixed	11	12
Total	91	100

Table-4 indicates that majority (56%) of the university students have positive reflections towards teachers' skills and competencies regarding online classes. 32% university students have negative reflections towards teachers' skills and competencies regarding online classes. 12% university students have mixed reflections (both positive and negative reflections) towards teachers' skills and competencies regarding online classes.

Table-5: Reflections of University Students towards Online Learning Assessment

Reflections	Frequency	Percentage (%)
Positive	41	44
Negative	33	37
Mixed	17	19
Total	91	100

Table-5 indicates that majority (44%) of the university students have positive reflections towards online learning assessment. 37% university students have negative reflections towards online learning assessment.19% university students have mixed reflections (both positive and negative reflections) towards online learning assessment.

FINDINGS

- Female university students have better reflections towards online learning than male university students.
- 72% of the university students used Google Meet for online learning.
- Majority (56%) of the university students used their own mobile for online learning. Whereas 23% university students used their family member's mobile for online learning.
- 56% of the university students have positive reflections towards teachers' skills and competencies regarding online classes.
- Only 44% university students have positive reflections towards online learning assessment.

EDUCATIONAL IMPLICATIONS

- Male university students need to inspire for online learning.
- Teachers and students of university must have to increase knowledge about different online platforms for online learning.
- As the study found 23% university students did not have their own electronic gadgets for online learning, university or government must have to take initiative regarding this problem.
- As the study found 32% university students have negative reflections towards teachers' skills and competencies regarding online classes, University teachers must have to develop their technological skills and competencies. Government can organize training programme for university teachers to develop their technological skills and competencies.
- As the study found 37% university students have negative reflections towards online learning assessment, University or government must have to take necessary steps to improve online learning assessment procedure.
- The government should organize seminars, workshops, and colloquiums to teach students and teachers how to use online learning in real-world situations.
- This research encourages instructional designers, instructors, and institutions to improve the quality of present and future online education.

DISCUSSION

There are some studies (Wiesenberg, & Stacey, 2005; McSporran, & Young, 2001) who revealed that female students have better reflections towards online learning than male students. The present study also found that female university students have better reflections towards online learning than male university students. Benta et al (2014) highlighted that 96% students had participated in online learning through different platforms at higher education level. The present study also found that majority of the university students have participated in online learning through different platforms. NCERT (2020) reported that 27% students did not have electronic devices for online learning. The present study revealed that 23% university students did not have their own electronic gadgets for online learning; they used their family member's mobile for online learning. Queiroz, & Mustaro, (2003) suggested that teachers need to improve their technological skills and competencies to achieve the pedagogical skills. The present study also recommended that government can organize training programme for university teachers to develop their technological skills and competencies. Bali & Liu (2018) found that majority students were satisfied with online learning assessment procedure. Although the present study found that only 44% university students have positive reflections towards online learning assessment.

CONCLUSION

From the above discussion it can be concluded that female students have better reflection towards online learning. University students used their own mobile phone, laptop, computer for online learning.Some students have negative reflection towards online learning assessment and teachers' skills and competencies regarding online classes. However, online learning can be defined as an innovative approach to provide access to everyone,

anywhere, by leveraging the attributes and resources of various digital technologies, as well as other forms of learning media that are well-suited to open, flexible, and distributed learning environments, in order to create a well-conceived, interactive, and user-friendly environment for learners (Khan 2005). Learner's effective reflection towards the online programme is a crucial input for successful accomplishment of online learning and it can be achieved if teachers are technologically competent.

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STUDENTS' ATTITUDE AND INTENTIONS TOWARDS ONLINE LEARNING IN HIGHER EDUCATION: EXAMINING THE ROLE OF INDIVIDUAL AND SYSTEM CHARACTERISTICS

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ABSTRACT
This study is aimed at examining the factors predicting the university students' attitudes and intentions to use online learning system with the intervention of individual and system-related characteristics as external factors.
We used 506 responses from undergraduate and post-graduate students enrolled in public and private universities in the state of Sikkim (India). The study adopted the Technology Acceptance Model (TAM) as a theoretical foundation, and we extended it with external individual and system-specific characteristics. We employed Partial Least Square Structural Equation Modelling (PLS-SEM) to assess the relationship between the external exogenous individual (computer self-efficacy, perceived enjoyment, and computer playfulness) and systems (content quality, information quality, and system quality) characteristics with the endogenous constructs.
The theoretical model we propose effectively explains the behavioural intention ($R^2 = 0.623$) of university students using online learning systems. The results suggest that perceived enjoyment and system quality have a significant impact on the perceived usefulness and perceived ease of use of online learning system. On the other hand, computer self-efficacy, computer playfulness among individual characteristics; and content quality & information quality characteristics of online learning system do not significantly affect the perceived use and perceived ease of use of online learning system. Further, the content quality does not affect the attitude and intentions of using an online learning system.
This study provides insightful information that will help universities and governments better prepare for the adoption of online learning in the context of higher education in developing nations like India.
Keywords: Online learning, Technology Acceptance Model, computer self-efficacy, computer playfulness, perceived enjoyment, content quality, Information quality, system quality, Higher Education

Introduction

The global spread of the COVID 19 epidemic had an impact on people's lives, but it also had an impact on students' ability to learn by using alternate methods of study, experience, or instruction. Clark & Mayer (2016) defined Online learning as "*the delivery of education in a flexible and easy way through the use of the internet to support individual learning or organizational performance goals"*. Nowadays, learning takes place in a digital environment where students and teachers are digitally connected. However, it is widely accepted that no educational strategy can match the pinnacle of formal education because it involves direct instruction from teachers. Many students today desire to study online and acquire degrees from international schools and institutions, but they are still unable to go since they live in remote places without adequate communication systems (Tarhini, Hone, & Liu, 2015). Therefore, for students who reside in remote places far from their educational institutions where they have enrolled, online learning is a choice because it saves time and energy. In fact, most universities and colleges around the world have embraced online education.

While imparting education through the online system, technology plays an important role. The technology acceptance model (henceforth TAM) proposed by (Davis, 1989) explains the determinants of accepting new technologies and has been extensively used by researchers. TAM argues that the perceived usefulness (individual's subjective belief that the use of this system can improve the performance of his work) and perceived ease of use (the extent to which an individual can easily use the system) will affect whether the user can accept and use the technology. The idea contends that two individual beliefs—namely, perceived usefulness and perceived ease of use—are influenced by system-specific and external factors to forecast one's attitude toward using technology. The behavioural intention to use a certain technology is influenced by attitude (Salloum, Qasim Mohammad Alhamad, Al-Emran, Abdel Monem, & Shaalan, 2019). However, recent research has revealed that online learning is a complex process comprising many components, including social factors (Schepers & Wetzels, 2007; Tarhini, Hone, & Liu, 2014, 2015), individual factors (Liaw & Huang, 2011; Sun & Zhang, 2006), facilitating conditions (Ejdys, 2021; Sun & Zhang, 2006; Tarhini et al., 2015) behavioural and cultural factors (Tarhini, Hone, Liu, & Tarhini, 2017). Understanding the development of online learning and application of information technology depends on such crucial factors (Kim & Moore, 2005).

Online learning is said to have many benefits, such as lower educational expenses, flexible access to instructional resources, response to space constraints, ease of access to content, straightforward team collaboration, and timely

mutual discussions (Anderson, 2008; Bacow, Bowen, Guthrie, Long, & Lack, 2012; Dong, Cao, & Li, 2020; Means, Toyama, Murphy, Bakia, & Jones, 2009; Moore, Dickson-Deane, & Galyen, 2011; Surani & Hamidah, 2020; Xhaferi & Xhaferi, 2020). Due to the physical infrastructure present in developed nations, these advantages might be further expanded. On the other hand, prior research has indicated that online learning systems have their own unique set of issues, such as the high cost of setting up the system, internet access, and technological difficulties (Siti et al., 2021; Turnbull, Chugh, & Luck, 2021). In addition, the uncomfortable environment at home reduces children' desire for learning. Additionally, a system of online learning demands tight cooperation between teachers and students. Almaiah, Al-Khasawneh, and Althunibat (2020) noted a few obstacles to the adoption of online learning systems, such as a lack of funding, a lack of trust, managerial problems, and technological problems.

However, the adoption of online learning systems in developing nations has either partially or completely failed; their use is still ongoing and is seen as being below a satisfactory level (Tarhini et al., 2017). This alludes to a lack of knowledge of the elements influencing its adoption (Salloum et al., 2019). Additionally, most of earlier studies have concentrated on analysing the effects of certain factors on the adoption of online learning. Those variables typically vary from study to study depending on the participants and context. We employ individual (related to perception and abilities of the students) and system (related to the quality of online learning system) characteristics in the existing Technology Acceptance Model. There are a few studies exploring the influence of system and individual variables on university students' acceptance of online learning in India's higher education sector, as online learning was not widely used in the higher education system prior to the epidemic. Therefore, it is thought that a thorough theoretical model is required to comprehend the variables influencing the acceptance of online learning when human and system characteristics are involved in the Technology Acceptance Model. With this background, this paper is organized as follows: section 1 presents the introductory background to the motives of the study followed by the literature review in section 2. The research framework and hypotheses development in presented in section 3. Section 4 highlights the research methodology used for the study followed by the results in section 5. A detailed discussion and implications of the study is presented by section 6 and finally the conclusion and scope for further research in presented in section 7.

Literature Review

Online learning requires the use of various forms of technologies, internet connectivity, online platforms, and media. Like any other technology-based activity, online learning also possesses some pros and cons. In terms of benefits, online learning can foster a sense of community among students, develop independent learners, foster strong relationships between students and instructors, and increase problem-solving abilities. In terms of flaws, online learning makes it harder for students and instructors to keep up with their workload (Schroeder, Minocha, & Schneider, 2010).

The Technology Acceptance Model (TAM) and its refined versions proposed by (Davis, 1989; Davis, Bagozzi, & Warshaw, 1989; Davis & Venkatesh, 1996) have been employed in various research studies concerned with the user acceptance of technology, and therefore, It has grown in importance as having a strong capacity for predicting how students will use technology in the classroom (Chang, Hajiyev, & Su, 2017; Farahat, 2012; Hu, Chau, Sheng, & Tam, 1999; Lai, 2017; Md Lazim, Ismail, & Tazilah, 2021; Siti et al., 2021). External and system-specific factors influence two personal beliefs i.e. perceived usefulness (henceforth PU) and perceived ease of use (henceforth PEU) to predict the attitude toward adopting a technology, according to the theory (Davis, 1989). The behavioural intention to use a certain technology is influenced by attitude alone. The definition of perceived ease of use is "*the degree to which a person feels that utilizing a specific technology will be free of effort*" whereas perceived usefulness is "*the degree to which a person believes that using a particular system would improve his or her performance*"(Davis, 1989). Numerous empirical investigations of user technology adoption have employed TAM as their theoretical foundation. Technology acceptance is defined as “an individual’s psychological state concerning his or her voluntary or intended use of a particular technology”(Hu et al., 1999). A number of studies such as (Aguilera-Hermida et al., 2021; Esteban-Millat, Martínez-López, Pujol-Jover, Gázquez-Abad, & Alegret, 2018; Farahat, 2012; Md Lazim et al., 2021; Ritter, 2017; Rizun & Strzelecki, 2020; Salloum et al., 2019; Singh, Sharma, & Paliwal, 2020; Sulistiyaningsih, Tambotoh, & Tanaamah, 2014) have been conducted for examining the relationship of external factors affecting the online learning using TAM.

There are growing concerns for a systematic synthesis to provide a clearer mechanism underlying technology acceptance in higher education, even though TAM has long dominated over the last three decades in explaining the creation of individuals' technology adoption behaviours in teaching and learning contexts. Hence, the researchers have examined the effect of various external factors related to online learning on the acceptance of online learning systems. In a quantitative meta-analytical study conducted by Abdullah & Ward (2016), 152 external factors influencing technology acceptance, were found. The results showed that “Self-Efficacy, Subjective norm, Enjoyment, Computer Anxiety, and Experience” are the most used external factors of TAM. The results

showed that the best predictors of students' PEU of online learning systems are "Self-Efficacy, Enjoyment, Experience, Computer Anxiety, and Subjective Norm". The best predictor of students' PU of online learning systems is "Enjoyment, Subjective Norm, Self-Efficacy, and Experience" (Abdullah & Ward, 2016; Chang et al., 2017; Farahat, 2012; Lee, Yoon, & Lee, 2009).

Online learning is said to be influenced by the characteristics of the instructor, the teaching materials, the design of the course materials, and playfulness (Lee et al., 2009). According to Chang et al. (2017), students' perceived usefulness (PU) of online learning is favourably and significantly influenced by subjective norm, experience, and enjoyment, whereas computer anxiety has the opposite effect. The perceived ease of use (PEU) of online learning is favourably and significantly influenced by experience, enjoyment, and self-efficacy. Technology innovation significantly modifies the association between Subjective norm and PU, PU, and Behavioural intentions to use online learning. Subjective norm has a positive and significant impact on behavioural intentions to utilise online learning (Chang et al., 2017). In another study, social trust influenced PU and PEU of online learning (Alshurafat, Al Shbail, Masadeh, Dahmash, & Al-Msiedeen, 2021). Salloum et al. (2019) identified 239 external unique factors in the 120 collected studies. Only eight external variables, including computer self-efficacy, subjective norm, perceived enjoyment, system quality, information quality, content quality, accessibility, and computer playfulness, were shown to be associated with TAM in at least four of the examined studies, according to the authors.

It is argued that students' acceptance of online learning systems also varies across various Subjects/disciplines in higher education. The accounting students appreciate the use of technology and an online learning system in assessment, and their performance improved with online tests (Aisbitt & Sangster, 2005). TAM was found to be able to provide a reasonable picture of physicians' intention to employ telemedicine technology to explain physicians' decisions to accept telemedicine technology in the healthcare environment by Hu et al. (1999) in Hong Kong. PU was found to be a significant determinant of attitude and intention, but PEU was not. The students' satisfaction in business and management discipline is significantly affected by content, the level of accuracy of the system, format, ease of use, and timeliness delivery (Hastuti, Wijiyanto, Lestari, & Sumarlinda, 2020). Due to the lack of importance given to online learning in the higher education sector during pre-covid 19 years, technical issues are considered to be the most important, followed by teachers' lack of technical skills and their teaching style improperly adapted to the online environment (Coman, Țîru, Meseșan-Schmitz, Stanciu, & Bularca, 2020).

Considering the previously examined and summarised literature, it has been determined that most of earlier studies have concentrated on analysing the influence of certain elements on the adoption of online learning. Those variables typically changed based on the participants and the situation from study to study. Only a small number of studies (Salloum et al., 2019; Salloum & Shaalan, 2018) have looked at the impact of system and individual characteristics (content quality, information quality, and system quality) on students' attitudes and behavioural intentions toward accepting the online learning system. Therefore, the purpose of this study is to investigate the variables that influence university students' decision to use an online learning system.

Research Framework and Hypotheses Development

The Technology Acceptance Model was developed by Davis (1989) to explain how and when users will adopt and use new technology. This model investigates the users' attitude and intention to adopt technology with perceived use and perceived ease of use along with the intervention of external factors (Figure 1).

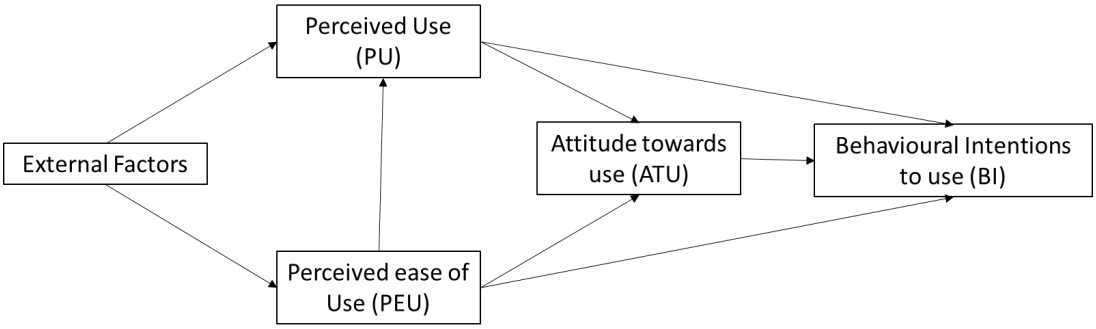

Figure 1: Technology Acceptance Model

External Factors influencing the Online learning & Hypothesis Formulation

Individual Characteristics

Computer Self-Efficacy (CSE): CSE refers to the "*individuals' beliefs about their abilities to competently use computers"* (Compeau & Higgins, 1995). Computer systems are linked to self-efficacy in this study and used as "the confidence exhibited by the users in their ability to use the online learning system". CSE plays a key role in

shaping an individual's feelings and behaviour (Compeau & Higgins, 1995). It is said that the task's likelihood of success increases with increasing efficacy expectations. Computer self-efficacy is found to have a substantial impact on the perceived usefulness and perceived ease of use of an online learning system in a variety of empirical research (Esteban-Millat et al., 2018; Mailizar, Burg, & Maulina, 2021; Park, 2009; Salloum et al., 2019; Sulistiyaningsih et al., 2014). Hence, we hypothesize the following:

H1a1: CSE has a positive effect on the PU of the online learning system.

H1a2: CSE has a positive effect on the PEU of the online learning system.

Perceived Enjoyment (PE): PE refers to the extent to which "*the activity of using a specific system is perceived to be enjoyable in its own right, aside from any performance consequences resulting from system use*" (Venkatesh, 2000). PE is a crucial factor in the adoption or acceptance of online learning. PE has been shown in earlier studies (Abdullah & Ward, 2016; Chang et al., 2017; Hastuti et al., 2020; J. J. Kim, Yoon, & Kim, 2021; Md Lazim et al., 2021; Salloum et al., 2019; Siti et al., 2021) to have a substantial effect on PEU and PU of online learning. A student is more likely to have a favourable influence on the usefulness and usability of an online learning system when they realise that working on it is enjoyable. Hence, the following hypotheses were developed:

H2a1: PE has a positive effect on the PU of the online learning system.

H2a2: PE has a positive effect on the PEU of the online learning system.

Computer Playfulness (CP): CP refers to "*the degree of cognitive spontaneity in computer interactions*" (Webster & Martocchio, 1992). The term "playfulness" is used to describe ideas such as creativity, inquiry, discovery, exploration, curiosity, and difficulties (Venkatesh, 2000). The term refers to the fundamental drive behind utilising a new system. (Venkatesh & Bala, 2008). Many studies (e.g. Aguilera-Hermida et al., 2021; Ejdys, 2021; Esteban-Millat et al., 2018; Mailizar et al., 2021; Md Lazim et al., 2021; Park, 2009; Singh et al., 2020; Surani & Hamidah, 2020; Tarhini et al., 2014) suggested that perceived computer playfulness has a close link with PEU and PU. Therefore, the following hypotheses were developed:

H3a1: CP has a positive effect on the PU of the online learning system.

H3a2: CP has a positive effect on the PEU of the online learning system.

System Characteristics

In this study, the system characteristics comprise three factors viz. content quality (CQ), information quality (IQ), and system quality (SQ).

Content Quality (CQ): CQ about online learning signifies "*the depth and frequent updates of the content*"(Vululleh, 2018). It includes formatting, readability, and grammatical accuracy of the learning material received by the students from their teachers through the online learning system. Previous studies have shown that content quality has a considerable effect on PU (Sami Saeed Binyamin, Rutter, & Smith, 2019; Cheng, 2011; Mailizar et al., 2021; Park, 2009; Salloum et al., 2019; Salloum & Shaalan, 2018; Venkatesh & Bala, 2008) and there is a positive relationship between CQ and PEU of online learning system (Baki, Birgoren, & Aktepe, 2018; Cheng, 2011; Coman et al., 2020; Esteban-Millat et al., 2018; J. J. Kim et al., 2021; Lee et al., 2009; Md Lazim et al., 2021; Ritter, 2017; Saleem & Saleem, 2021; Schepers & Wetzels, 2007). As a result, the following hypotheses were developed:

H4b1: CQ has a positive effect on the PU of the online learning system.

H4b2: CQ has a positive effect on the PEU of the online learning system.

Information Quality (IQ): IQ refers to "*using online learning for seeking information that may be important for learning and which is updated, to make it easier for the learner to comprehend it*"(Cho, Cheng, & Lai, 2009). Information quality also refers to "the degree to which the user receives complete, precise and well-timed information over the electronic service interface" (Liu, Chen, Sun, Wible, & Kuo, 2010). The perceived ease of use was found to be significantly impacted by the quality of the information in earlier studies on online learning that extended the TAM (Abdullah & Ward, 2016; Almaiah et al., 2020; Alshurafat et al., 2021; Baki et al., 2018; Coman et al., 2020; Siti et al., 2021). Additionally, earlier studies discovered a correlation between IQ and the belief that an online learning system is effective. (Lai, 2017; Salloum et al., 2019; Salloum & Shaalan, 2018; Shah, Bhatti, Iftikhar, Qureshi, & Zaman, 2013). As a result, the following hypotheses were developed:

H5b1: IQ has a positive effect on the PU of the online learning system.

H5b2: IQ has a positive effect on the PEU of the online learning system.

System Quality (SQ):_SQ in this study refers to the "*quality characteristics such as usability, reliability, availability, and adaptability associated with online learning"*. SQ is critical to the adoption and use of an online learning system, according to prior studies. Previous studies discovered that SQ has a favourable effect on how simple people perceive online learning to be (Cheng, 2011; Park, 2009; Rym, Olfa, & Mélika, 2013; Shah et al., 2013; Venkatesh & Bala, 2008). Additionally, it was discovered that SQ has a favourable impact on how beneficial people view online learning (Mahmodi, 2017; Park, 2009). As a result, the following hypotheses were developed:

H6b1: SQ has a positive effect on the PU of the online learning system.

H6b2: SQ has a positive effect on the PEU of the online learning system.

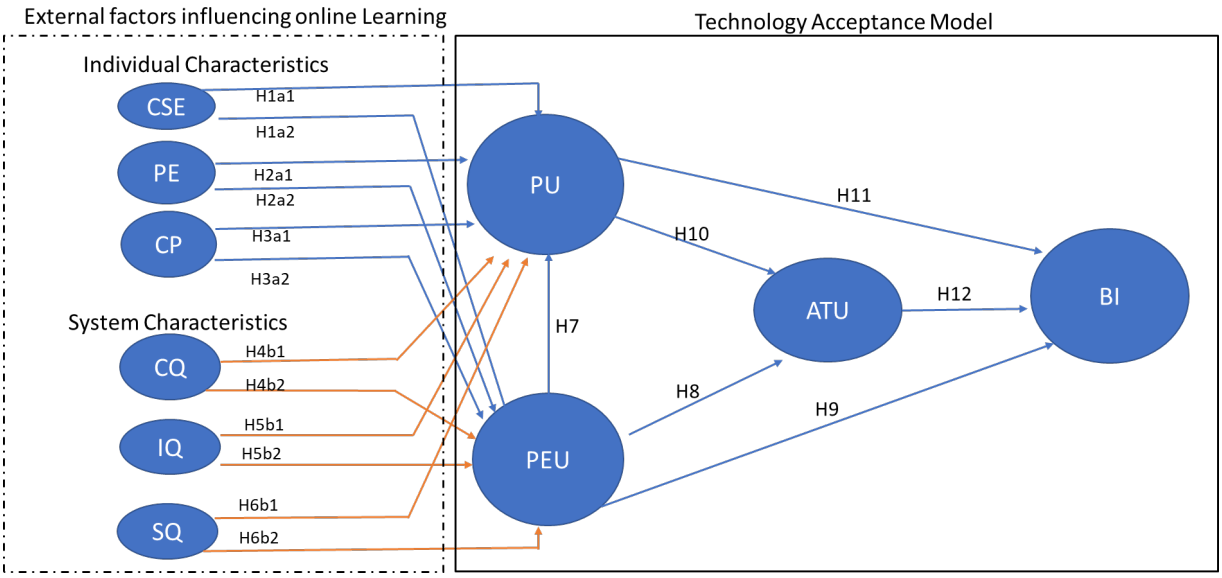

Figure 2: Research Model with the intervention of individual and system Characteristics

Technology Acceptance Model Constructs

The Technology Acceptance Model (Davis, 1989), which claims that perceived ease of use and perceived usefulness are two crucial factors that impact a person's intention to adopt new technology, is one of the most significant models of technology acceptance. The following is a detailed explanation of the hypothetical impact of the users' opinions based on the extended TAM (Figure 1):

Perceived Ease of Use (PEU): In the context of online learning, the PEU refers to "the degree to which a student perceives that the use of an online learning system would not be complicated" (Lin, Chen, & Fang, 2011). Previous studies confirmed that PEU significantly affects perceived usefulness (Abdullah & Ward, 2016; Sami S. Binyamin, Rutter, & Smith, 2019; Chang et al., 2017). It has been shown in several studies (e.g. Alharbi & Drew, 2014; J. J. Kim et al., 2021; Lai, 2017; Mailizar et al., 2021) carried out in the past that the PEU has a positive relationship with behavioural intention to use (BI), directly as well as indirectly (Alharbi & Drew, 2014). In addition, previous research indicated that there is a positive relationship between PEU and the attitudes toward using (ATU) online learning system (Hastuti et al., 2020; Lai, 2017; Md Lazim et al., 2021; Rizun & Strzelecki, 2020; Siti et al., 2021). Thus, based on the literature support on the relationship of PEU with PU, BI, and ATU, we hypothesize the following:

H7: PEU has a positive effect on the PU of the online learning system.

H8: PEU has a positive effect on the attitude towards the use (ATU) of the online learning system.

H9: PEU has a positive effect on the behavioural intention to use (BI) the online learning system

Perceived Usefulness (PU): According to Lin et al. (2011), PU refers to "the degree to which individuals believe that the use of online learning system support and improves their learning objectives". Students will only adopt the online learning system when they believe that using it would enhance their academic achievement. The idea is that an individual's positive attitude would be viewed as being higher the more valuable they believed the online learning system to be. The association between PU and the mindset for utilising online learning methods has substantial empirical backing (Hastuti et al., 2020; Lai, 2017; Md Lazim et al., 2021; Rizun & Strzelecki, 2020; Singh et al., 2020; Siti et al., 2021; Wong, 2016). Hence, the following hypothesis is developed:

H10: PU has a positive effect on the attitude toward using (ATU) the online learning system.

Previous online learning studies (e.g. (Alharbi & Drew, 2014; J. J. Kim et al., 2021; Lai, 2017; Mailizar et al., 2021) indicated that there is a significant positive correlation between PU and the behavioural intention to use the online learning system (BI). Hence, the following hypothesis is formulated:

H11: PU has a positive effect on the behavioural intention to use (BI) the online learning system.

Attitude Towards Use (ATU): Attitude refers to "the degree to which a person has a positive or negative feeling towards online learning systems"(Hussein, 2017). Numerous research have demonstrated that behaviour intention is directly impacted by attitude (Alharbi & Drew, 2014; Deshpande, Bhattacharya, & Yammiyavar, 2012; Lai, 2017; Mailizar et al., 2021). Hence, the following hypothesis is formulated:

H12: Attitude towards use (ATU) has a positive effect on the behavioural intention to use (BI) the online learning system.

Behavioural Intention (BI): Behavioural Intention (BI) is "*a cognitive process of individuals' readiness to perform specific behaviour and is an immediate antecedent of usage behaviour*" (Abbasi et al., 2011). Behavioural intention (BI) is a term used to describe the learners' intention to utilise online learning systems, and it includes continued use in the present and the future (Liao & Lu, 2008). A system's or technology's success is mostly dependent on BI (Abdullah & Ward, 2016; Coman et al., 2020; Lee et al., 2009; Md Lazim et al., 2021; Tarhini et al., 2015).

Research Methodology

Research Design

We used a quantitative research design using a cross-sectional survey in this current study. This method was chosen because it is thought to be capable of producing reliable, valid, and generalizable results (Fraenkel et al., 2011).

Data Collection

Students enrolled in Sikkim's public and private universities, including Sikkim University, Sikkim Manipal University, Shri Ramasamy Memorial (SRM) University, ICFAI University, and Sikkim Professional University, make up the study's target group. Self-administrated surveys were given out to the students between the months of January through March 2021 in order to collect the data. The information from the undergraduate, graduate, and PhD students was gathered using an online survey including questionnaires. The convenience of an online survey and its compatibility with various devices made it the chosen method (Fraenkel, Wallen, & Hyun, 2011). During the pandemic, the students were approached through a message on WhatsApp to be shared among the students' group with a link to the questionnaire. The questionnaire survey remained open for two-three months. A total of 534 responses were received and the data analysis was performed on 506 valid cases after data cleaning. The details of the responses received are given in Table 1.

Table 1: Participants' Details

Variables	Categories	Count	Column N %
Institution	Sikkim University	331	65.4%
	Sikkim Manipal University	111	21.9%
	SRM University, Sikkim	17	3.4%
	ICFAI University, Sikkim	27	5.3%
	Sikkim Professional University	20	4.0%
	Total	506	100.0%
Type	Public	331	65.4%
	Private	175	34.6%
	Total	506	100.0%
Education	UG	262	51.8%
	PG	244	48.2%
	Total	506	100.0%
Gender	Male	177	35.0%
	Female	329	65.0%
	Total	506	100.0%

Study Instrument

A survey tool was created in order to test the research's hypothesis. The survey was divided into two parts. The participants' basic information, such as their university, level of education, gender, and age, was covered in the first portion. The items pertaining to the use of the online learning system are included in the second section. A five-point Likert scale was used to score the items in the second portion, with 1 denoting "strongly disagree" and 5 denoting "strongly agree." To measure the ten components in the research model, the survey instrument had 45 items. The sources of these constructs are shown in Table 2. The items from the earlier studies were modified to make them consistent with the requirements of the current study.

Tools for Data Analysis

To examine the created proposed technology acceptance model for students' acceptance of online learning, we use the Partial Least Squares-Structural Equation Modelling (PLS-SEM) approach. The PLS-SEM is used to evaluate the measurement and structural models in this study. The fact that PLS-SEM allows contemporaneous analysis for both measurement and structural model, which leads to more accurate estimations, was the reason for its adoption in this study.

Table 2: Constructs, Items, and Sources of Scale

Construct	No. of items	Source
Attitude towards use (ATU)	4	(Hastuti et al., 2020; Hussein, 2017; Lai, 2017; Md Lazim et al., 2021; Rizun & Strzelecki, 2020; Singh et al., 2020; Siti et al., 2021)
Behavioural Intention to use (BI)	4	(Abbasi, Chandio, Soomro, & Shah, 2011; Alharbi & Drew, 2014; Deshpande et al., 2012; J. J. Kim et al., 2021; Lai, 2017; Mailizar et al., 2021)
Perceived Usefulness (PU)	4	(Abbasi et al., 2011; Alharbi & Drew, 2014; Davis & Venkatesh, 1996; Farahat, 2012; Hastuti et al., 2020; Siti et al., 2021)
Perceived Ease of Use (PEU)	4	(Abdullah & Ward, 2016; Farahat, 2012; J. J. Kim et al., 2021; Lai, 2017; Lin et al., 2011; Venkatesh & Bala, 2008)
Computer Self-efficacy (CSE)	5	(Chang et al., 2017; Ejdys, 2021; Rizun & Strzelecki, 2020; Salloum et al., 2019; Salloum & Shaalan, 2018; Venkatesh, 2000)
Perceived Enjoyment (PE)	4	(Chang et al., 2017; Lai, 2017; Rizun & Strzelecki, 2020; Salloum & Shaalan, 2018; Wang, Lew, Lau, & Leow, 2019)
Computer Playfulness (CP)	5	(Salloum et al., 2019; Salloum & Shaalan, 2018; Venkatesh, 2000; Webster & Martocchio, 1992)
Content Quality (CQ)	5	(Sami Saeed Binyamin et al., 2019; Hastuti et al., 2020; Salloum et al., 2019; Salloum & Shaalan, 2018)
Information Quality (IQ)	5	(Roca, Chiu, & Martínez, 2006; Salloum et al., 2019; Salloum & Shaalan, 2018; Shah et al., 2013)
System Quality (SQ)	5	(Mailizar et al., 2021; Roca et al., 2006; Salloum et al., 2019; Shah et al., 2013)

Results

Measurement Model Evaluation

For the measurement of attitude, perception, intents, etc. in the behavioural sciences, there are two types of validities that are necessary: convergent validity and discriminant validity (Hair, Risher, Sarstedt, & Ringle, 2019). The sections below address these concerns:

Convergent Validity

When assessing the convergent validity of a reflective scale, various measures must be considered. These metrics include Cronbach's alpha, composite reliability (CR), factor loading of the construct's individual items, and average extracted variance (AVE). Cronbach's alpha should be set to 0.7 to check the construct's items' internal consistency (Hair et al., 2019). Here, one CSE2 item reported that the Cronbach's alpha was smaller than recommended (alpha=0.659), hence it was removed from the CSE construct. Additionally, the values of the factor loadings and composite reliability should be equal to or greater than 0.7 to establish the convergent validity of the constructs, while the values of the AVE must be greater than 0.5 to be accepted (J. F. Hair, Risher, Sarstedt, & Ringle, 2019). The convergent validity results are displayed in Table 3. The loadings for the measurement items were shown in

this study to be higher than the suggested value. Additionally, it was shown that the composite reliability (CR), Cronbach's alpha, and AVE values were higher than suggested. This confirms the convergent validity.

Table 3: Convergent Validity Results

Constructs	Items	Factor loading	Cronbach Alpha	CR	AVE
Attitude toward use (ATU)	ATU1	0.813	0.831	0.888	0.664
	ATU2	0.778			
	ATU3	0.803			
	ATU4	0.864			
Behavioural Intentions to use (BI)	BI1	0.802	0.825	0.884	0.656
	BI2	0.762			
	BI3	0.831			
	BI4	0.843			
Computer playfulness (CP)	CP1	0.757	0.846	0.890	0.620
	CP2	0.741			
	CP3	0.828			
	CP4	0.833			
	CP5	0.772			
Content Quality (CQ)	CQ1	0.789	0.838	0.885	0.607
	CQ2	0.744			
	CQ3	0.804			
	CQ4	0.784			
	CQ5	0.773			
Computer self-efficacy (CSE)	CSE1	0.730	0.830	0.887	0.664
	CSE3	0.825			
	CSE4	0.847			
	CSE5	0.851			
Information Quality (IQ)	IQ1	0.765	0.845	0.890	0.618
	IQ2	0.794			
	IQ3	0.827			
	IQ4	0.780			
	IQ5	0.761			
Perceived Enjoyment (PE)	PE1	0.770	0.815	0.878	0.642
	PE2	0.800			
	PE3	0.832			
	PE4	0.803			
Perceived ease of use (PEU)	PEU1	0.799	0.787	0.862	0.611
	PEU2	0.731			
	PEU3	0.751			
	PEU4	0.842			
Perceived usefulness (PU)	PU1	0.846	0.860	0.905	0.704
	PU2	0.834			
	PU3	0.825			
	PU4	0.850			
System quality (SQ)	SQ1	0.842	0.910	0.933	0.736
	SQ2	0.835			
	SQ3	0.878			
	SQ4	0.859			
	SQ5	0.876			

Discriminant Validity

Discriminant validity is the extent to which one construct differs from all other constructs in the study model (Ketchen, 2013). The Fornell-Larcker criterion and Cross-Loadings are the two measures we utilised to determine the discriminant validity. As shown in Table 4, the present study satisfies the Fornell-Larcker criterion for discriminant validity, which states that each construct's square root of AVE (diagonal value) in the correlation matrix should be greater than the correlation of latent constructs.

Table 4: Fornell-Larcker criterion for Discriminant Validity

	ATU	BI	CP	CQ	CSE	IQ	PE	PEU	PU	SQ
ATU	**0.815**									
BI	0.777	**0.810**								
CP	0.721	0.719	**0.787**							
CQ	0.566	0.601	0.634	**0.779**						
CSE	0.592	0.587	0.668	0.680	**0.815**					
IQ	0.628	0.629	0.664	0.761	0.662	**0.786**				
PE	0.636	0.632	0.757	0.684	0.621	0.723	**0.802**			
PEU	0.609	0.573	0.635	0.640	0.679	0.742	0.699	**0.782**		
PU	0.649	0.612	0.723	0.670	0.645	0.712	0.712	0.754	**0.839**	
SQ	0.689	0.624	0.694	0.616	0.637	0.668	0.694	0.748	0.783	**0.858**

As another measure to check the discriminant validity, we examined the cross-loadings of the items with the constructs. According to Hair et al. (2014), an item's outer loadings on a construct should be higher than all its cross-loadings with other constructs. Table 5 presents the results of cross-loading of the items on the latent constructs. The items in the respective construct showed no cross-loading with other constructs, hence confirming the discriminant validity of the constructs.

Table 5: Cross-Loading Results

	ATU	BI	CP	CQ	CSE	IQ	PE	PEU	PU	SQ
ATU1	**0.813**	0.621	0.538	0.501	0.485	0.505	0.480	0.483	0.526	0.553
ATU2	**0.778**	0.577	0.532	0.452	0.474	0.500	0.526	0.474	0.486	0.492
ATU3	**0.803**	0.631	0.624	0.427	0.473	0.512	0.513	0.497	0.557	0.587
ATU4	**0.864**	0.697	0.648	0.467	0.498	0.531	0.556	0.528	0.544	0.609
BI1	0.662	**0.802**	0.601	0.486	0.484	0.538	0.541	0.528	0.536	0.542
BI2	0.575	**0.762**	0.483	0.494	0.453	0.484	0.447	0.408	0.419	0.421
BI3	0.656	**0.831**	0.605	0.474	0.455	0.482	0.519	0.448	0.510	0.533
BI4	0.617	**0.843**	0.631	0.496	0.510	0.532	0.534	0.465	0.509	0.516
CP1	0.519	0.592	**0.757**	0.512	0.511	0.482	0.542	0.487	0.546	0.527
CP2	0.547	0.561	**0.741**	0.448	0.477	0.483	0.607	0.475	0.496	0.485
CP3	0.612	0.598	**0.828**	0.460	0.526	0.502	0.610	0.488	0.582	0.564
CP4	0.615	0.574	**0.833**	0.534	0.550	0.572	0.629	0.530	0.626	0.577
CP5	0.540	0.510	**0.772**	0.535	0.560	0.567	0.592	0.514	0.586	0.569
CQ1	0.408	0.430	0.464	**0.789**	0.533	0.600	0.499	0.462	0.467	0.460
CQ2	0.385	0.420	0.422	**0.744**	0.487	0.572	0.450	0.493	0.498	0.494
CQ3	0.530	0.552	0.622	**0.804**	0.567	0.659	0.638	0.573	0.606	0.543
CQ4	0.426	0.489	0.465	**0.784**	0.547	0.554	0.523	0.488	0.561	0.471
CQ5	0.440	0.431	0.471	**0.773**	0.510	0.570	0.537	0.462	0.454	0.418
CSE1	0.431	0.438	0.556	0.510	**0.730**	0.505	0.462	0.470	0.482	0.430
CSE3	0.443	0.460	0.495	0.532	**0.825**	0.505	0.491	0.536	0.492	0.479
CSE4	0.505	0.458	0.535	0.556	**0.847**	0.557	0.531	0.593	0.553	0.563

CSE5	0.540	0.553	0.592	0.614	**0.851**	0.586	0.535	0.603	0.569	0.590
IQ1	0.509	0.519	0.511	0.666	0.528	**0.765**	0.580	0.562	0.594	0.538
IQ2	0.467	0.454	0.505	0.608	0.530	**0.794**	0.532	0.544	0.518	0.502
IQ3	0.507	0.519	0.552	0.619	0.538	**0.827**	0.624	0.613	0.578	0.515
IQ4	0.475	0.472	0.517	0.564	0.501	**0.780**	0.544	0.579	0.543	0.518
IQ5	0.506	0.502	0.521	0.533	0.505	**0.761**	0.553	0.612	0.559	0.549
PE1	0.440	0.449	0.519	0.476	0.445	0.497	**0.770**	0.512	0.464	0.481
PE2	0.542	0.493	0.630	0.556	0.479	0.605	**0.800**	0.539	0.574	0.551
PE3	0.543	0.563	0.645	0.512	0.499	0.571	**0.832**	0.581	0.610	0.602
PE4	0.507	0.512	0.622	0.638	0.560	0.632	**0.803**	0.600	0.618	0.579
PEU1	0.507	0.471	0.560	0.513	0.546	0.650	0.622	**0.799**	0.651	0.632
PEU2	0.403	0.395	0.436	0.516	0.550	0.528	0.533	**0.731**	0.489	0.483
PEU3	0.472	0.440	0.446	0.445	0.444	0.522	0.480	**0.751**	0.524	0.546
PEU4	0.512	0.479	0.531	0.530	0.582	0.609	0.546	**0.842**	0.672	0.659
PU1	0.561	0.520	0.649	0.552	0.557	0.614	0.627	0.672	**0.846**	0.684
PU2	0.523	0.459	0.558	0.550	0.530	0.586	0.586	0.613	**0.834**	0.628
PU3	0.509	0.499	0.605	0.513	0.518	0.551	0.558	0.610	**0.825**	0.653
PU4	0.580	0.569	0.613	0.629	0.560	0.634	0.616	0.633	**0.850**	0.663
SQ1	0.571	0.507	0.571	0.510	0.481	0.537	0.561	0.597	0.668	**0.842**
SQ2	0.544	0.512	0.544	0.517	0.521	0.517	0.558	0.589	0.646	**0.835**
SQ3	0.584	0.520	0.611	0.509	0.564	0.580	0.590	0.666	0.675	**0.878**
SQ4	0.608	0.543	0.601	0.549	0.579	0.617	0.619	0.671	0.661	**0.859**
SQ5	0.644	0.590	0.642	0.558	0.583	0.610	0.645	0.681	0.710	**0.876**

Structural Model Evaluation

The key criteria for assessing the structural model in PLS-SEM are the collinearity diagnostics, the significance of the path coefficients, the level of the R^2 values, the f^2 effect size, and the predictive relevance (Q^2) (Hair et al., 2019). The collinearity statistics are presented in Table 6. Each predictor construct's variance inflation factor (VIF) value is higher than 0.20 and lower than 5 as suggested by (Hair et al., 2014), hence there is no problem with lateral multicollinearity among the constructs.

Path Coefficients and t-statistics

The results of path coefficients and coefficients of determination (R^2) are shown in Figure 2. Among the individual characteristics, the path coefficients of CSE→PU and CP→PEU were negative i.e., -0.005 and -0.065 respectively whereas CQ among system characteristics was negatively related to PEU with a path coefficient of -0.031. All the constructs of the TAM model showed positive path coefficients. We have used bootstrapping to assess the significance of path coefficients. The path coefficients and their t-statistics for a one-tailed t-test at a 5% level of significance are shown in Table 6. The path coefficient of CSE→PU (β= -0.005, t-value=0.095) and PE→PU (β=0.050, t-value=0.940); and CP→PEU (β=-0.065, t-value=1.270) are not significant (t-value <1.645) among individual characteristics. Among the system characteristics, the path coefficients of CQ→PEU (β= -0.031, t-value=0.626) and IQ→PU (β=0.083, t-value=1.416) are not statistically significant at 5% level of significance. Having a t-value <1.645 for a significant level of 5% (α = 0.05) in the one-tailed test indicates that CSE, PE, and IQ do not significantly affect PU; and CP and CQ do not significantly affect PEU.

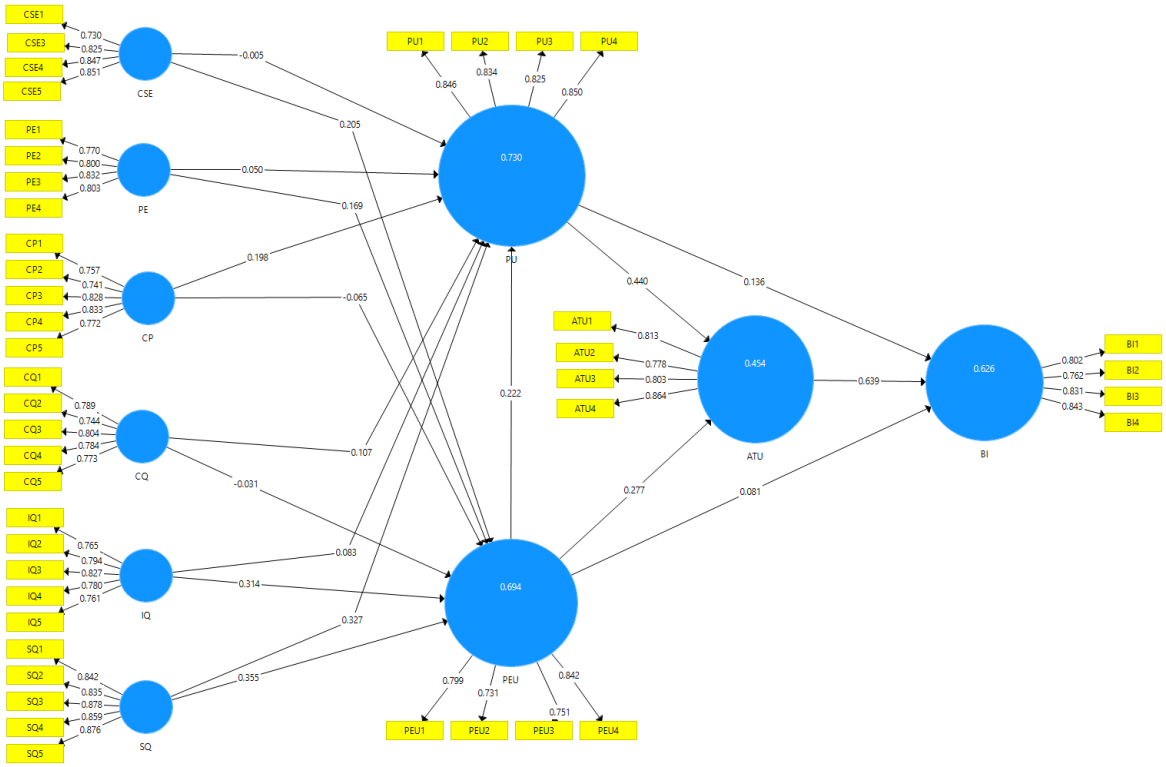

Figure 3: Path coefficients and R^2 of Extended TAM

While examining the effect of individual and systems characteristics on PU as an endogenous construct in the structural model, Fig. 2 shows that R^2 is 0.730, indicating that the PEU, individual characteristics (CSE, PE, and CP) and system characteristics (CQ, IQ, and SQ) together explain 73.0% of the variance in PU. Among the individual characteristics, CP (β = 0.198, t-value = 4.079) is the strongest predictor of PU whereas CSE and PE are not. This shows that our hypothesis H3a1 is supported whereas H1a1 and H2a1 are not.

Table 6: Collinearity, Path coefficients, t-statistics and Effect Size of Exogenous constructs

Hypothesis	Relationship	VIF	Original Sample β	Standard Deviation	t-statistics	Effect size (f^2)
H1a1	CSE → PU	2.546	-0.005	0.052	0.092	0.000
H1a2	CSE →PEU	2.409	0.205	0.047	4.386	0.057
H2a1	PE → PU	3.281	0.050	0.053	0.940	0.003
H2a2	PE → PEU	3.188	0.169	0.055	3.091	0.029
H3a1	CP → PU	2.973	0.198	0.049	4.079	0.049
H3a1	CP → PEU	2.959	-0.065	0.051	1.270	0.005
H4b1	CQ → PU	2.889	0.107	0.050	2.142	0.015
H4b2	CQ → PEU	2.886	-0.031	0.050	0.626	0.001
H5b1	IQ → PU	3.481	0.083	0.058	1.416	0.007
H5b2	IQ → PEU	2.546	0.314	0.062	5.077	0.102
H6b1	SQ → PU	2.888	0.327	0.068	4.798	0.138
H6b2	SQ → PEU	2.476	0.355	0.054	6.604	0.166
H7	PEU → PU	3.273	0.222	0.058	3.823	0.056
H8	PEU →ATU	2.317	0.277	0.061	4.513	0.061
H9	PEU → BI	2.457	0.081	0.050	1.733	0.007
H10	PU → ATU	2.317	0.440	0.057	7.677	0.153
H11	PU → BI	2.671	0.136	0.055	2.490	0.019
H12	ATU → BI	1.831	0.639	0.042	15.297	0.596

The model reveals that SQ is the strongest predictor of PU (β = 0.327, t-value = 4.798) followed by CQ (β = 0.107, t-value = 2.142) among the system characteristics whereas IQ (β = 0.083, t-value = 1.416) does not contribute

significantly. This implies that our hypotheses H5a1 and H6a1 of positive relationship with PU were supported whereas H4a1 was not. From the TAM constructs, PEU (β = 0.222, t-value = 3.823) is the significant predictor of PU, meaning thereby, supporting our H7 hypothesis. This confirms that PEU from TAM, CP from individual characteristics; and SQ and CQ from System characteristics have a strong positive relationship with PU.

Regarding PEU as an endogenous construct, the R^2 is 0.6944 as shown in Table 7, indicating that Individual characteristics (CSE, PE, and CP) and system characteristics (CQ, IQ, and SQ) together explain 69.44% of the variance in PEU. Among the individual characteristics, CSE (β = 0.205, t-value = 4.386) is the strongest predictor of PEU followed by PE (β = 0.169, t-value = 3.091) whereas CP (β = -0.065, t-value = 1.270) is not. This implied that our hypotheses (H1a2 and H2a2) of CSE and PE having a positive relationship with PEU were supported whereas H3a2 was not supported. On the other hand, among the system characteristics, SQ (β = 0.355, t-value = 6.604) is the strongest predictor of PEU followed by IQ (β = 0.314, t-value = 5.077). CQ (β = -0.031, t-value = 0.626) is negatively related to PEU and does not contribute significantly to predicting the PEU. This indicated that the hypotheses H5b2 and H6b2 of IQ and SQ having a positive relationship with PEU were supported whereas H4b2 was not supported. This confirms that CSE & PE from individual characteristics and SQ & IQ from system characteristics have a strong and significant positive relationship with PEU.

To examine the predictive accuracy of the model, Fig. 2, shows that R^2 is 0.625 for BI. This indicates that the three exogenous constructs (PU, PEU, and ATU) explain 62.5% of the variance in BI. The inner model shows that ATU is the only strongest predictor of BI (β = 0.639, t-value = 15.297) followed by PU (β = 0.136, t-value = 2.490) and PEU (β = 0.081, t-value = 1.617, p value=0.053). This supports our hypotheses H10, H11, and H12. Having a t-value >1.645 for a significant level of 5% (α = 0.05) in the one-tailed test indicates that PU, PEU, and ATU possess a strong positive relationship with BI.

As an endogenous construct, the model identifies ATU as having an R^2 of 0.453. This means that the variance in ATU is explained by the two constructs (PEU and PU) to the extent of 45.3%. The model also shows that PEU is the second-strongest predictor of ATU, coming in at 0.277, t-value 4.513, and PU at 0.440, t-value 7.677. We can conclude that PU and PEU had a significant relationship with ATU based on the fact that our hypotheses H8 and H9 are supported by t-values > 1.645 for a significant level of 5 percent in the one-tailed test.

Coefficient of Determination (R^2), Predictive Relevance (Q^2), and Effect Size (f^2)

The coefficient of determination (R^2) measure denotes the model's predictive power and the amount of variance in the endogenous constructs that is explained by each associated exogenous construct (Hair et al., 2014). Chin (1998) asserts that the R2 value is regarded as "strong" when it exceeds 0.67, "moderate" when it falls between 0.33 and 0.67, and "poor" when it falls between 0.19 and 0.33.

As shown in Table 7, the R^2 values for the attitude towards use (ATU), and behavioural intention to use (BI), were found to be moderate (between 0.33 and 0.67); and PEU and PU were found to be high (more than 0.67).

Table 7: R^2 of the endogenous latent variables

Constructs	R^2	R^2Adjusted	Predictive Accuracy	Predictive Relevance (Q^2)
ATU	0.45391	0.45174	Moderate	0.296
BI	0.62595	0.62372	Moderate	0.403
PEU	0.69445	0.69078	High	0.414
PU	0.73007	0.72628	High	0.505

To assess the predictive relevance of endogenous constructs, we used blindfolding with default omission distance (7) to obtain cross-validated redundancy measures for each endogenous construct. As shown in Table 7, the resulting Q^2 values larger than 0 indicate that the exogenous constructs have predictive relevance for the endogenous construct under consideration.

Moreover, to evaluate the effect size of individual and system characteristics on PU and PEU; and of PEU & PU on ATU and BI, we used Cohen's f^2 (Cohen, 2013). The effect size f^2 enables determining the contribution of an external construct to the R^2 value of an endogenous latent variable. The exogenous construct's influence on the endogenous construct is indicated by the f^2 values of 0.02, 0.15, and 0.35, respectively. The effect of SQ→PEU and PU→ATU was small whereas the effect of ATU→BI was large. The effects of the remaining exogenous constructs on PU, PEU, ATU, and BI were small as shown in Table 6.

Discussion

The current study aims to assess characteristics that influence university students' behavioural intention to accept online learning with the intervention of individual and system-specific characteristics. This study differs from

others in that it looked at students at public and private universities in a developing country where online learning was not widely used before the COVID-19 outbreak. As a result, further research is needed into this topic to have a better knowledge of the elements that influence student acceptance of online learning. We used the TAM model (Davis et al., 1989) to investigate this issue, which included external elements such as individual characteristics and online learning system-specific characteristics.

The hypotheses related to TAM and the external factors (individual and system characteristics) were examined and the results are presented in Table 8. This study shows four important points of discussion. First, Perceived usefulness (PU) is significantly affected by computer playfulness (CP) from individual characteristics; and by the content quality (CQ) and system quality (SQ) from the system characteristics of online learning. This finding supports the existing literature.

Table 8: Results of Hypotheses testing

Hypothesis	Effect	Hypothesized Relation	Path coefficient	p Values	Decision
H1a1	CSE → PU	Positive	-0.005	0.463	Not supported
H1a2	CSE →PEU	Positive	0.205	0.000	Supported
H2a1	PE → PU	Positive	0.050	0.174	Not supported
H2a2	PE → PEU	Positive	0.169	0.001	Supported
H3a1	CP → PU	Positive	0.198	0.000	Supported
H3a1	CP → PEU	Positive	-0.065	0.102	Not supported
H4b1	CQ → PU	Positive	0.107	0.016	Supported
H4b2	CQ → PEU	Positive	-0.031	0.266	Not supported
H5b1	IQ → PU	Positive	0.083	0.079	Not supported
H5b2	IQ → PEU	Positive	0.314	0.000	Supported
H6b1	SQ → PU	Positive	0.327	0.000	Supported
H6b2	SQ → PEU	Positive	0.355	0.000	Supported
H7	PEU → PU	Positive	0.222	0.000	Supported
H8	PEU → ATU	Positive	0.277	0.000	Supported
H9	PEU → BI	Positive	0.081	0.042	Supported
H10	PU → ATU	Positive	0.440	0.000	Supported
H11	PU → BI	Positive	0.136	0.007	Supported
H12	ATU → BI	Positive	0.639	0.000	Supported

However, among the individual characteristics of the students, their Computer Self-efficacy (CSE) and Perceived enjoyment (PE); and information quality (IQ) among system characteristics did not significantly affect PU. This finding contradicts the previous studies that showed CSE, PE and IQ have a positive impact on users' PU of online learning (Abdullah & Ward, 2016; Chang et al., 2017; Ejdys, 2021; J. J. Kim et al., 2021; Rizun & Strzelecki, 2020; Salloum et al., 2019; Salloum & Shaalan, 2018; Venkatesh, 2000; Wang et al., 2019). However, there are pieces of evidence in the extant body of knowledge that indicated that CSE and PE do not have a significant impact on PU of online learning. For instance, Binyamin, Rutter, & Smith, (2018) and Thakkar & Joshi (2018) found that individuals' CSE does not significantly affect the PU of the online learning system. Maheshwari (2021) argued that although PE has a significant positive relationship with PU, PE is affected by ICT infrastructure and internet speed and access, which indirectly influences students' intentions to learn online. Furthermore, the impact of information quality (IQ) on PU is fully mediated by the ICT infrastructure and service delivery quality of the online learning system (Alsabawy, Cater-Steel, & Soar, 2016). Therefore, universities must be aware of the crucial influence of ICT infrastructure services and examine how investing in these services might improve online learning system and information quality, as well as online learning systems' perceived usefulness.

Table 9: Total Indirect effects of individual and system characteristics on ATU & BI

Indirect path	Sample mean	Standard Deviation	T Statistics	P Values
CP → ATU	0.064	0.031	2.063	0.020
CP → BI	0.061	0.029	2.068	0.020
CP → PU	-0.013	0.011	1.257	0.105
CQ → ATU	0.036	0.032	1.117	0.132
CQ → BI	0.035	0.030	1.115	0.133

CQ → PU	-0.006	0.012	0.566	0.286
CSE → ATU	0.074	0.030	2.505	0.006
CSE → BI	0.069	0.028	2.530	0.006
CSE → PU	0.044	0.016	2.802	0.003
IQ → ATU	0.150	0.035	4.402	0.000
IQ → BI	0.141	0.034	4.241	0.000
IQ → PU	0.067	0.023	3.033	0.001
PE → ATU	0.086	0.031	2.710	0.003
PE → BI	0.081	0.029	2.778	0.003
PE → PU	0.037	0.017	2.255	0.012
PEU → ATU	0.095	0.027	3.641	0.000
PEU → BI	0.265	0.043	6.306	0.000
PU → BI	0.280	0.037	7.569	0.000
SQ → ATU	0.278	0.044	6.257	0.000
SQ → BI	0.262	0.043	6.032	0.000
SQ → PU	0.076	0.020	3.848	0.000

Second, CSE, PE from individual characteristics, and IQ and SQ from system characteristics showed a significant positive effect on PEU which is also supported by many studies (Abdullah & Ward, 2016; Chang et al., 2017; Esteban-Millat et al., 2018; Hastuti et al., 2020; J. J. Kim et al., 2021; Mailizar et al., 2021; Md Lazim et al., 2021; Park, 2009; Salloum et al., 2019; Siti et al., 2021; Sulistiyaningsih et al., 2014). However, our study revealed that CP from individual characteristics and CQ from system characteristics do not significantly affect the PEU of the online learning system. This finding is also not in line with the mainstream literature regarding the acceptance of online learning that indicates a significant influence of CP on PEU (Ejdys, 2021; Lai, 2017; Wang et al., 2019). Although computer playfulness (CP) is expected to have a significant impact on PEU, our findings show that CP does not affect the perceived ease of use of an online learning system, implying that university students were unable to achieve an acceptable level of intrinsic motivation while learning online during the COVID-19 pandemic. As a result, our study also confirms the findings of Al-Gahtani (2016) who suggested that students perceive the online learning system as difficult and complicated because it lacks the fun that would ordinarily encourage them to consider it as easy to use. Furthermore, CQ also does not affect the students' perceived ease of use of online learning. This may be due to less importance or the non-existence of online learning systems in most of the universities before the COVID-19 pandemic. A sudden switch from the traditional classroom system to online learning also puzzled the teachers and this had an impact on developing the quality of content for their course. Therefore, this finding is important in terms of enhancing the content quality so that the online learning system can be perceived by the students as easy to use.

Third, this study reveals that perceptions of ease of use and usefulness had a substantial impact on participants' attitudes toward utilising online learning (ATU) and behavioural intentions (BI) of acceptance of it. Additionally, the best predictor of ATU and BI was PU. This result supports our hypothesis that PEU and PU of online learning greatly influenced students' attitudes and behavioural intentions toward using it. Additionally, prior research has demonstrated the significance of PU and PEU on attitudes toward using online learning (Abdullah & Ward, 2016; Alsabawy et al., 2016; Alshurafat et al., 2021; Salloum et al., 2019; Siti et al., 2021; Vululleh, 2018; Wang et al., 2019).

Fourth, while examining the total indirect effect of the exogenous constructs on ATU and BI of acceptance of online learning (Table 9), this study revealed that individual characteristics (CSE, PE, and CP) and system characteristics (IQ and SQ) have a significant effect on ATU & BI of using online learning system. Accordingly, this finding agrees with our prediction that CSE, PE, CP, SQ, IQ PEU, and PU of online learning significantly affected students' attitudes and behavioural intentions towards accepting online learning. However, CQ from system characteristics did not show any significant impact on ATU & BI which is in contrast to the studies that support the significant effect of CQ on attitude and intentions to use online learning (Sami Saeed Binyamin et al., 2019; Hastuti et al., 2020; Lin et al., 2011; Salloum et al., 2019; Salloum & Shaalan, 2018). While examining the direct effect, we also found that the perception of students towards the quality of content is negatively related to the perceived ease of use and does not affect PEU significantly (Table 9). This finding is an important contribution of the present study in terms of alarming the policymakers to focus more on enhancing the quality of content developed for online learning and delivered by the faculty members in the universities.

Concluding Remark

This study suggests a paradigm for analysing attitudes toward and plans for implementing online learning among university students. The technology acceptance model (TAM) was used for analysis, with system (content quality, information quality, and system quality) and individual (computer self-efficacy, perceived enjoyment, and computer playfulness) characteristics included as external constructs. The suggested theoretical model successfully explains university students' behavioural intention to use the online learning system ($R^2 = 0.623$). The findings suggested that perceived enjoyment and system quality strongly affected students' perceived usefulness and perceived ease of use of online learning. On the other hand, computer self-efficacy, computer playfulness among individual characteristics; and content quality & information quality characteristics of online learning system do not significantly affect the perceived use and perceived ease of use of online learning system. Further, the content quality does not affect the attitude and intentions of using an online learning system. The insignificant impact of these individual and system characteristics on students' intention to use online learning may signify a shift in the thinking paradigm among skilled students and tech-savvy with digital technologies (Gan & Balakrishnan, 2018; Mailizar et al., 2021). Another reason may be that the students were left with no choice except to online learning during the COVID-19 pandemic. In such circumstances, when students did not have any other choice, perceived usefulness, perceived ease of use and content quality of online learning might become less important factors for them in accepting the use of online learning. This study also demonstrated that students' perceptions of the usability and simplicity of online learning had a substantial impact on their attitudes. We draw the conclusion that the quality of the online learning system is essential to ensuring the long-term viability of online learning during the epidemic and beyond. Universities must therefore continue to enhance the quality of the online learning system.

This study had several restrictions. First, because convenience sampling was used, the sampling was limited to only the students of Sikkim's public and private universities. Therefore, it is advised that future research concentrate on gathering samples from many other states (plain places where network connectivity is not a problem) in order to make the findings more applicable to other contexts. Second, the study carried out a survey, but the information was gathered during a pandemic by distributing the links. During the COVID-19 pandemic, online learning may have been the sole emergency management tool that allowed for the continuation of teaching and learning even in the absence of a well-established ICT infrastructure. As a result, qualitative research methodologies may be used in future to examine the intentions to adopt online learning post-COVID-19.

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THE MYSTERIOUS MANTLE OF TECHNOLOGY: ELABORATIVE ANALOGY AND DISTANCE EDUCATION

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ABSTRACT
With continuing expansion of online learning and an increase in the use of computer technology, the complexity of technology can complicate the understanding of computer concepts. Elaborative analogy may help to enhance understanding and speed the learning process. With the ever increasing growth of computer use and technology in online education, the purpose of this study was to empirically evaluate a model of teaching and online learning designed to help students better understanding of basics of technology. A model of elaborative analogy was developed by the authors modeled after the Human Information Process (HIP) with the intention of enhancing the understanding of ubiquitous computer technology used throughout online education. A cognitive map may be drawn to assist students in the assimilation of new knowledge regarding basic computer understanding and function in relation to the HIP. Perceptions and attitudes toward the efficacy of the model were examined in this study. Results of a survey designed to measure student ($n = 64$) perceptions about an expanded Input-Process-Output (EIPO) model of computer technology were found to be favorable overall and support the need for further research.
Keywords: Elaborative Analogy, Human Information Processing, Teaching, Learning, Cognition, Constructivism, Technology, AI, Distance Education

Introduction

Technology has had and will continue to have a significant influence on all aspects of society (Blut & Wang, 2020; Tipton, 1998). Computers have become an integral component of daily life. As Morrette (1988) predicted years earlier, the invention and development of the computer will continue to have an impact on all human experience. Work, manufacturing, and growing segments of education, including an exponential rise in online learning and distance education are increasing in their dependence upon computers, education, and learning. The phenomenon can be thought of as a paradigm shift, a change in the way society perceives, learns, and interacts, a phenomenon that is changing at an exponential rate, and one that may be described as 'staggering' (Dennis, 2017; Harrington, 2011).

Computer literacy is fast becoming an expectation of academicians, students, and administrators (Blut & Wang, 2020). Theoretical and application concepts are more or less taken for granted in most educational settings. Yet, unlike subjects like arithmetic or language, for example, computers and technology may be foreign to students thrust into distance education settings. The technological perplexity of understanding and operating a computer, smartphone, or tablet, for example, combined with uncertainty due to lack of previous knowledge, can result in an enigmatic and exasperating experience for distance education learners. Even those who grew up with computer games, cell phones, and laptop computers may not fully comprehend technological fundamentals, leading to what may be a mysterious experience or perhaps a state of technology anxiety (Blut & Wang, 2020) - technophobia.

Effective teaching doesn't just happen. It involves more than just knowing the subject matter (Davis, 2019). Effective teaching can be defined as "…the art of getting information to the students' memory in an organized manner to facilitate later retrieval." (Hutchison & Padgett, 2007, p. 69). The use of elaborate analogy may help relate new information to what students already know. The importance of constructing meaning by relating previous knowledge to new information is well-documented (Holyoak & Thagard, 1997; Oppenheimer, 1956; Ormrod, 2020; Ormrod, Ormrod, Wagner & McCallin, 1988; Piaget, 1977; Royce & German, 2019). According to Armelin, Heinemann, & de Hoz, (2017), learning can be facilitated when information is incorporated into an existing, learned set of rules, or "mental schema." The task of presenting difficult new information can be mitigated to one extent or another by overlapping that information with previous knowledge, with what is already known (Gentner & Holyoak, 1997; Lu, Wu, & Holyoak, 2019; Ormrod, 2020; Paris & Glynn, 2004, Vamvakoussi, 2017). People inherently know something about themselves from a physiological perspective, presenting an opportunity for relational analogical learning. In early years of development and with little guidance, toddlers become self-aware. Teaching children to identify body

"hardware" (e.g., eyes, ears, hands, etc.) often occurs as early as the sensorimotor stage (birth to 2 years of age), Piaget's earliest stage of development (Flavell, 2000; Piaget, 2000).

Technological Imperative

Previous knowledge of aspects of technology may be virtually nonexistent for those inundated with or compelled to use technology in their daily work. In this case, in online or distance learning, presumption of computer skills is often taken for granted. Knowledge may be incomplete, or at best, imprecise in those learning to use the technology for the first time. A significant population represented by this phenomenon may include preadolescent and adolescent students in K-12 settings or adult learners pursuing an online degree at the undergraduate or graduate level. Previous knowledge of computer technology may even be limited in those who are comfortable with the use of smartphones, tablets or laptops. People educated in previous generations received little or no computer training in public or private schools, nor had ready access to technological devices such as computers, iPads, or smartphones. Many still don't today. Even children who appear to be computer literate may know how to *play* computer games without truly understanding fundamental computer concepts. As Morrette (1988) envisioned years earlier, many young people were reared in home and school environments where computer knowledge was not valued or not available due to societal inequities. The same may hold true today. Even where lack of previous knowledge exists, there may be metacognitive methods of teaching and learning about computers that can enhance the learning process, improve learning, and assist in the retention of important, useful computer and technological concepts, assisting those who are now faced with aspects of technology, educating online. Through the challenges, lack of previous knowledge, and ever increasing presence of technology, a technological imperative persists, demanding at the very least a basic understanding of hardware devices and software applications.

Metacognition & Constructivism

Metacognition is widely considered salient to efficient learning and is defined as the act of thinking about one's own thinking (Ganz & Ganz, 1990; Heyes, et al., 2020; Ormrod, 2020). The greater a learner's metacognitive self-awareness, the more likely that learner is to achieve (Hofer & Pintrich, 2002). Drawing meaningful comparisons to that which learners inherently know about themselves has shown promise as a method of improving learning and retention. Students appear to achieve relational understanding when they are actively engaged in constructing their own knowledge (Glaser, 1991; Hwang & Chang, 2021). Self-reference appears to be a powerful encoding system, functioning as a superordinate schema (Markus, 1977; Rogers, Kuiper, & Kirker, 1999), a Piagetian cognitive construct to which new information can be learned through assimilation or accommodation (Armelin, Heinemann, & de Hoz, 2017; Piaget, 2000). Clearly, schemas contribute to learning and retrieval of information (Sakamoto & Love, 2004). According to Ormrod (2020), the task of relating new information to one's self can have a dramatic effect on learning. Evidence points to the fact that the more learners relate new material not only to existing material but also to themselves, the more meaningful learning is likely to be (Glaser, 1991; Rogers, Kuiper, & Kirker, 1999). In particular, elaborative analogy appears to be more effective than simple analogy alone in the acquisition and retention of knowledge (Paris & Glynn, 2004) and can serve as an inspiration to learning (Glynn, 2008). Elaborative analogy incorporates visual images and text, promoting organization of information into a more meaningful concept map, helping the learner to map concepts from the analogy to the target (that which is intended to be learned).

Pedagogy

The pedagogical process appears to be improved by organizing information for learners. Comparative organizers (i.e., comparing computers to people) help to establish meaningful learning sets. People then begin to understand new material at a more meaningful level (Ausubel, Novak, & Hanesian, 1978). Research suggests that overlapping new information with what people already know can increase comprehension (Ormrod, 2020). Adding comparative organizers, memory maps, and analogous materials to the pedagogical process may improve teaching and learning in technological areas. To support this further, reading may not be the most efficient method of learning. For example, Paris & Glynn (2004) evaluated the use of elaborate and simple analogy in the teaching of science to a diverse group of students at a large university (N = 140). Their empirical findings suggested that elaborate analogies tended to improve the learning and recall of science knowledge. They noted findings to be consistent with the benefits of a constructivist view of learning. Ngu & Phan (2020) proposed a model designed to aid students in learning trigonometry. Their model drew upon the complementary strengths of learning through the use of analogy and learning by comparison. The goal was to help counter the inherent difficulty of learning subjects like trigonometry. Their conceptual compared pedagogical approaches for effective teaching and learning of trigonometry. A similar condition may exist when expecting students to comprehend knowledge about computers and technology, inherent in the employment of distance learning platforms, for example.

In an earlier study, Yanowitz (2001) examined the effects of analogy in a K-6th grade environment. Scientific concepts were taught to some students using instructional analogies and to others in expository text absent of analogy. In two separate experiments, students who were presented material using analogical text showed higher

levels of performance on inference questions than those who received the non-analogical texts and appeared to demonstrate better inferential reasoning than students who were not exposed to analogical texts.

The IPO Model

The predominant paradigm for teaching basic concepts of computers is the ubiquitous Input-Process-Output (IPO) model of computing as shown in Figure 1. This universal concept has appeared regularly over the years throughout computer textbooks in one form or another (Hennessey & Patterson, 1998; Parsons & Oja, 2013; Peat, 1988; Shelly, Freund, & Vermaat, 2011; Szymanski, Pulschen, & Szymanski, 1995). Input to the computer takes place through input channels. Information is then sent to the processor, where any number of operations may take place. In a computer, data is processed through memory, the arithmetic unit, or the control unit. Output from the processor is received by an output device such as a computer screen, file, cloud server, printer, external storage device, or a speaker.

Fundamentally similar, nearly all computers in operation follow the Von Neuman processor concept, illustrated via the IPO model seen in Figure 1. Even high-powered supercomputer vector processors and "fuzzy logic" computers follow the IPO model, just as smartphones, pads, and laptop computers do to this day. This model serves as an essential foundation in introductory computer classes and in courses in which computer concepts are taught as an adjunct to the primary curriculum. The same model appears to parallel human information processing.

Human Information Processing

Human Information Processing (HIP) is an area that may be drawn upon to enhance learning about computers. The HIP model may help the student organize information, mapping that information to her or his psychophysiological self, and compare that new information to existing knowledge, as shown in Figure 2. HIP employs terms such as the cognitive process, learning vs. memory, storage, retrieval, and encoding (Ormrod, 2020). Computer processing employs similar terms such as memory, storage, retrieval, coding, programming, and processing.

The mind and the computer have much in common (Cuzzolin, et al., 2020; Peat, 1988) and is demonstrated by the surge in neural networks and artificial intelligence, a branch of science that incorporates neuropsychological concepts with those of computers (Minsky, 2019). In artificial intelligence (AI) systems, computers learn. In human education, people learn. Throughout the cognitive study of human memory, concepts of sensory register, short-term memory, working memory, long term memory, capacity, and forms of storage are discussed. Computer vernacular includes concepts such as short-term memory, often referred to as working memory or random access memory (RAM). Concepts of long term storage and storage capacity are also used throughout computer technology education. Even in information science education, constructs such as propositional networks, models of reasoning, logic dependencies, and association of ideas overlap (d'Avila Garcez & Lamb, 2006; Rödder & Kulmann, 2006). Terms including schema, internal coding, and compilation are common to both cognitive psychology and computer sciences. In computer theory, even today, these may be lofty and nebulous concepts to the new learner. Mapped to the human form, such concepts may become more familiar. As they become more familiar, they become less threatening, which may increase students' levels of self-efficacy and confidence to learn.

The Expanded IPO Model of Computing

An expanded version of the IPO model (EIPO) as shown in Figure 3 may be useful as a base for teaching fundamental concepts of computing, as a bridge between theory and practice, and as an aid in organizing new material more efficiently for students faced with online learning. Like the IPO model, the EIPO model outlines the basic components of most known computer configurations, including hand calculators, personal computers, and supercomputers, which may also serve as a model for the human mind. The expanded IPO model adds the concepts of hardware and software to the conventional IPO model, further organizing fundamentals of computing into an understandable format. Logos and icons are superimposed upon the model, which explain each of the areas of input, process, and output within the areas of software and hardware. Hardware devices are paired with equivalent software functions that further organize and link network relationships within the learner's mind. The list structure more closely parallels the propositional network posited as the preferred paradigm of cognitive memory theory (Heyes et al., 2020).

This expanded IPO model may be referred to throughout a computer technology course with varied reference to the framework. The model enables students to organize information and draw comparisons to activities in which computers are involved: from fundamental theory to application of specific computer software applications, such as spreadsheet and database packages, apps and learning platforms. Even during the theoretical and practical learning of word processing or programming applications, references to the associated components of the EIPO model may enhance learning.

A combination of iconic symbols and logogic elements are used to deliver what could be new and complex material to students. This process simulates the conjoint retention theory that suggests that learners are able to utilize two systems of recall; spatial and verbal. Representations from either system can be combined to assist in learning and recall (Webb, Thornton, Hancock, & McCarthy, 1992). The advantage of dual representation appears to be that information stored in either spatial or verbal form can be accessed from either system (Paivio, 1986). The EIPO model can be presented using icons, labels, memory maps to physical human body locations or be used as an organizer allowing students to map new terms to that which learner are familiar. Combining verbal and pictorial material provides an advanced or more elaborative form of analogy and embedding analogy in context may improve inferential learning. Adding pictorial schematics can potentially increase factual learning as well. As Adding situational information provides a more elegant method of analogous learning. Such information may take the form of relating to the human form. Jonasson (2007) posited meaningful learning as consisting of an integration of co-requisite reasoning skills, analogical reasoning, and causal reasoning.

Combining computer theory with what is inherently known about human physiology and mental structure may improve learning and retention of computer-related theory and use. By drawing inferences from the human information process to the computer processor, as shown in the EIPO model (see Figure 2), students can better organize new information, which may then improve both learning and retention. The EIPO model may assist in that process, helping to organize information for learning and providing a method of adding meaning by relating the substance to a well-known entity, the human information system. The job of the teacher can then enable or encourage interpretation by the student, rather than to simply transmit text (Gademer, 2011). The EIPO model may help to close the gap between learner and subject matter, adding a level of personalization to the learning process (Papert, 1993).

The EIPO model encapsulates concepts of hardware, software, and the associated components of each, drawing an analogy to the human form and thereby making learning about computer technology potentially easier. From the perspective of human information processing, within the category of "Input," human input devices such as eyes and ears can then be associated through analogy to corresponding human software functions such as *seeing* and *hearing* to form a complete functioning system. Within the category of "Output," for example, devices such as human vocal cords combine with mental software called *language* or *speech* to parallel a similar concept in computing. Within the concept of computer information processing, a computer's voice output requires both hardware in the form of the speaker and software in the form of a voice synthesis program in order to function. Making the comparison of human language in relation to vocal cords to the computer's speech synthesis software in relation to the computer speaker may ease the task of learning. The connection between the fleeting memory of logogen-based computer teaching and practical application appears to be improved by providing a model like EIPO. Students appear less confused, more attentive, and demonstrate less difficulty in practical application labs upon comprehending the concepts presented in the EIPO model.

Method

Procedure

A survey design was employed in this seminal study to determine whether the Expanded IPO Model (EIPO) could help learners better comprehend computer processing through elaborative analogy. Students from two courses taught at a mid-sized midwestern university were recruited voluntarily to participate in the study, which including a brief demonstration of the EIPO Model followed by completing a simple survey. Both courses were taught at a large, urban, Midwestern college and students were about mid-way through the semester. All participation was voluntary and IRB rules were adhered to. No incentives were offered, and no external funding was used for this study.

Participants

The diverse convenience sample of participants (n = 64) consisted of 23 males and 41 females ranging in age from 18 to 55. Participation was voluntary. All information was kept confidential, and from the onset, no names were collected with the surveys. A brief presentation incorporating the elaborative IPO, HIP, and EIPO models (e.g., verbal lecture, textual and graphic handouts) was then given to the students in both classes. Learners were informed of the conceptual expanded IPO model and how it could better relate to the human form (HIP model). Students were then asked to point to input channels (i.e., eyes and ears) and discuss human processors (i.e., componential brain functions such as memory, cognition, and speech). Following the 1-hour presentation and subsequent discussion, students were asked to complete a brief survey.

Instrumentation

The survey collected basic demographic information excluding name or identifying data. Following demographics were four statements:

1. I found this teaching concept clear and easy to follow.
2. This teaching concept will help me to remember the information.

3. The model presented was a helpful method of learning about computers.
4. I can see this model being used in textbooks to help others to understand the concept of computers.

A Likert-type scale ranging from 1 (lowest) to 5 (highest) was used to rank the level of agreement with each survey question in an attempt to measure student perceptions of this elaborative analogous learning process.

Results

Responses from both groups were found to be significantly favorable on all four survey items with quasi-interval mean scale scores ranging from 4.23 (s = .90) to 4.52 (s = .85) out of 5. Results of the survey are shown in Table 1, and overwhelmingly support the use of analogy in teaching and learning about technological concepts from the students' perspective. Thus, participants (n = 64) exposed to the EIPO model clearly favored the analogous method contained within this model. Observation of students during the process also revealed a high level of attentiveness to the models, although this aspect was purely observational and not empirically derived.

Discussion

Constructed from within the consciousness of the mind, the microcomputer brings with it inherent pedagogical advantage. The ease of accessibility, cost advantage of personal computers, and expanding use of technology and the Internet support the need for new paradigms in education, such as constructivism, cooperative learning, hands-on, peer, and analogous learning. Novice computer students or those compelled by technological imperative do not often reap the benefit of years of pre-school or K-12 fundamentals in building a knowledge base from early years, as they might with arithmetic, literature, reading, writing, or native language, for example. Thus, assigning meaning through elaborative analogy may ease the initial shock of unexpected constructs that students may be faced with due to the technological imperative thrust upon us. Again, inherent in this extension of the human mind, we have the opportunity to use analogy to assist students to genuinely comprehend and retain knowledge. Many new paradigm techniques (i.e., elaborate analogy, constructivism, peer learning, web-based learning) offer students opportunities for more rapidly assigning meaning to theoretical constructs (Slavin, 1991; Williams, 2002). These techniques may also help increase attentiveness and improve the self-efficacy of the learner, help to debug minor glitches, and lead to increased learning and understanding, potentially resulting in the achievement of higher grades and more effective learning environments.

Limitations

Responses to the survey were overwhelmingly favorable to the use of the self-reference and analogy with the EIPO model. Teaching new information in and of itself may enhance learning, confounding the results of this preliminary study. Many factors may be covertly at work in any non-experimental study, this one included. Thus, further research is recommended. Replication of this study is warranted. Research using pre- and post-treatment design or experimental causal comparative methods may provide better control in the measure of learning about technology, Internet, and computer concepts by analogy. An experimental design would be helpful to isolate confounding variables and implicate elaborative analogy as the main effect in better teaching and learning in technology.

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Statements & Declarations
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Table 1 *Means and Standard Deviations of Likert-type Quasi-interval Scale Scores*

	Group 1		Group 2		Total	
Survey question	Mean	Standard deviation	Mean	Standard deviation	Mean	Standard deviation
1	4.33	.64	4.46	.82	4.44	.85
2	4.58	.76	4.15	.91	4.23	.90
3	4.58	.64	4.33	1.11	4.38	1.04
4	4.58	.95	4.50	.89	4.52	.85

Figure Captions

Figure 1. The Von Neumann Input-Process-Output model of computing.

Figure 2. The Expanded Input-Process-Output model of computing.

Figure 3. The Expanded Input-Process-Output model of Human Information Processing.

Figure 1.

Figure 2.

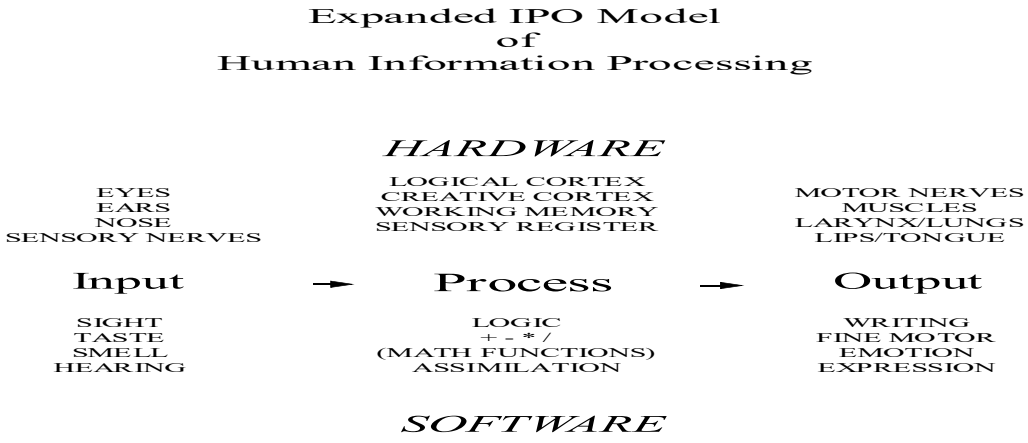
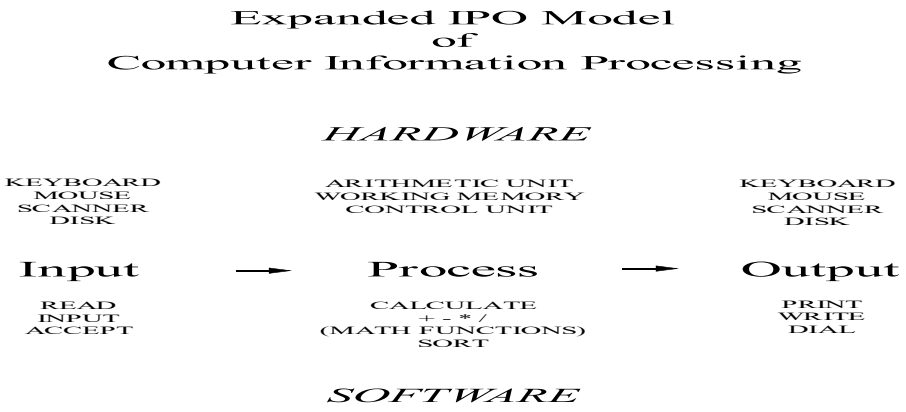


Figure 3.



UNDERGRADUATE STUDENTS' ATTITUDE TOWARD E-LEARNING: GENDER AND STREAM OF EDUCATION PERSPECTIVES

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ABSTRACT
The present study is designed to examine the attitude of undergraduate students towards e-learning in the COVID era. The objectives of this investigation were to examine undergraduate students' attitudes toward e-learning in the COVID era and to compare undergraduate students' attitudes towards e-learning in terms of gender and stream of education. A sample of 180 undergraduate boys and girls belonging to Arts, Science, and Commerce streams were selected from the population using a stratified random sampling technique. The findings of the study showed that about 46.67% of undergraduate students were having a neutral attitude toward e-learning in the COVID era. The finding also showed gender and stream of education as significant predictors of attitude towards e-learning. Undergraduate girls were having a more positive attitude toward e-learning as compared to boys. Undergraduate students belonging to Commerce stream were having a more positive attitude towards e-learning as compared to the students belonging to Ars and Science stream. There was no significant influence of the interaction between gender and stream of education on the attitude of undergraduate students towards e-learning in the COVID era. The results of the study were discussed and the implications were described.
Keywords: Attitude towards e-learning; COVID-19 era; Gender; Stream of Education; Undergraduate Students

INTRODUCTION

The 21st century is said to be the modern age and found the proper use of science and technology in the field of Education, Health and Communication. Due to the use of the Internet, the communication process between people has been increased rapidly. The world is becoming a family with the advent of new technology. Scientific discoveries have influenced all aspects of human life in many directions. Science and technology are used in all areas like hospitals, banks, industries, etc. The success of science and technology is also generalized to the teaching-learning situation in the form of e-learning. E-learning is the composition of two words 'E' and 'learning', where 'E' refers to electronic and learning refers to the relatively permanent changes in behavior through practice and experience. E-learning involves the use of information technology, information and communication technology, the internet, CDs, DVDs, etc. in the teaching-learning process. E-learning also involves a large number of technology applications such as audio and videotape, television, PDF, etc. The word e-learning is used synonymously with online learning and computer-based learning. Saroha (2013) defines e-learning as the combination of learning principles with the systematic application of information technology. E-learning enables people to work in their place because it is flexible (Dhamija, 2014). E-learning increases student achievement by

using internet technology, and digital content and providing a learner-centered environment (Khan, 2017). The term e-learning conveys a broader meaning than the terms computer-based learning or computer-aided instruction (Gupta & Sharma, 2018). E-learning is one of the most trusted areas to transmit education using different educational tools and communication media. It is the learning make possible by information and communication technology. The government has supported various e-learning programs to develop various tools and technologies to promote e-learning. A wide range of internet users are accessing the internet from their smartphones, tablets, laptop, and computer increasingly. The government of India has taken several initiatives through the Ministry of Education and University Grant Commission, which lunch e-learning platforms for students. Dabbagh (2005) mentioned three components of e-learning design. These components are instructional strategies, learning technologies, and pedagogical models or constructs. Instructional strategies include different pedagogical aspects of delivering lectures or content. Learning technologies include various tools of support that are used to deliver content to e-learners, which includes both synchronous and asynchronous tools of communication. Pedagogical models or constructs are used to design the curriculum in the e-learning process.

A theory-based design framework for the e-learning process is useful for content delivery (Dabbagh 2005). For proper implementation of the e-learning strategy, the instruction should be carefully organized, implemented, and created a relationship between the teacher and students that will be consequences in the meaningful knowledge acquisition. This model helps to make the e-learning process more realistic using slideshows, graphics, audio, and video media and makes the learner an active participant in this process. Students' favorable attitude toward e-learning can be increased by designing the e-learning process according to this framework. Based on the user's requirements Davis (1985, 1989) developed "Technology Acceptance Model". "Technology Acceptance Model has three elements such as; perceived usefulness, perceived ease of use, and attitude toward using. According to this model, perceived usefulness is influenced by perceived ease of use, and students' attitude toward using e-learning system is influenced by perceived usefulness and perceived ease of use" (Davis, 1985, 1989). Davis in this model suggested that students' perceived ease of use has a direct effect on their attitude of students toward the use of e-learning resources. Another element of the technology acceptance model is the use of technologies in the teaching-learning process and its effectiveness depends upon students' perception of the usefulness of a particular technology. If learners believe that the instruction given by the instructor in the e-learning process is useful and effective, they are involved in the teaching-learning process more actively and their attitude towards e-learning will be more favorable. Based on the assumptions of the theories/model cited above, it was found that attitude towards e-learning as technology is influenced by varied factors in varied situations. Therefore, in the present study, an effort has been taken to investigate the attitude of undergraduate students towards e-learning concerning their gender and stream of education, especially in the COVID era, where online teaching was prevailing all over the country. An attempt has been made to study the attitudinal variations among undergraduate students with reference to their gender and streams of education. The influence of interaction between gender and stream of education has also been examined for gaining a deeper understanding.

LITERATURE REVIEW

The analysis results revealed a positive attitude of respondents towards e-learning. (Dhamija, 2014; Rhema & Miliszewska, 2014; Kar et al., 2014; Cakir & Solak, 2015; Ali et al., 2016; Ogunnowo, 2016; Zabadi & Alawi, 2016; Elnoor et al., 2017; Konwar, 2017; Thakkar & Joshi, 2017; Dookhan, 2018; Pathak et al., 2019; Periasamy, 2019, Nachimuthu, 2020; Subedi et al., 2020). Findings of (Dhas, 2017; Fouzdar & Behera, 2017; Khan, 2017) showed a moderate attitude of respondents toward e-learning, whereas findings of (Saroha, 2013; Behera et al., 2016; Gupta & Sharma; 2018; Oktem, 2020) showed different levels of attitude towards e-learning. There found inconsistencies in the results among various studies conducted by other researchers such as Saroha (2013) indicated differences in attitudes of people toward e-learning, while the result of Periasamy (2019) indicated no differences in the attitude of learners toward e-learning based on age. The results (Suri & Sharma, 2013; Kar et al, 2014; Rhema & Miliszewska, 2014; Behera et al., 2016; Dhas, 2017; Fouzdar & Behera; 2017; Khan, 2017; Konwar, 2017; Thakkar & Joshi, 2017; Pathak et al.,2019; Periasamy, 2019: Nachimuthu, 2020) showed no significant differences between student's attitudes towards e-learning based on gender, in contrast to these findings of (Dhamija, 2014; Zabadi & Alawi,2016; Gupta & Sharma,2018 and Sao et al., 2018) showed differences between student's attitudes towards e-learning based on gender. Results of (Rhema & Miliszewska, 2014; Behera et al., 2016; Dhas, 2017; Fouzdar & Behera, 2017; Khan, 2017; Konwar, 2017; Thakkar & Joshi, 2017; Gupta & Sharma, 2018; Pathak et al.,2019) revealed no significant differences in the attitude of students towards e-learning based on locality, whereas results of (Dhamija, 2014 and Periasamy, 2019) showed differences in the attitude of students towards e-learning based on locality. Similarly, the results (Dhamija, 2014; Kar et al., 2014; Behera et al.,2016; Dhas, 2017; Gupta and Sharma, 2018) showed no significant differences in student's attitudes towards e-learning based on stream, considering that the results of (Fouzdar & Behera,2017; Periasamy, 2019 and Nachimuthu, 2020) showed significant difference among student's attitudes towards e-learning based on the stream. Results (Kar et al., 2014; Behera et al., 2016 Fouzdar & Behera, 2017) evidenced no significant differences between students'

attitudes toward e-learning based on the category of students. From the result of Dookhan (2018), it was found that students' competency level and perceived usefulness had a significant influence on attitude toward e-learning, although the results of Oktem (2020) showed a significantly different attitude of students towards e-learning tendency and e-learning avoidance were based on grades. The result of Elfaki et al. (2019) showed that electronic learning affects better learning outcomes than traditional face-to-face learning. Raheem & Khan (2020) concluded e-learning is the most effective way of teaching and learning during the COVID-19 period. Lastly, the findings of Shete et al. (2020) showed that students preferred blended learning during the COVID-19 period.

A retrospective review of related kinds of the literature showed that numerous studies have already been conducted on the attitudes of students towards e-learning all over the world and the findings revealed a positive attitude of respondents towards e-learning proven by (Dhamija, 2014; Cakir & Solak, 2015; Zabadi and Alawi, 2016; Elnoor et al., 2017; Dookhan, 2018; Pathak et al., 2019; Periasamy, 2019; Nachimuthu, 2020), and a neutral attitude of students towards e-learning (Dhas, 2017; Fouzdar & Behera, 2017; Khan, 2017), different levels in attitudes of respondents towards e-learning (Saroha, 2013; Behera et al., 2016; Gupta & Sharma, 2018; Oktem, 2020). A large number of researches is being conducted to study the attitudes of postgraduate students toward e-learning (Elnoor et al., 2017; Fouzdar & Behera, 2017), attitudes of student-teachers toward e-learning (Behera et al., 2016; Periasamy, 2019; Nachi Muthu, 2020) but a few numbers of studies have been conducted to study the attitude of students towards e-learning at undergraduate levels, particularly in the state of Odisha. From the above analysis, the findings revealed that a small number of researches have been conducted to assess the attitude of students towards e-learning at the undergraduate level which had a greater impact during the COVID-19 period. Apart from it, the predictors of attitude towards e-learning have not been studied variedly. Therefore, the present study has been undertaken to examine gender and stream of education as predictors of attitude towards e-learning. It is also highly required to know the attitude of undergraduate students towards e-learning because e-learning played a major and an alternative role in the absence of a physical model of teaching which might have proved beneficial for the students concerning their suitability of time, place, and situations. Considering that the present study has been designed to study the attitudes of undergraduate students in e-learning during the COVID era. The rationale behind the COVID era was that during this period there was online teaching and learning all over the country, so it developed keen interest among the researchers to undertake a study on the attitude toward e-learning.

OBJECTIVES OF THE STUDY

1. To study undergraduate students' attitude towards e-Learning in the COVID era
2. To find out the variations in the attitude of undergraduate students towards e-learning in the COVID era concerning their gender and stream of education
3. To study the influence of interaction between gender and stream of education on the attitude of Undergraduate students towards e-learning

HYPOTHESES OF THE STUDY

1. There exists no significant difference in the attitude of undergraduate students towards e-learning concerning their gender and stream of education.
2. There exists no significant influence of interaction between gender and stream of education of undergraduate students towards e-learning.

DELIMITATIONS OF THE STUDY

- As per the data availability and convenience of research, the present study is exclusively delimited to Gangadhar Meher University, Sambalpur, Odisha.
- Further, the study is delimited to undergraduate boys and girls belonging to Arts, Science, and Commerce stream studying at Gangadhar Meher University, Sambalpur, Odisha.
- The design of the study is delimited to the survey method, similarly, the sampling technique is delimited to stratified random sampling with a sample size of 180 students.

METHODOLOGY

The methodology used in this study is as follows.

a) Method: The main objective of the study was to examine the attitudinal levels and variations of undergraduate students towards e-learning in the COVID era; to compare the attitude of undergraduate male and female students towards e-learning in the COVID era and to compare the attitude among undergraduate Arts, Science and Commerce students towards e-learning in COVID era concerning levels of attitude, gender, and stream, so descriptive survey method was used. Along with this, to study the influence of interaction between gender and streams of education on the attitude of undergraduate students, 2*3 Factorial Design was also used.

b) Participants: All the final year Undergraduate students studying at Gangadhar Meher University, Sambalpur were constituted the population of the present study. In the present study, a stratified random sampling technique

was used to select 180 final year Undergraduate students belonging to the Arts, Science, and Commerce stream of Gangadhar Meher University, Sambalpur. Out of which, 60 students each from Arts, Science, and Commerce streams were taken as samples. The following table depicts the distribution of samples in the present study.

Table 1: Distribution of samples in percentage

Factors	Levels	N	Percentage
Gender	Male	90	50%
	Female	90	50%
Stream of Education	Arts	60	33.33%
	Science	60	33.33%
	Commerce	60	33.33%

c) Instrument: The Attitude towards the e-Learning scale developed by Dimpal Rani (2015) was used in the present study. The scale has been standardized on a sample of 200 students Ludhiana District in Punjab, India. The scale comprises 65 items, out of which 38 items are positive items and 27 items are negative items. The test-retest method was used to find out the reliability of the scale, which showed a reliability index of 0.87. Content validity and construct validity were used to test the validity of the tool. The scale was developed to cover four aspects of e-learning such as e-learning interest, usefulness, ease of e-learning, and e-learning confidence.

d) Data Collection: The data for this study have been collected personally by the investigators. After getting permission from the authorities, the researchers personally visited various departments of Gangadhar Meher University, Sambalpur, and introduced the tools to the sample students, convincing them about the purpose of the data collection. Further, the researchers asked and requested them to complete all the items on the scale. After filling up the scale, the investigators individually collected all the scales.

RESULTS AND DISCUSSION

A) Descriptive Analysis

One of the objectives of the present study was to examine the attitudinal level of undergraduate students towards e-learning n the COVID era. So, this descriptive analysis was done using the norms of the attitude scale.

Table 2: Attitude of undergraduate students towards e-learning in the COVID Era

Sr.No.	Range of z-score	Grade	Remarks	Number of Students	Percentage of Students
1.	+2.01 and above	A	Extremely High	5	2.78%
2.	+1.26 to + 2.00	B	High	20	11.11%
3.	+0.51 to + 1.25	C	Above Average	17	9.44%
4.	-0.50 to + 0.50	D	Average	84	46.67%
5.	-1.25 to – 0.51	E	Below Average	38	21.11%
6.	-2.00 to -1.26	F	Low	13	7.22%
7	-2.01 and below	G	Extremely Low	3	1.67%
Total				180	100%

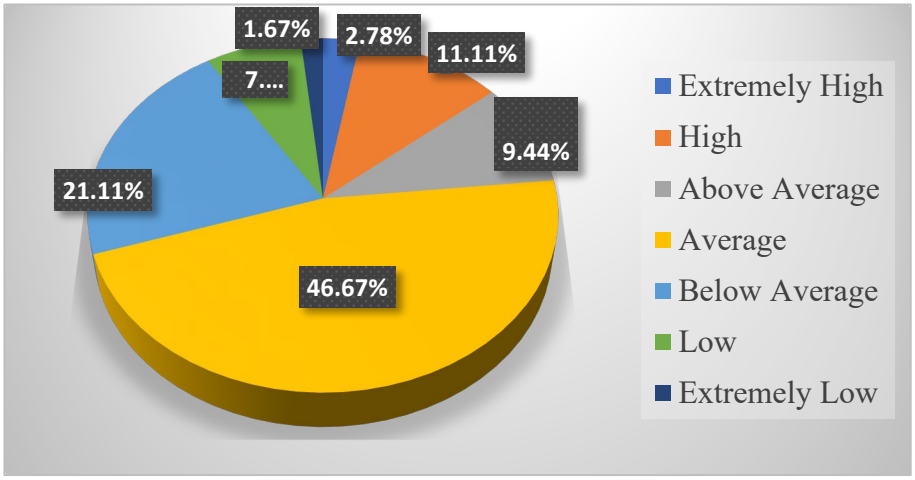

Figure 1: Attitude of undergraduate students towards e-learning in percentage

From Table 2 and Figure 1, it is revealed that the percentage of students having an extremely high level of attitude towards e-learning is 2.78%, the percentage of students having a high level of attitude towards e-learning is 11.11%, the percentage of students having an above-average level of attitude towards e-learning is 9.44%, the percentage of students having an average level of attitude towards e-learning is 46.67%, the percentage of students having a below-average level of attitude towards e-learning is 21.11%, the percentage of students having a low level of attitude towards e-learning is 7.22%, the percentage of students having an extremely low level of attitude towards e-learning is 1.67% in COVID era. So, from this, it is clear from the descriptive point of view that maximum undergraduate students are having an average level of attitude toward e-learning in the COVID era.

B) Predictor Analysis

In the present study, there were two independent variables i.e., gender and stream of education, and one dependent variable i.e., attitude towards e-learning. An attempt was taken to study whether gender and stream of education are the predictors of attitude towards e-learning or not? An effort was made to find out the factors which predict the attitude of undergraduate students towards e-learning. For this purpose, linear regression analysis was employed by converting the above-cited categorical variable into dummy variables in SPSS. The results of the regression analysis are presented below.

Table 3: Results of linear regression analysis

Model	Regression weight	Beta coefficient	R^2	F	P value	t-value	P-value
1	Gender	.253	.064	12.20**	.001	3.493**	.001
2	Science	-.110	.038	3.47*	.033	-1.287	.200
	Commerce	.115				1.345	.180

** Significant at 0.01 level
* Significant at 0.05 level

The table-3 shows two models of regression analysis. In the first model, gender has been taken into account as the independent variable. The R square value of the first model is .064, which reveals that 6.4% variance is caused by gender as a predictor of attitude towards e-learning. The F-value of the model is 12.20, which is significant at 0.01 level (P<0.01), and the t-value of the model was 3.493, which is also significant at 0.01 level (P<0.01). from this, it can be concluded that the gender of undergraduate students was found as a significant predictor of the attitude toward e-learning. Similarly, the second model was run for a stream of education. As the stream of education were having three levels, so, one group was taken as a reference group for comparison and linear regression was run. The model shows an R square value of .038 which reveals that 3.8% variance is caused by the stream of education when the Arts stream is taken as the reference group and a comparison is made. The F-value of the model was found as 3.47, which is significant at a 0.05 level (P<0.05). from which it can be concluded that the stream of education of undergraduate students is also a significant predictor of attitude towards e-learning in the COVID era. As both gender and stream of education, were found as significant predictors of attitude toward e-learning, further analyses were made to gain a deeper understanding by applying t-test and ANOVA.

C) Variation Analysis

a) Gender wise variations analysis

One of the objectives of the present study was to find out the attitudinal variations in the attitude of undergraduate students in terms of their gender. Here, gender was having two levels, namely, boys and girls. So, the t-test statistical technique was employed using SPSS-23, and the results are given below.

Table 4: Gender-wise mean, SD, df and t-value of attitude of undergraduate students towards e-learning in COVID Era

Groups	N	Mean	SD	Df	t- value	Sig.	Remark
Male Students	90	214.53	15.719	178	3.49**	.001	P<0.01
Female Students	90	224.30	21.366				

**Significant at 0.01 level

From Table 4, it is found that the attitude of undergraduate male and female students toward e-learning differed significantly (t=3.49; df=178; p<0.01) in favor of the attitude of the female undergraduate student toward e-learning (M=214.53<M=224.30). Therefore, the null hypothesis that there exists no sign of the difference between the attitude of undergraduate male and female students towards e-learning in the COVID era is rejected. Further, it can be said that the attitude of undergraduate female students towards e-learning is significantly better than the attitude of undergraduate male students towards e-learning in the COVID era related to e-learning interest, usefulness, ease of e-learning, and e-learning confidence.

b) Streamwise variations analysis

One of the objectives of the present study was to examine the attitude of undergraduate students towards e-learning regarding their stream of education. Here, the stream of education was having three levels, namely, the Arts, Science, and Commerce stream. So, the statistical comparison was made by employing One Way ANOVA by using SPSS-23, and the results are given below.

Table 5: Summary of the F-value for the attitude of undergraduate Arts, Science, and Commerce students towards e-learning in the COVID Era (N=180)

Source of Variation	Sum of Squares	df	Mean Square	F value	P-value	Remark
Between Groups	2521.23	2	1260.61	3.46*	.033	P<0.05
Within Groups	64392.51	177	363.80			
Total	66913.75	179				

*Significant at 0.05 level

As can be seen in Table 5, it is found that the mean scores of attitudes of undergraduate Arts, Science, and Commerce students towards e-learning differ significantly (F=3.46; df=178; p<0.05). Therefore, the null hypothesis that there exist no significant differences among mean scores of attitudes of undergraduate students belonging to Arts, Science, and Commerce streams towards e-learning in the COVID era is rejected. So, it can be said that the attitude of Arts, Science, and Commerce undergraduate students toward e-learning in the COVID era differed significantly related to e-learning interest, usefulness, ease of e-learning, and e-learning confidence.

As the result of One-Way ANOVA was significant, a posthoc test (Scheffe) was run to gain an understanding of the group having a better attitude towards e-learning, so a streamwise comparison was made accordingly.

Table 6: Stream-wise mean, standard deviation, and N of attitude

Streams	Mean	SD	N
Arts	219.35	18.45	60
Science	214.87	20.17	60
Commerce	224.03	18.56	60
Total	219.42	19.33	180

Table 7: Results of posthoc test (Scheffe)

Multiple Comparisons						
					95% Confidence Interval	
(I) Stream	(J) Stream	Mean Difference (I-J)	Std. Error	Sig.	Lower Bound	Upper Bound
Arts	Science	4.48	3.48	.438	-4.11	13.08
	Commerce	-4.68	3.48	.407	-13.28	3.91
Science	Arts	-4.48	3.48	.438	-13.08	4.11
	Commerce	-9.17*	3.48	.033	-17.76	-.57
Commerce	Arts	4.68	3.48	.407	-3.91	13.28
	Science	9.17*	3.48	.033	.57	17.76

* Significant at 0.05 level

The results of the Scheffe test give a clear picture of multiple comparisons on the attitude of undergraduate students belonging to the Arts, Science, and Commerce streams. As there were three levels of stream of education, multiple comparisons were run three times i.e., Arts vs Science, Arts vs Commerce, and Science vs Commerce. From table 4, it is clear that the mean difference between the attitude of undergraduate students belonging to the Arts and Science stream is found to be 4.48, which is not significant (P>0.05). The mean difference between the attitude of undergraduate students belonging to the Arts and Commerce stream is found to be 4.68, which is not significant (P>0.05). So, it can be said that the attitude of undergraduate students belonging to the Arts and Science stream, and Arts and Commerce stream did not differ significantly. Finally, the mean difference between the attitude of undergraduate students belonging to the Science and Commerce stream is found to be 9.17, which is significant (P<0.05). It revealed that there is significant altitudinal variation in the attitude of undergraduate students belonging to the Science and Commerce stream towards e-learning in the COVID era. Further, the mean score of undergraduate students' attitude towards e-learning was in favour of the Commerce stream, as the mean score for the Commerce stream was 224.03, which is significantly higher than of science stream which was found to be 214.87. So, it can be concluded that the undergraduate students belonging to Commerce stream were having a more positive attitude towards e-learning as compared to the students of the Arts and Science stream.

D) Analysis of Influence of Interaction between Gender and Stream of Education

One of the objectives of the present study was to examine the influence of the interaction of gender and the stream of education of undergraduate students towards e-learning in the COVID era. As per these objectives, two factors were taken into account i.e., gender and stream of education. Gender was having two levels, namely, boys and girls. Stream of education was having three levels, namely, Arts, Science and Commerce. So, the data was analyzed by employing Two-Way ANOVA or 2*3 Factorial Design ANOVA using SPSS-23, and the results are given below.

Table 8: Gender and streamwise mean, SD, and N of the attitude of undergraduate students towards e-learning

Gender	Stream	Mean	SD	N
Males	Arts	215.60	18.25	30
	Science	213.03	18.70	30
	Commerce	214.97	8.48	30
	Total	214.53	15.72	90
Females	Arts	223.10	18.18	30
	Science	216.70	21.70	30
	Commerce	233.10	21.41	30
	Total	224.30	21.37	90
Total	Arts	219.35	18.45	60
	Science	214.87	20.17	60
	Commerce	224.03	18.56	60
	Total	219.42	19.33	180

Table 9: Result of two-way ANOVA (2×3)

Source	Sum of Squares	df	Mean Squares	F	Sig.
Gender	4292.45	1	4292.45	12.79	.000
Stream	2521.23	2	1260.62	3.76	.025
Gender * Stream	1685.23	2	842.62	2.51	.084
Error	58414.83	174	335.72		
Total	8732775.0	180			
Corrected Total	66913.75	179			
a. R Squared = .127 (Adjusted R Squared = .102)					

From Tables 8 & 9, it can be seen that the F-value for interaction between Gender and Stream is found as 2.510 which is not significant at the 0.05 level. It indicates that there is no significant influence of interaction between gender and stream of education on the attitude of undergraduate students towards e-learning. It reveals that there exists no significant difference between the mean scores of undergraduate boys and girls belonging to the Arts, Science, and Commerce stream of education. Therefore, the null hypothesis that there is no significant influence of interaction between gender and the stream of education of undergraduate students towards e-learning in the COVID Era is accepted. Therefore, it may be said that the attitude of undergraduate students is free from interaction influence between gender and stream of education.

DISCUSSION OF RESULTS

After going through the analysis of the data and results of the study, it can be said that the majority of undergraduate students were having an average level of attitudes toward e-learning in the COVID era. The findings of the present study match with the findings of Dhas, (2017), Fouzdar & Behera, (2017), and Khan, (2017). The findings of the study conclude that undergraduate male students had a less positive attitude than undergraduate female students towards e-learning, which matches with the findings of Dhamija, (2014), Zabadi & Alawi, (2016), Gupta & Sharma, (2018), Sao et al., (2018). The findings of the present study show that the attitude of Arts, Science, and Commerce undergraduate students towards e-learning differed significantly, which matches with the findings of Fouzdar & Behera (2017), who found that there was a significant difference between PG Arts students and PG Science students in favour of PG Arts students, Periasamy (2019) who found significant differences among Language, Arts and Science B.Ed. trainees in favour of Science B.Ed. trainees, Nachimuthu (2020) found a significant difference between student teachers who belonged to Science and Arts stream. As far as the findings related to the influence of interaction between gender and stream of education is concerned, it was a new finding for which a smaller number of studies were found. From the analysis of the results of the present study, it can be hypothesized that the attitude of undergraduate girls was found to be significantly higher than the boys, it may be due to the higher participation of girls in attending online classes. It may also be due to the educational usage of the internet among girls. In addition to this, from the results relating to the attitude of Commerce stream students, which was found to be significantly higher than other streams, it can be hypothesized that the commerce undergraduate students may be needing to go for educational usage when they remain at home for doing mathematical calculations.

EDUCATIONAL IMPLICATIONS

The findings of the present study have the following implications for *students*,

- Students should be encouraged to attain various e-learning programs organized by different educational institutions and central and state governments to have better e-learning experiences
- Based on the findings of the present study, it is recommended that more e-learning materials and facilities should be provided to develop their attitude toward e-learning.

The findings of the present study have the following implications for *teachers*,

- Teachers should give more emphasis on the use of technology in the teaching-learning process.
- The E-learning process should be adopted by educational institutions and teachers to make students up-to-date.

The findings of the present study have the following implications for *policy makers*,

- Government should provide e-learning platforms for students of higher education and follow-up services should be provided to them.

- Various seminars, workshops, and symposiums should be organized for undergraduate students to develop an e-learning attitude among students at central, state, or institutional levels.

CONCLUSION

E-learning is a source of knowledge, values, skills, and student evaluation. It has brought a drastic change in the educational context. As far as the results of the present study are concerned, it was found that the attitude of undergraduate girls was found to be significantly higher than the boys. So, essential measures are needed to be taken in favour of boys, so that they can develop a positive attitude toward e-learning and focus on their studies. On the other hand, the attitude of undergraduate students belonging to the Commerce stream was found to be significantly higher as compared to others. So, essential measures should be taken similarly to develop the attitude of undergraduate students in the Arts and Science stream towards e-learning. However, the study concluded gender and stream of education as significant predictors of attitude toward e-learning, especially for undergraduate students. In addition to that, it was concluded that there was a significant influence of interaction between gender and stream of education on the attitude of undergraduate students towards e-learning.

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No potential conflict is reported in the study.

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