



“Is Online Teaching–Learning Process an Effective Tool for Academic Advancement”

Seema Verma, Deepa Tyagi, and Rakesh Verma

Abstract

In modern times, especially in the current prevailing COVID-19 period, a system of studies came into the picture replacing the classroom learning with online classes. Although there are many challenges which the teachers and learners are facing during their online process of interaction, it has become the need of the hour. There may be various questions related to the online methods of teaching and learning such as the quality of online teaching, problems of students, the question of recognition, health issues, Internet connection, professional space, and still, its popularity is incredible. The online work environment now involves using communicative teaching tools and different software to interact with the learners as required. Microsoft Teams, Google Meet, Olympus, Zoom, and many more names are enlisted in the category of online assistance tools for academic advancement in the teaching–learning process. In the online mode of teaching, the teachers may choose their own schedules and timings, but is this flexibility adds to learning, or is it only a facility? Moreover, salaries for online instructors or teachers solely depend on the organization for which they are teaching, and it hardly matters what is their qualification and experience. It may be said that online teaching–learning provides a golden opportunity to meet people across the world while staying at home and it may be a rich experience for them to learn new things about the culture of other learners. They can share their way of life including their foods, clothes,

behavior, etc., contributing to the mutual understanding and building global bridges: they can have a wonderful experience of all kinds of lifestyles.

Keywords

Microsoft teams • Google meet • Olympus • Online • Teaching–learning

1 Introduction

Before COVID-19, the online teaching–learning process was popularized as a distant learning course. Most commonly, it was used for the higher education programs. This process was opted by the persons who were not able to go to the institutions/universities/colleges, but they are willing to study, and they study by themselves with the study materials provided by the institutions. In the process, the students were communicating through the correspondence process via postal/courier media along with telephonic conversations and e-mails. The number of students in online teaching/distant learning is increasing continuously and everyone is considered in their career program with their online courses.

The onset of COVID-19 is very much unexpected and became the name of a terror for the public in general because it is leading to toll. Students are children, and children are more sensitive toward the contagious diseases, mainly upper respiratory tract infection and lung infection diseases. The pandemic of COVID-19 created an awkward condition of lockdown in almost all the places, therefore, all schools, colleges, and workplaces were closed which lead to employees to be suffered from their income and students were suffered in their education. In the month of March 2020, it was understood that COVID-19 will be limited by 2 or 3 months, and in the earlier phases of COVID-19, it was the time for examinations along with the high time for the studies, so students suffered a lot in the academics. So, to

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complete the session of students, the online method of the teaching–learning process with the digital technology of smartphones, laptops, and the Internet was utilized.

The pandemic of COVID-19 as assumed did not end in 3 months but keep spreading and exaggerating daily to month on month time. This is the third week of September 2020 in running and approximately fifty-five-lakh-sixty-eighty-thousands cases have occurred in India with total death of approximately eighty-eight-thousands-nine-hundred-ninety, and approximately seventy-lakh cases are reported in America with total death of approximately two-lakhs-four-thousand-five-hundred have been reported (data sources—world-o-meter—corona-virus cases). Currently, 2% death rate out of infected cases is running for COVID-19, which was fearsome with more than 3% just 2 months back (data sources—world-o-meter—corona-virus cases).

Nowadays, it is the time of advancing in technology, Internet connections with high-speed broadband, and 4G are popularizing in the society, business world, and institutions. Side by side, high speed, compatible and loaded with software, machines like computers, laptops, tablets, and smartphones are available which are supporting all the commercial work of the business, promotion, teaching, learning, communication, etc. Therefore, students are getting benefits for their academics from the teachers and institutions. Applications like Microsoft Team, Google Meet, Olympus, WebEx, etc., are playing an important role in the teaching–learning process.

1.1 Microsoft Team

Microsoft Team is a platform that helps in communication for business propagations and collaborations. So, because of its importance and utility, Microsoft Team is used for the conversation, explanations, and presentations by the teaching community to the students who are at distant places in their home. With the use of Internet facility, audio–video and presentation along with slide share, etc., can be easily done; which gives easy accessibility to the students as well to the teachers. Microsoft launched the Microsoft Team on March 14, 2017, all over the world by Brian McDonald (Corporate Vice-president). Microsoft professionals are approaching the institution and installing teams with their institutions for teachers and students for audio–video, presentation, attendance, assignments, quizzes, etc. The growth of users of Microsoft Team is remarkable and mentioned in the following table from November 2017 to April 30, 2020. The sources of the data are mentioned in Table 1 (Fig. 1):

1.2 Google Meet

Google Hangouts and Google Chat combined to become Google Meet and launched in March 2017 for video conferencing. It is used for business purposes as well as for

academics' purposes by students and teachers/professors. It is easy in handling and offers satisfaction to the users. From the January 2020 month, the use has increased very much. It can be used through smartphones, laptops, tablets, and desktops. Currently, Google Classroom is used by more than 100 million students which are doubled when compared to March 2020 starting (according to CEO Sundar Pichai). Approximately 100 million participants are using Google Meet nowadays. (Source https://www.google.com/search?q=ggoogle+meet+growth+in+India&rlz=1C1CHZL_hiIN767IN767&oq=ggoogle+meet+growth+in+India&aqs=chrome..69i57.26003j1j4&sourceid=chrome&ie=UTF-8).

1.3 Growth of the Internet

We are nearly 700 million users across the country in India in 2020, and users are increasing in a good proportionate in urban areas as well as in rural areas. India stands second position on the Internet (online) market globally as per the year 2019 while China stands for number 1 in 2019. In India, the number of users of the Internet with growth is shown in Table 2: (as compared to other years, 2020 is an incomplete year, therefore, data is accordingly) (Fig. 2).

The growth of broadband users in India is also increased because of COVID-19 and people are required to work from home and students must take classes online. The data for February and March 2020 is shown in Table 3 (Fig. 3).

The number of 4G users, i.e., users of the Internet with smartphones is increasing at a very fast rate which became 348 million in 2020 (year not complete) as compared to 183 million in 2019. As because of COVID-19, people are using more and more smartphones for academic purposes mainly and also for other purposes. Students are more comfortable with smartphones for an audio–video conversation with their teacher (Fig. 4).

2 Literature Review

Research study is based on primary data and subject matter is relatively new, so more secondary data and literature is not required.

- (1) Bao [1], he states that corona closed all university campuses, so students and teachers shifted to online education platforms.
- (2) Sophia [7], she states that to ensure accessibility, students need support for online classes. Positive output and challenges were seen in online classes.
- (3) Kaup et al. [3], they state that because of keeping social distance and restricted movements, online education substituted traditional education.
- (4) Kim [4], he states that COVID-19 made online education ubiquitous and online teaching–learning plays an indispensable role.

Table 1 Active Microsoft Team users worldwide

Month	Microsoft Team users (million)		
		Growth	Growth%
Nov-17	2		
Aug-18	5	3	150.00
Nov-18	8	3	60.00
Jul-19	13	5	62.50
Nov-19	20	7	53.85
12-Mar-20	32	12	60.00
19-Mar-20	44	12	37.50
30-Apr-20	75	31	70.45

Source <https://www.statista.com/statistics/1033742/worldwide-microsoft-teams-daily-and-monthly-users/#:~:text=Microsoft%20Teams%3A%20number%20of%20daily%20active%20users%202019%20and%202020&text=The%20number%20of%20daily%20active,2020>

Source <https://www.businessofapps.com/data/microsoft-teams-statistics/>

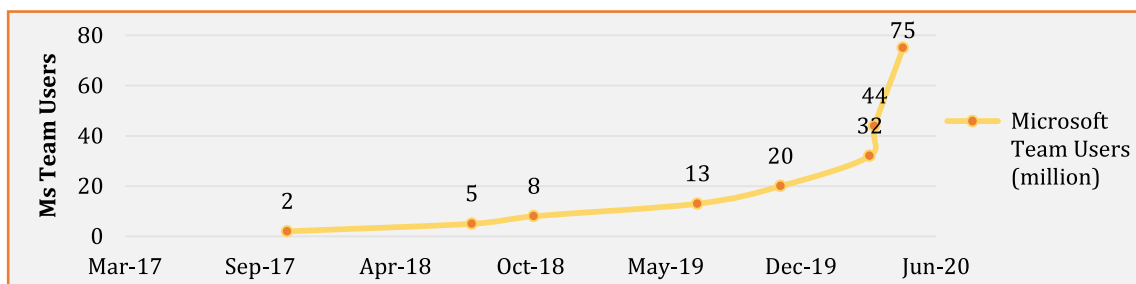


Fig. 1 Microsoft Team users (million) (Sources Table 1)

Table 2 Growth of the Internet in India

Year	Number of Internet users in India (millions)		
		Growth in users	Growth %
2015	302.36		
2016	342.56	40.2	13.30
2017	422.2	79.64	23.25
2018	493.96	71.76	17.00
2019	636.73	142.77	28.90
2020	696.77	60.04	9.43

Source <https://www.statista.com/statistics/255146/number-of-internet-users-in-india/>

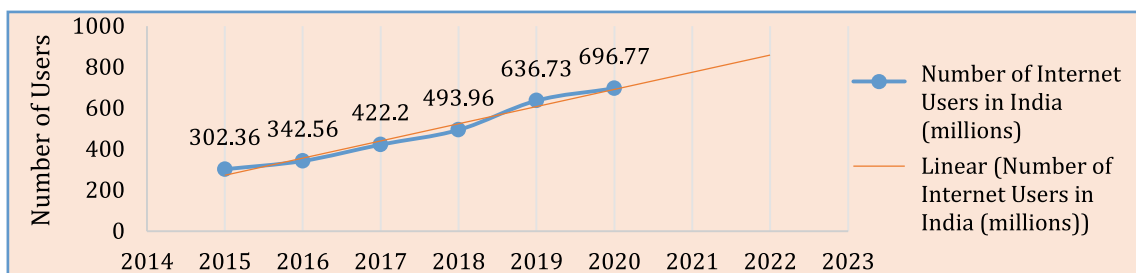
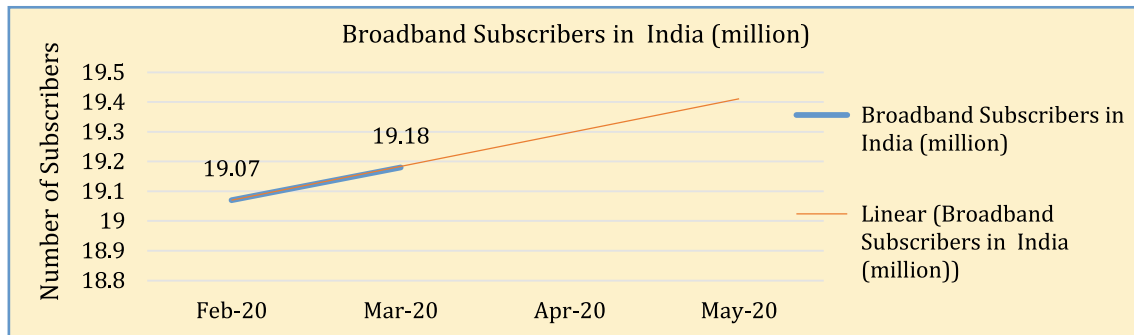


Fig. 2 Number of Internet users in India (millions) (Sources Table 2)

Table 3 Broadband subscribers in India

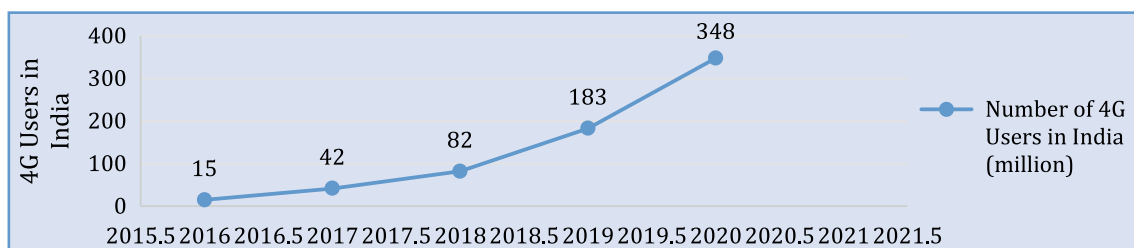
Month	Broadband subscribers in India (million)		
Feb-20	19.07	Growth	Growth %
Mar-20	19.18	0.11	0.58

Source <https://www.telecomlead.com/broadband/indias-wired-broadband-subscribers-reach-19-18-mn-in-march-2020-96017#:~:text=India's%20wired%20broadband%20subscribers%20reach%2019.18%20mn%20in%20March%202020,-July%2019%2C%202020&text=India's%20wired%20broadband%20subscribers%20rose,661.45%20million%20in%20February%202020>

**Fig. 3** Broadband subscribers in India (million) (Sources Table 3)**Table 4** 4G connections (millions) in India

Year	Number of 4G users in India (million)		
2016	15	Growth	Growth %
2017	42	27	180.00
2018	82	40	95.24
2019	183	101	123.17
2020	348	165	90.16

Source <https://indiaincgroup.com/india-ready/#:~:text=We%20expect%20to%20provide%20at,of%204G%20BTS%20are%20233%2C695>

**Fig. 4** Number of 4G users in India (million) (Sources Table 4)

- (5) Dhawan [2], she states that in an early period many institutions were not ready for online classes, but, later on with SWOT analysis and with the importance of online classes they are shifted.
- (6) Rapanta et al. [5], they said that there are significant challenges like face to face classes must shift online and for this learning activities need certain characteristics.
- (7) Sindiani et al. [6], they said that new methods of teaching were adapted for online learning. Advantages and

disadvantages along with experiences of students and teachers was accessed with the help of 18 questions survey.

3 Objectives

- (1) To judge the use of online classes at different educational qualification

- (2) To explore the effectiveness of online teaching at students and teachers’ level
- (3) To understand the utility of online classes
- (4) To find the familiarity for the use of different gadgets for online classes
- (5) To access the attitude of the public toward the online teaching–learning process
- (6) To see the advancement of online classes.

4 Methodology

Online teaching–learning is supported by the Internet, broadband, Wi-Fi, Microsoft Team, Google Meet, etc., to understand the growth and uses of these supports secondary data is explored through the Internet which is discussed above in Sects. 2, 3, and 4. To understand the effectiveness and advancements, categorical primary data is collected with the help of a structured questionnaire, and with the help of many attributes and social factors. Place, profile, age group, and educational group are considered as social factors. Nine attributes are selected for the usages and utility of online classes with variables of ‘easily’, ‘with extra efforts’, ‘difficult’, and ‘not’. Seven attributes are selected for the attitude and advancement of online classes with dimensions of ‘yes’, ‘may be’, ‘no’, and ‘cannot say’.

Hypothesis:

For usages and utility: If the number of responses is more with variables ‘easily’ and ‘with efforts’, it means that students and teachers wish to use online classes more with better utility, thus, online teaching–learning is an effective tool.

H_{0E} : Students and teachers understand that online classes are effective tool.

H_{AE} : Students and teachers understand that online classes are not effective tool.

For Attitude and Advancements: If the number of responses is more with ‘yes’ and ‘maybe’, it means that students and teachers want to use online classes for academic advancement.

H_{0A} : Students and teachers understand that online classes help in academic advancement.

H_{AA} : Students and teachers understand that online classes do not help in academic advancement.

To judge the null hypothesis and alternate hypothesis percentage analysis, the chi-square test, p -values, C -values, and ϕ -values will be applied. Chi-square test is calculated through excel. The lower value of χ^2 state that H_0 cannot be

rejected and p -value higher than the significant value (α) support this, therefore, H_0 is accepted.

Tools of Analysis:

Percentage tools, pivot table, probability (p) value for chi-square (MS Excel), chi-square Inv RT value (χ^2) (MS Excel), coefficient of contingency ($C = \sqrt{(\chi^2/(\chi^2 + N))}$), and phi coefficient ($\phi = \sqrt{\chi^2/N}$), etc., are used.

Sample Area:

A structured questionnaire is circulated through Google Form in September 2020 to a few thousand people via the forwarding process. The response received from 78 places, which belong to different 11 states of India.

Sample Size: The questionnaire circulated through WhatsApp and the data from 267 respondents received as primary data which is used for analysis and testing the hypothesis.

Sample Design: Categorical samples as the questionnaire are used to obtain to judge the utility of the online teaching–learning process as an effective tool with four variables, and few sample questions are designed to judge the advancement of the online teaching–learning process.

Research Design: Descriptive and exploratory research design is used to judge the online teaching–learning process is an effective tool and help in advancement.

5 Analysis

Based on primary data, tables and graphs for social values with the percentage of respondents are drawn below, which are self-explanatory (Table 5).

Respondents responded from 78 places, out of that 92 are from Ghaziabad. Wide coverage with more variety of primary data is obtained which will lead to trustworthy inference in the study. The percentage of the city, metro city, and villages are in Table 6.

Statistical Analysis:

To judge that a teaching–learning process is an effective tool, following χ^2 , p , C , and ϕ values are analyzed with the primary data (sources questionnaire with Google Form September 2020) ($N = 267$). Social groups of students, teachers, and others are explored with selected attributes. Respondents are able to use online classes with variables ‘easily’ and ‘with extra efforts’ and ‘yes’ and ‘maybe’ are considered as positive effect toward online classes and the variables ‘not’ and ‘difficult’ and ‘no’ ‘cannot say’ are considered as negative effect toward online classes (Fig. 5; Tables 7, 8, 9, 10, 11, 12 and 13).

Table 10 Internet connection respondents have

Row labels	Count of Internet connection you have (%)
3G	8.24
4G	53.93
Broadband	8.61
No Internet	2.62
Wi-Fi	26.59
Grand total	100.00

Table 11 Respondents use the gadget

Row labels	Count of for online teaching, the gadget, you (%)
Borrowed	5.24
Had already	77.53
Have to purchase	11.99
Shared with someone	5.24
Grand total	100.00

Table 12 Respondents have gadget for online teaching

Row labels	Count of which gadgets you have for online teaching? (%)
Desktop	1.12
Laptop	38.58
Smartphone	59.55
Tablet/iPad	0.75
Grand total	100.00

Table 13 How you became familiar with the gadget?

	Respondents	Others	Students	Teachers
<i>P</i> -value	0.999989327	0.622723686	0.785157195	0.99540176
χ^2 value	13.70773102	4.399925891	5.537582436	3.019917662
χ^2 Crit	58.12403768	12.59158724	16.9189776	21.02606982
α	0.05	0.05	0.05	0.05
df	42	6	9	12
$C = \sqrt{(\chi^2 / (\chi^2 + N))}$	0.220981339	0.127326212	0.142543331	0.105754693
$\phi = \sqrt{\chi^2 / N}$	0.226582913	0.128371037	0.14401392	0.106351084

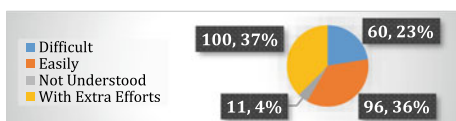


Fig. 6 Are you able to understand through online teaching?

1. How you became familiar with the Gadget?

93% of respondents responded that they became familiar with gadgets easily and with extra efforts in online classes. The calculated χ^2 values are quite lower than the critical value and show acceptance of the null hypothesis. Lower χ^2

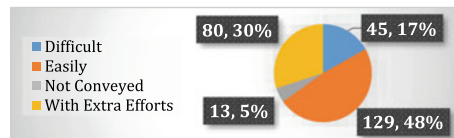
value state that H_0 cannot be rejected, which is supported by high *P*-values which are much higher than $\alpha = 0.05$. The *C*-values and ϕ -values very small which shows less association and support χ^2 values. This means that respondents became familiar easily with gadgets for online classes and have independency of the use of gadgets (Fig. 6; Table 14).

2. Are you able to understand through Online Teaching?

73% of respondents responded that they are able to understand easily and with extra efforts in online classes. The calculated χ^2 values are smaller than the critical value,

Table 14 Are you able to understand through online teaching?

	Respondents	Others	Students	Teachers
<i>P</i> -value	0.143645238	0.274061598	0.049006228	0.892699407
χ^2 value	51.76541308	7.536522919	16.98151559	6.433054167
χ^2 Crit	58.12403768	12.59158724	16.9189776	21.02606982
α	0.05	0.05	0.05	0.05
df	42	6	9	12
$C = \sqrt{(\chi^2/(\chi^2 + N))}$	0.402980699	0.16568586	0.244536216	0.153385073
$\phi = \sqrt{\chi^2/N}$	0.440315741	0.168007969	0.252192748	0.155221892

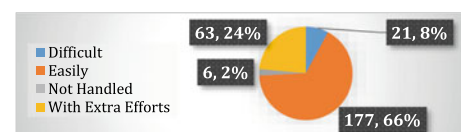
**Fig. 7** Are you able to communicate properly in online classes?**Table 15** Are you able to communicate properly in online classes?

	Respondents	Others	Students	Teachers
<i>P</i> -value	0.984769525	0.827399024	0.587342253	0.978510853
χ^2 value	24.67138829	2.850206787	7.479340924	4.249075541
χ^2 Crit	58.12403768	12.59158724	16.9189776	21.02606982
α	0.05	0.05	0.05	0.05
df	42	6	9	12
$C = \sqrt{(\chi^2/(\chi^2 + N))}$	0.29083715	0.102772473	0.1650733	0.125159291
$\phi = \sqrt{\chi^2/N}$	0.303977307	0.103319561	0.16736939	0.126151261

thus, overall respondents and teachers are able to understand through online teaching. The χ^2 value for students is nearly the same as the critical value and the *p*-value is also near to α , therefore, it is clear that the students have difficulty in understanding through online classes. These both different responses are supported by *p*-value, *C*-value, and ϕ -value accordingly. So, it means that students have some dependency on online classes (Fig. 7; Table 15).

3. Are you able to communicate properly in online classes?

78% of respondents responded that they are able to communicate easily and with extra efforts in online classes. The calculated χ^2 values are quite lower than critical values, and it states that respondents are easily able to communicate in online classes. The high *p*-values than α and smaller *C* and ϕ values support this. Therefore, H_0 cannot be

**Fig. 8** Are you able to operate the gadget in online classes?

rejected. So, the null hypothesis is accepted, and respondents have no dependency on communication in online classes (Fig. 8; Table 16).

4. Are you able to operate the Gadget in online classes?

90% of respondents responded that they are able to operate and handle the gadgets easily and with extra efforts in online classes. The calculated χ^2 values are quite lower than critical values, and it states that the respondents are easily able to operate/handle the gadgets in online classes.

Table 16 Are you able to operate the gadget in online classes?

	Respondents	Others	Students	Teachers
<i>P</i> -value	0.999945135	0.586319197	0.858963193	0.997867436
χ^2 value	15.38264259	4.673486607	4.708251946	2.576351594
χ^2 Crit	58.12403768	12.59158724	16.9189776	21.02606982
α	0.05	0.05	0.05	0.05
df	42	6	9	12
$C = \sqrt{(\chi^2/(\chi^2 + N))}$	0.233397648	0.13115863	0.131637138	0.097760107
$\phi = \sqrt{\chi^2/N}$	0.24002686	0.132301531	0.132792705	0.098230631

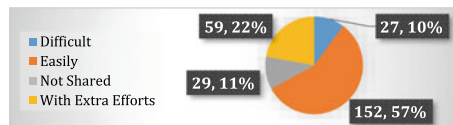


Fig. 9 Are you able to share PPT, video, numerical, etc.?

Table 17 Are you able to share PPT, video, numerical, etc.?

	Respondents	Others	Students	Teachers
<i>P</i> -value	0.917155612	0.722230244	0.314102496	0.910361346
χ^2 value	29.99394476	3.662566086	10.46586532	6.111422602
χ^2 Crit	58.12403768	12.59158724	16.9189776	21.02606982
α	0.05	0.05	0.05	0.05
df	42	6	9	12
$C = \sqrt{(\chi^2/(\chi^2 + N))}$	0.317792026	0.116326494	0.194215009	0.14958954
$\phi = \sqrt{\chi^2/N}$	0.335166931	0.117121629	0.197984842	0.151291848

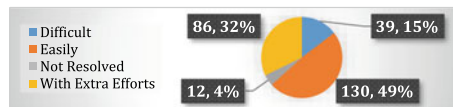


Fig. 10 Are you able to resolve the objections/queries/issues?

The high *p*-values than α and smaller *C* and ϕ values support this. Therefore, H_0 cannot be rejected. So, the null hypothesis is accepted, and respondents have independency to use the gadgets (Fig. 9; Table 17).

5. Are you able to share PPT, Video, Numerical, etc.?

79% of respondents responded that they are able to share PPT, video, numerical, etc., easily and with extra efforts in online classes. The calculated χ^2 values are much lower than critical χ^2 values, and it states that the respondents are easily able to share PPTs, video, etc., in the online classes. The high *p*-values than α and smaller *C* and ϕ values support this. Therefore, H_0 cannot be rejected. So, the null

hypothesis is accepted, and respondents have independency in sharing the PPTs, videos, etc. (Fig. 10; Table 18).

6. Are you able to resolve the objections/queries/issues?

81% of respondents responded that they are able to resolve the objections/queries/issues easily and with extra efforts in online classes. The calculated χ^2 values are quite lower than critical values, and it states that the respondents are easily able to resolve the objections/queries/issues in the online classes. The high *p*-values than α and smaller *C* and ϕ values support this. Therefore, H_0 cannot be rejected. So, the null hypothesis is accepted, and respondents have independency in handling to resolve the objections (Fig. 11; Table 19).

Table 18 Are you able to resolve the objections/queries/issues?

	Respondents	Others	Students	Teachers
P -value	0.998972221	0.707939272	0.970241826	0.906460648
χ^2 value	19.28221906	3.768731868	2.841691276	6.18518206
χ^2 Crit	58.12403768	12.59158724	16.9189776	21.02606982
α	0.05	0.05	0.05	0.05
df	42	6	9	12
$C = \sqrt{(\chi^2 / (\chi^2 + N))}$	0.259526266	0.117977276	0.102620452	0.150469222
$\phi = \sqrt{\chi^2 / N}$	0.26873416	0.118806989	0.103165103	0.152202089

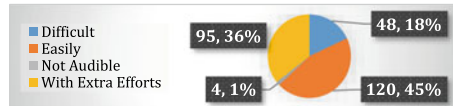


Fig. 11 Are you able to listen to the voice clearly?

Table 19 Are you able to listen to the voice clearly?

	Respondents	Others	Students	Teachers
P -value	0.951754496	0.181483856	0.553891304	0.997487223
χ^2 value	28.02351661	8.862090356	7.805191803	2.663958629
χ^2 Crit	58.12403768	12.59158724	16.9189776	21.02606982
α	0.05	0.05	0.05	0.05
df	42	6	9	12
$C = \sqrt{(\chi^2 / (\chi^2 + N))}$	0.308200259	0.179234693	0.168530816	0.099392196
$\phi = \sqrt{\chi^2 / N}$	0.323970664	0.182184933	0.170976396	0.099886802

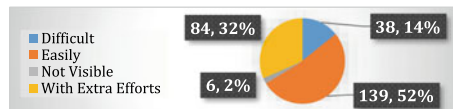


Fig. 12 Are you able to visualize the presentation?

Table 20 Are you able to visualize the presentation?

	Respondents	Others	Students	Teachers
P -value	0.992834156	0.235881026	0.909415296	0.983179529
χ^2 value	22.89915376	8.030448831	4.030174593	4.014159469
χ^2 Crit	58.12403768	12.59158724	16.9189776	21.02606982
α	0.05	0.05	0.05	0.05
df	42	6	9	12
$C = \sqrt{(\chi^2 / (\chi^2 + N))}$	0.281051717	0.170875391	0.121941942	0.12170301
$\phi = \sqrt{\chi^2 / N}$	0.292855973	0.173426029	0.122858809	0.122614457

7. Are you able to listen to the voice clearly?

81% of respondents responded that they are able to listen to the voice clearly, easily, and with extra efforts in online classes. The calculated χ^2 values are quite lower than critical

values, and it states that the respondents are easily able to listen to the voice clearly in the online classes. The high p -values than α and smaller C and ϕ values support this. Therefore, H_0 cannot be rejected. So, the null hypothesis is

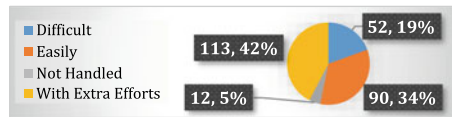


Fig. 13 Are you able to handle the challenge of online classes?

Table 21 Are you able to handle the challenge of online classes?

	Respondents	Others	Students	Teachers
<i>P</i> -value	0.452528415	0.325559625	0.248745436	0.690927585
χ^2 value	42.42777227	6.949318861	11.40847418	9.140008747
χ^2 Crit	58.12403768	12.59158724	16.9189776	21.02606982
α	0.05	0.05	0.05	0.05
df	42	6	9	12
$C = \sqrt{(\chi^2 / (\chi^2 + N))}$	0.370292972	0.159270743	0.202428919	0.181931809
$\phi = \sqrt{\chi^2 / N}$	0.398629545	0.161330132	0.206708412	0.185019573

accepted, and respondents have independence in voice clarity (Fig. 12; Table 20).

8. Are you able to visualize the presentation?

84% of respondents responded that they are able to visualize the presentation clearly, easily, and with extra efforts in online classes. The calculated χ^2 values are quite lower than critical values, and it states that the respondents are easily able to visualize the presentation in the online classes. The high *p*-values than α and smaller *C* and ϕ values support this. Therefore, H_0 cannot be rejected. So, the null hypothesis is accepted, and respondents have independence in the presentation (Fig. 13; Table 21).

9. Are you able to handle the challenge of online classes?

76% of respondents responded that they are able to handle the challenge of online classes easily and with extra efforts in online classes. The calculated χ^2 values are quite lower than critical values, and it states that the respondents are easily able to handle the challenges in the online classes.

Table 22 Do students wish to learn from online classes?

	Respondents	Others	Students	Teachers
<i>P</i> -value	0.345269305	0.01504645	0.438921563	0.713632078
χ^2 value	45.05653881	15.76944117	8.982171346	8.87424899
χ^2 Crit	58.12403768	12.59158724	16.9189776	21.02606982
α	0.05	0.05	0.05	0.05
df	42	6	9	12
$C = \sqrt{(\chi^2 / (\chi^2 + N))}$	0.37998134	0.236152156	0.180405658	0.179353651
$\phi = \sqrt{\chi^2 / N}$	0.410793235	0.243025878	0.183415079	0.182309867

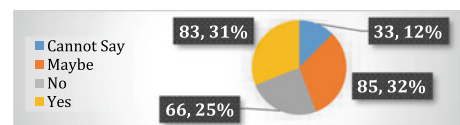


Fig. 14 Do students wish to learn from online classes?

The high *p*-values than α and smaller *C* and ϕ values support this. Therefore, H_0 cannot be rejected. So, the null hypothesis is accepted, and respondents have independency in handling the challenges (Fig. 14; Table 22).

10. Do Students wish to learn from online classes?

63% of respondents responded, ‘yes and maybe’, that they wish to learn from online classes. The calculated χ^2 values are smaller than critical values for overall respondents, students, and teachers, and it states that they wish to learn from the online classes. The high *p*-values than α and smaller *C* and ϕ values support this. Therefore, H_0 cannot be rejected. So, the null hypothesis is accepted, and overall respondents have independence in learning. But other than

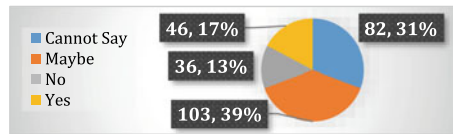


Fig. 15 Are teachers happy with online classes?

Table 23 Are teachers happy with online classes?

	Respondents	Others	Students	Teachers
P -value	0.133631307	0.649114461	0.766980248	0.041016229
χ^2 value	52.24422583	4.203828768	5.726173936	21.70055007
χ^2 Crit	58.12403768	12.59158724	16.9189776	21.02606982
α	0.05	0.05	0.05	0.05
df	42	6	9	12
$C = \sqrt{(\chi^2/(\chi^2 + N))}$	0.404536417	0.124501505	0.144900158	0.274164718
$\phi = \sqrt{\chi^2/N}$	0.44234744	0.125477795	0.146445704	0.285088527

students and teachers, for example, parents or others, they do not want the online classes for schooling or learning; therefore, the calculated χ^2 value is higher than the critical value and is supported by the p -value also. Overall respondents are accepting the advancement of online learning (Fig. 15; Table 23).

11. Are Teachers happy with online classes?

56% of respondents responded, 'yes and maybe', that teachers are happy with online classes. The calculated χ^2 values are smaller than critical values for overall respondents and students, and it states that they are happy with online classes. The high p -values than α and smaller C and ϕ values support this. Therefore, H_0 cannot be rejected. So, the null hypothesis is accepted. But teachers are supposed to be burdened with online classes, a change in technology and pedagogy, preparation of PPTs, video, checking assignments online, conducting examinations, etc., has created an extra work as the additional workload on the teachers, therefore, the χ^2 value is almost same and the p -value is also nearby to

Table 24 Are assignments, question-answers easy with online classes?

	Respondents	Others	Students	Teachers
P -value	0.992420473	0.155229925	0.876335585	0.898771143
χ^2 value	23.02233308	9.342158944	4.489695215	6.325891396
χ^2 Crit	58.12403768	12.59158724	16.9189776	21.02606982
α	0.05	0.05	0.05	0.05
df	42	6	9	12
$C = \sqrt{(\chi^2/(\chi^2 + N))}$	0.28174677	0.183865418	0.128597272	0.152131967
$\phi = \sqrt{\chi^2/N}$	0.293642583	0.187054429	0.129673968	0.153923608

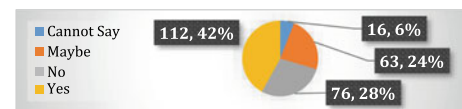


Fig. 16 Are assignments, question-answers easy with online classes?

α . But the overall scenario shows the advancement in the online classes with satisfactory happiness in the attitude of teachers. Ultimately, these are the teachers who have to take care of everything about online classes and enhancement of the student's performance (Fig. 16; Table 24).

12. Are assignments, question-answers easy with online classes?

66% of respondents responded, 'yes and maybe', that assignments, question-answers easy with online classes. The calculated χ^2 values are quite lower than critical values, and it states that the respondents are easily able to handle the assignments and question-answers in the online classes. The

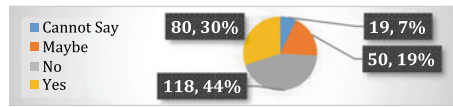


Fig. 17 Do you receive the same/better advantage with online classes?

Table 25 Do you receive the same/better advantage with online classes?

	Respondents	Others	Students	Teachers
<i>P</i> -value	0.80350603	0.199892774	0.274144659	0.475043789
χ^2 value	34.05695808	8.559750655	11.02286872	11.63955877
χ^2 Crit	58.12403768	12.59158724	16.9189776	21.02606982
α	0.05	0.05	0.05	0.05
df	42	6	9	12
$C = \sqrt{(\chi^2 / (\chi^2 + N))}$	0.336340057	0.176247378	0.199116412	0.204383989
$\phi = \sqrt{\chi^2 / N}$	0.357147239	0.179050248	0.20318502	0.20879141

high *p*-values than α and smaller *C* and ϕ values support this. Therefore, H_0 cannot be rejected. So, the null hypothesis is accepted, and respondents have independency in handling the assignments and question-answers (Fig. 17; Table 25).

13. Do you receive the same/better advantage with online classes?

49% of respondents responded, ‘yes and maybe’, that they receive the same/better advantage with online classes as they were receiving from regular (offline) classes. The calculated χ^2 values are quite lower than critical values, and it states that the respondents receive the same/better advantage with the online classes as they were receiving through regular classes in their institutions. The high *p*-values than α and smaller *C* and ϕ values support this. Therefore, H_0 cannot be rejected. So, the null hypothesis is accepted (Fig. 18; Table 26).

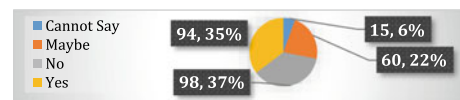


Fig. 18 Is the interaction between students and teacher easy in online classes?

14. Is the interaction between students and teachers easy in online classes?

57% of respondents responded, ‘yes and maybe’, that the interaction between students and the teacher easily converses in online classes. The calculated χ^2 values are quite lower than critical values, and it states that the interaction between students and teachers is easy with the online classes. The high *p*-values than α and smaller *C* and ϕ values support this. Therefore, H_0 cannot be rejected. So the null hypothesis is accepted, and respondents have independence in interaction (Fig. 19; Table 27).

Table 26 Is the interaction between students and teachers easy in online classes?

	Respondents	Others	Students	Teachers
<i>P</i> -value	0.908728681	0.166394445	0.478986371	0.864375144
χ^2 value	30.38467173	9.130063437	8.558475721	6.896524911
χ^2 Crit	58.12403768	12.59158724	16.9189776	21.02606982
α	0.05	0.05	0.05	0.05
df	42	6	9	12
$C = \sqrt{(\chi^2 / (\chi^2 + N))}$	0.319645051	0.181836076	0.17623466	0.158679891
$\phi = \sqrt{\chi^2 / N}$	0.337342954	0.184918885	0.179036913	0.160716151

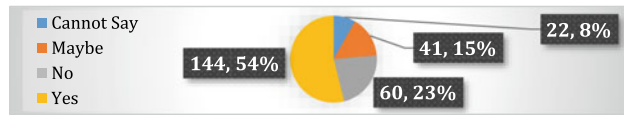


Fig. 19 Is the workload more with online classes than offline?

Table 27 Is the workload more with online classes than offline?

	Respondents	Others	Students	Teachers
P -value	0.267959355	0.270397458	0.161598002	0.539964295
χ^2 value	47.21374225	7.581457179	13.02234005	10.87147498
χ^2 Crit	58.12403768	12.59158724	16.9189776	21.02606982
α	0.05	0.05	0.05	0.05
df	42	6	9	12
$C = \sqrt{(\chi^2 / (\chi^2 + N))}$	0.387633788	0.166165455	0.215649361	0.197798162
$\phi = \sqrt{\chi^2 / N}$	0.420512182	0.168508073	0.220845668	0.201784872

15. Is the workload more with online classes than offline?

69% of respondents responded, ‘yes and maybe’, that the workload is more with online classes. The calculated χ^2 values are quite lower than critical values, and it states that the workload is more on teachers and students with the online classes. The high p -values than α and smaller C and ϕ values support this. Therefore, H_0 cannot be rejected. So the null hypothesis is accepted. The reason for more workload may be the creation and study of PPTs, PDFs, video, assignments, online-questions-bank, etc.

6 Conclusion

The percentages of respondents, for the ‘teaching–learning’, are an effective tool and has better utility and uses, are on the higher side. 93% respondents are familiar with gadgets, 73% respondents are in the understanding mode, 78% respondents are able to communicate, 90% respondents are operating gadgets, 79% respondents are able to share PPT, video, etc., 81% respondents are able to resolve objections, 81% respondents are able to listen clearly, 84% respondents are able to see presentation clearly, and 76% respondents are able to handle the challenge of online classes, thus, it states that online teaching–learning is an effective tool. For these attributes, all the calculated χ^2 test values are smaller than the critical values of χ^2 tests, which is supported by high P -values (p -values are higher than the significant value of 0.05). Thus, the null hypothesis cannot be rejected. The smaller C -values and ϕ -values also support the acceptance of the null hypothesis. So, it is clear that the null hypothesis (H_0E) is accepted.

H_{0E} : Students and teachers understand that online classes are effective tools.

The percentages of respondents for ‘teaching–learning’ and for ‘academic advancements’ have a better attitude for online classes and are on the higher side. 63% respondents wish to learn from online classes, 56% respondents says that teachers are happy, 66% respondents say that assignments, etc., are easy in online classes, 49% respondents are getting the better advantages with online classes, and 57% respondents say that interaction is easy in online classes, thus, it states that online teaching–learning is for academic advancements. 69% of respondents say that workload is more with online classes, but the overall view of most respondent states that the workload for learning new technological changes and technical smart classes is welcomed. For these attributes also, all the calculated χ^2 test values are smaller than the critical values of χ^2 , which is supported by high p -values (p -values are higher than the significant value of 0.05). Thus, the null hypothesis cannot be rejected. The smaller C -values and ϕ -values also support the acceptance of the null hypothesis. Therefore, null hypothesis (H_0A) is accepted.

H_{0A} : Students and teachers understand that online classes help in academic advancement.

On testing, both the hypothesis are accepted, concludes that in the present age of technical and technological updating, and the online classes are better and leading to academic advancements, and moreover teachers and students are happy and in acceptance mode, thus, the title “Is Online Teaching–Learning Process An Effective Tool For Academic Advancement” is justified. This effect is visualized especially in COVID-19 time, but the high level of acceptance and implementation signifies that online teaching–learning mode and online classes will remain to continue even after the COVID-19 period ends, and people start to live a normal and usual life.

Student’s Perception:

1. Students are able to accommodate and learn the technology, gadgets, and process of online classes.
2. Students are happy with the computer subjects in the syllabus as it became helpful in the handling of gadgets.
3. Students have better chances to get a variety of desired courses from specialized institutions and experts.
4. Students who are willing to enhance their knowledge, have better exposure with online classes.

Teacher’s Perception:

1. Teachers have to learn the handling of technology and the technicality of gadgets, which might be cumbersome.
2. Teachers are feeling workload in online classes because they have to prepare the PPTs, videos, presentation strategies, assignments, etc., in the team or meet.
3. Online examination paper preparation, online check of answer sheets, etc., increases workload on the teachers.
4. Management of the institution/universities should support the teachers in the handling of the gadgets, technology for the proper assessment for the online classes.

7 Future Scope

- (1) Flexibility as you can access it from an institution or home.
- (2) Wide range of educational program as technical and non-technical can be availed.
- (3) Affordable to students and teachers both.
- (4) Teaching–learning experience is customized as students and teachers may be specific.
- (5) More cost-effectiveness than a regular course.
- (6) Approach to distant universities/institution.
- (7) Freedom to select the course of your choice.
- (8) High chances to get the expert of your field/subject for your better clarity.
- (9) Commuting time and energy may be utilized for the learning process in a better way.
- (10) Mutual discussion and better understanding options are available.
- (11) IIT, IIM, and specialized institutions are approachable to students while students are sitting at his/her place.

8 Suggestions

- (1) After COVID-19, online classes should be continued in a ratio of 20 to 25% to the regular classes.
- (2) Online classes should be in assistance to regular/offline classes.
- (3) The proper workshop should be organized for teachers for better performance in online classes and for better handling of tools like Microsoft Team, Google Meet, etc.
- (4) Webinars on related topics to the online teaching–learning process should be conducted.
- (5) Training programs should be regularized for online classes for teachers.
- (6) Presentation and group discussion should be conducted on related topics in institutions.
- (7) A techno-friendly environment should be maintained, i.e., paper waste along with ink, electricity and printer-wear-n-tear should be minimized.
- (8) In continuity, online classes should not be the substitute for offline classes.

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