



## Impact of E-Learning on INTTIC Students during the COVID-19

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### Abstract

The COVID-19 pandemic forced much of the world into lockdown. For that reason, INTTIC switched from blended learning to total e-learning. In this paper, we explore the impact of e-learning on INTTIC students during the COVID-19 lockdown. To this end, we focus on four main variables: the effectiveness, the cost, the flexibility, and the independent work involved in e-learning. Our results show that e-learning cannot be entirely effective without the teacher's online interaction. It is budget-friendly because students can save on transportation, food and daily school expenses, and it offers students a large degree of flexibility. Nevertheless, almost all students struggle to complete their homework on a deadline. The main causes could include the psychological aspects of lockdown, the lack of prior experience with total e-learning, and a need for teachers' supervision. Future research should study the impact of e-learning on teachers during the COVID-19 lockdown.

**Keywords:** E-Learning, COVID-19, Likert scale, Moodle, INTTIC, Lockdown, Effectiveness.

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### Contribution of this paper to the literature

This study contributes to the existing literature by analyzing the impact of e-learning during the COVID-19 pandemic on a sample of Algerian university students. The results could be used to further develop online education at Algerian universities since they outline some advantages and disadvantages from the students' perspective.

## 1. Introduction

The first reported onset of a COVID-19 case was December 1, 2019, and the first hospital admission was on December 16, 2019 (Huang et al., 2020). On December 30, 2019, a group of pneumonia patients in Wuhan, China, was reported to the World Health Organization's Beijing office (Guarner, 2020). The analysis of their respiratory tract samples indicated the presence of a new coronavirus, which was named the 2019 novel coronavirus or 2019-nCoV (Huang et al., 2020). One month after the recognition of the viral pneumonia cluster, the World Health Organization declared a Public Health Emergency of International Concern (Lai, Shih, Ko, Tang, & Hsueh, 2020), and on March 11, 2020, a COVID-19 pandemic was declared (World Health Organization, 2020).

The worldwide outbreak of COVID-19 brought the world to a standstill. On February 25, an Algerian laboratory confirmed the first national case of severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2). "Social distancing" or "physical distancing" measures were introduced to attempt to reduce interpersonal contact and thereby minimize the degree of community transmission that could quickly develop in dense social networks like university campuses (Murphy, 2020; Weeden & Cornwell, 2020).

The spokesperson for the scientific committee monitoring the evolution of the COVID-19 pandemic in Algeria noted that the decision to renew the quarantine process is "necessary", stressing the need for citizens to play their part alongside the efforts of the State due to a "national and moral duty" to "preserve the health and security of the country".

To follow these recommendations and reduce the spread of COVID-19, INTTIC, like all universities in Algeria, has ensured the continuity of students' education by employing e-learning through its chosen platform Moodle. This operation was launched at the end of the spring holidays on April 5th, 2020. However, this was not INTTIC's first use of e-learning; the university acquired experience when collaborating with the University of Nantes, France, on the development of the INTTIC LMS e-learning platform, which was implemented in 2006 and has been managed since then. Since January 2010, our e-learning research team has shifted towards using Moodle due to the variety of tools and good accessibility it offers (Etaati, Sadi-Nezha, & Makue, 2011; Soulimane, Kouninef, Senouci, & Djelti, 2016).

A Blended Learning approach has been applied at INTTIC since 2010; nevertheless, before the COVID-19 restrictions, use of the Moodle platform was limited. So, in order to evaluate its efficiency during this critical period, this paper aims to study the impact of e-learning via Moodle on INTTIC students.

## 2. Background

According to Simonson, Zvacek, and Smaldino (2019), remote teaching dates back to the 1830s, when it was known as correspondence education. As the name implies, this meant learning via assignments mailed to a tutor (Abarca, 2021). Through technological developments, the concept of remote teaching has morphed into e-learning.

E-learning is thus defined as a system of technology, organization, and management that bestows upon the students the ability to learn via the internet and facilitates this learning (Levy, 2006; Zare, Sarikhani, Salari, & Mansouri, 2016). E-learning makes use of telecommunications technology to transfer information to achieve the teaching and learning objectives (Bowles, 2004; Zare et al., 2016). The method has undergone significant changes due to the exponential growth of the internet and developments in information technology (Rodrigues, Almeida, Figueiredo, & Lopes, 2019). The inclusion of e-learning tools in higher education means that a greater amount of information can be analyzed, leading to an improvement in teaching quality (Caballero-Hernandez et al., 2020; Maldonado-Mahauad, Pérez-Sanagustín, Kizilcec, Morales, & Munoz-Gama, 2018; Palomo-Duarte, Doderó, Medina-Bulo, Rodríguez-Posada, & Ruiz-Rube, 2014).

During the COVID-19 pandemic, e-learning has become indispensable at universities and other educational institutions to ensure the continuity of education. Some scientific researchers have studied the effects of COVID-19 social distancing measures on students' performance. For example, Gonzalez et al. (2020) conducted an experiment with 450 students from three subjects in different higher education degree programs at Universidad Autónoma de Madrid, Spain. Their results show that the restrictions changed students' learning strategies to become a more continuous habit, improving their efficiency. The new learning methodology adopted during the pandemic had a positive influence on students' performance after the restrictions were lifted, and students were expected to achieve higher scores.

Putri, Hamuddin, Nursafira, and Derin (2020) used a quasi-experimental research design to determine the effectiveness of Moodle at the Indonesian university UNILAK. One class was chosen as the control class in which students were taught only through face-to-face methods, and the other class was chosen as the experimental class in which students were also taught through an e-learning process using Moodle. The results of this study showed that students who were taught via the blended-learning technique improved significantly in comparison to the students who were only taught face-to-face (Putri et al., 2020). Zhou, Wu, Zhou, and Li (2020) analyzed the background of the large-scale online education application launched by the Chinese government during the COVID-19 pandemic. The researchers clarified the development of the application and revealed its impact on both society and education. Their results show that over the last three decades, China has completed its Internet infrastructure. The application was a valuable tool for reforming teaching methods during the pandemic.

However, there are also certain problems with online teaching, such as a duplication of classroom teaching content in online courses and a lack of teacher-student interaction. In addition, some students have a greater need for face-to-face teaching because of low levels of self-control and independent learning ability.

Table 1. The questionnaire.

Items	Questions	Possible answers
1	Studying online during the COVID-19 lockdown is motivating.	Strongly disagree Disagree Neutral Agree Strongly agree
2	The use of e-learning apps such as Zoom, Moodle, Google Meet, helps you to learn your coursework effectively (reach your objectives).	Strongly disagree Disagree Neutral Agree Strongly agree
3	Accessing Moodle content is easy during the lockdown.	Strongly disagree Disagree Neutral Agree Strongly agree
4	How do you prefer content to be shared during the lockdown?	Submitted Pdf files Submitted PPT files Online videoconference (Zoom, Google Meet) Offline submitted videos Other
5	The courses are visually attractive.	Strongly disagree Disagree Neutral Agree Strongly agree
6	The sounds, texts, images, videos are helpful to comprehend the course.	Strongly disagree Disagree Neutral Agree Strongly agree
7	The teacher interacts with you via online discussion.	Yes No
8	The courses clearly explain what you are expected to learn (objectives).	Strongly disagree Disagree Neutral Agree Strongly agree
9	The lockdown affects your household income.	Yes No
10	E-learning during the lockdown allows you to save on transportation fees.	Yes No
11	E-learning during the lockdown allows you to save on food expenses.	Yes No
12	E-learning during the lockdown allows you to save on daily school expenses (printing fees, etc.).	Yes No
13	Unlike the face-to-face classroom, e-learning allows you to be more present for your family (participating in family tasks, sharing more moments together, etc. ...).	Strongly disagree Disagree Neutral Agree Strongly agree
14	During the COVID-19 lockdown, you are able to access the course via Moodle at any time of day.	Yes No
15	E-learning during the lockdown allows you to do your homework even when there are distractions in your house (noise, TV, children, music, etc.).	Strongly disagree Disagree Neutral Agree Strongly agree
16	During the lockdown, you would prefer to have a teacher's assistance in the face-to-face classroom, even if you have downloaded lectures and videos from Moodle.	Strongly disagree Disagree Neutral Agree Strongly agree
17	It is difficult for you to do your homework since the courses haven't been taught in the face-to-face classroom.	Strongly disagree Disagree Neutral Agree Strongly agree
18	You could focus on your e-learning courses during the lockdown at home even if there were: noise, TV, children, etc.	Strongly disagree Disagree Neutral Agree Strongly agree
19	During the lockdown, are you able to complete the homework before the deadline?	Yes No

Items	Questions	Possible answers
20	During the lockdown, the available internet apps allow you to work with your classmates, in order to do the homework and discuss the courses.	Strongly disagree Disagree Neutral Agree Strongly agree
21	E-learning during the lockdown is a great opportunity for you to explore new methods of learning.	Strongly disagree Disagree Neutral Agree Strongly agree
22	After the COVID-19 lockdown, you would like to carry on e-learning.	Totally Partially (E-learning to support the face-to-face classroom) No
23	What are the disadvantages of e-learning for you?	

Alipio (2020) was interested in investigating e-learning during the COVID-19 pandemic in less developed countries. To study this, he analyzed Filipino learners' readiness for e-learning. His results showed that most respondents answered 'No' to all e-learning readiness items. According to the researcher, any possible shift toward e-learning should only be considered if the financial, operational, and Internet connectivity issues of learners in low-income sectors and rural areas are first addressed.

In this paper, e-learning is defined as a technique through which students can learn by using a wide variety of tools (personal computer, notebook, mobile, laptop, tablet, etc.) on the Moodle platform. Therefore, this study aims to explore the use and effectiveness of e-learning among INTTIC students during the COVID-19 lockdown.

### 3. Methodology

This study takes a quantitative approach, employing a questionnaire (illustrated in Table 1) to obtain data on the effectiveness of e-learning among INTTIC students during the COVID-19 pandemic. Data was collected through an online survey carried out over a period of 15 days from May 1 to 15, 2020. The questionnaire, which included 23 items (Table 1) in addition to questions on demographic variables (gender, grade and weekly use) was conducted in English. Data were collected from students in different years (a total of 320 students from years one through four). We shared a link to the survey on Moodle and Facebook INTTIC student groups. We received 96 responses, which is equal to a 30% response rate. 68.8% of the respondents were male and 31.3% female.

The first part of the questionnaire collects demographic data on the respondents. The second part includes 5-point Likert scale closed questions, and the third part contains Yes/No questions. The final question of the questionnaire is an open one.

Four variables are used to measure the effectiveness of e-learning among INTTIC students during the COVID-19 pandemic lockdown: flexibility, working independently, cost, and learning quality. Google Sheets was used to assemble all the data.

Based on the variables above, we propose the following hypotheses:

*H1: The quality of e-learning is effective for student learning during the COVID-19 lockdown.*

*H2: E-learning is a budget-friendly option during the COVID-19 crisis.*

*H3: E-learning during the lockdown allows flexibility.*

*H4: E-learning during the lockdown allows students to work independently.*

### 4. Results and Discussion

At the beginning of the questionnaire, we collected the following demographic characteristics of our respondents: gender, year and e-learning weekly use (weekly access to Moodle platform). The results are shown in Figures 1, 2 and 3.

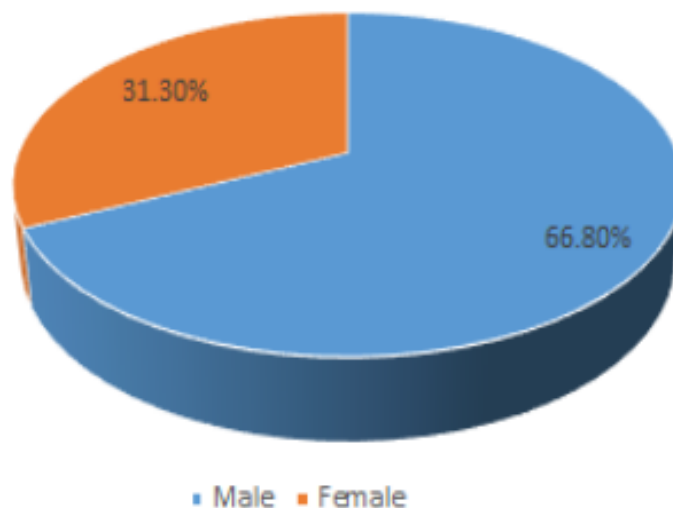


Figure 1. Respondents' gender.

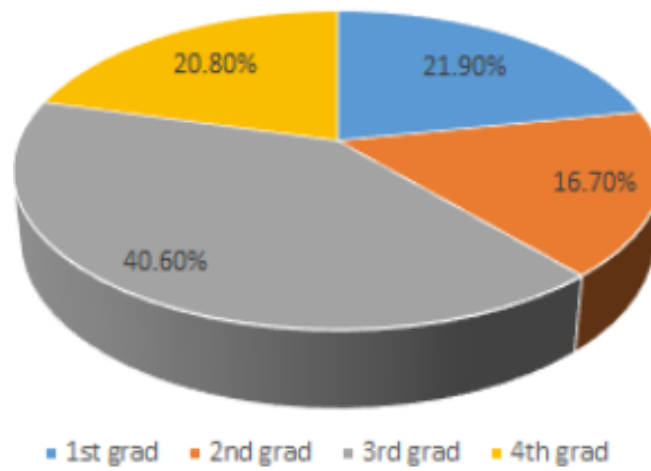


Figure 2. Respondents' year of study.

According to the survey results, of the 96 student respondents, 31.3% are female and 68.8% are male, as illustrated in Figure 1.

Concerning the students' year of study, 21.9% of respondents are in their first year, 20.8% are in their second year, 40.6% are in their 3rd year, and 16.70% are in their 4th year, as shown in Figure 2.

When we asked the students about their weekly use of the platform, 52.3% said they use it one day a week, 26.2% said they use it 3-4 days a week, 9.2% use it 5-6 days a week, and 12.3% use it daily, see Figure 3.

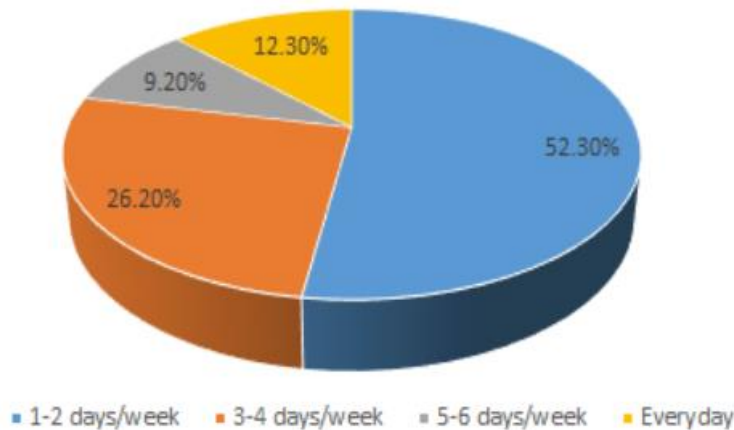


Figure 3. Weekly use of e-learning by INTTIC student respondents.

We have proposed the four hypotheses H1, H2, H3 and H4.

H1- The quality of e-learning is effective for student learning during the COVID-19 lockdown.

In order to test hypothesis one, we designed six questionnaire items to be answered using a five-point Likert scale. The seventh item is a Yes/No question. The results are shown in Table 2, Figure 4 and Figure 5.

Table 2. Results of testing the first hypothesis.

Item	Strongly Disagree (%)	Disagree (%)	Neutral (%)	Agree (%)	Strongly Agree (%)
1	43.8	21.9	19.8	12.5	2
2	36.5	26	14.6	21.9	1
3	24	14.6	25	19.8	16.7
5	37.2	21.3	27.7	11.7	2.1
6	18.9	15.8	23.2	26.3	15.8
8	43.8	19.8	21.9	10	4.2
Mean	34.03	19.90	22.03	17.03	2.33

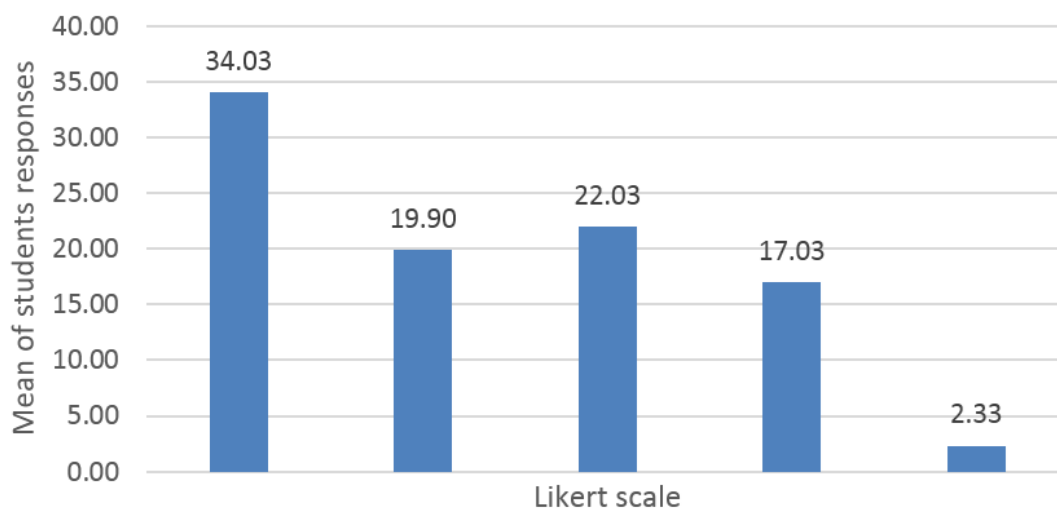


Figure 4. Mean of hypothesis H1 responses.



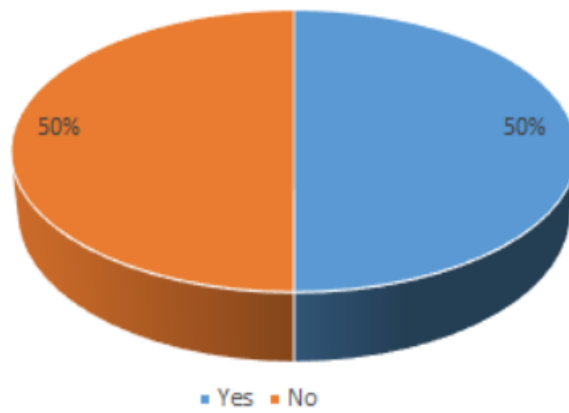


Figure 5. Results of item 7: Teacher's interaction.

The responses to item 1, in Table 2, show that the majority of INTTIC students are not motivated to study during the COVID-19 lockdown is (24% strongly disagree and 26% disagree). In item 8, see Table 2, around 43.8% of INTTIC students feel that the courses do not clearly explain what they are expected to learn. We can cite, for example, the students' explanations provided in the following responses:

1/ "Posting a bunch of pdfs and lots of exercises."

2/ "The majority of professors put up pdf files without any sort of explanation, and then they put up a whole bunch of exercises with a specific deadline and wait for us to solve them intelligently without any errors."

3/ "During the lockdown, there are no restrictions, and therefore you neglect to study, unlike studying face to face. For me, studying face to face is the best."

The responses to the fourth item in Table 2 are related to the way students prefer information to be shared. Here, the majority (60.2%) choose the videos submitted offline, while 52.3% preferred the online videos. This result shows that videos and the interactivity of the teacher (via Zoom, for example) are more attractive for students than other ways of sharing knowledge. However, according to the result of item 7, only 50% of INTTIC teachers interact with students during the lockdown e-learning courses, see Figure 5.

Regarding item 3 in Table 2, the majority of students stated that Moodle access is not easy for them. Also, in item 2, most respondents stated that the use of e-learning apps such as Zoom, Moodle and Google Meet does not help them learn effectively. We think that both these results can be explained by unreliable Internet connectivity.

Therefore, we can conclude that this first hypothesis is at least partially upheld, as illustrated by Figure 4.

H2: E-learning is budget-friendly.

To test this hypothesis, we designed four questionnaire items. The results are shown in Figures 6, 7, 8 and 9.

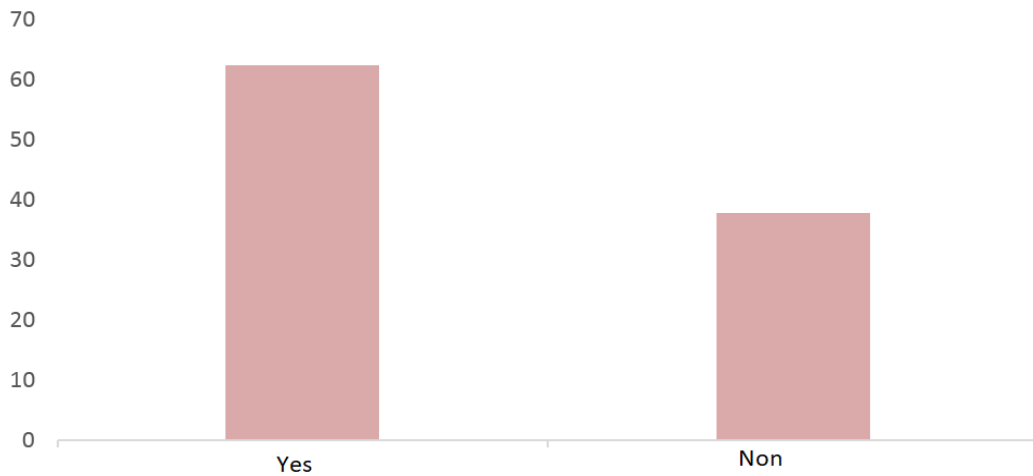


Figure 6. Percentage of student responses on whether household income was affected by the lockdown (item 9).

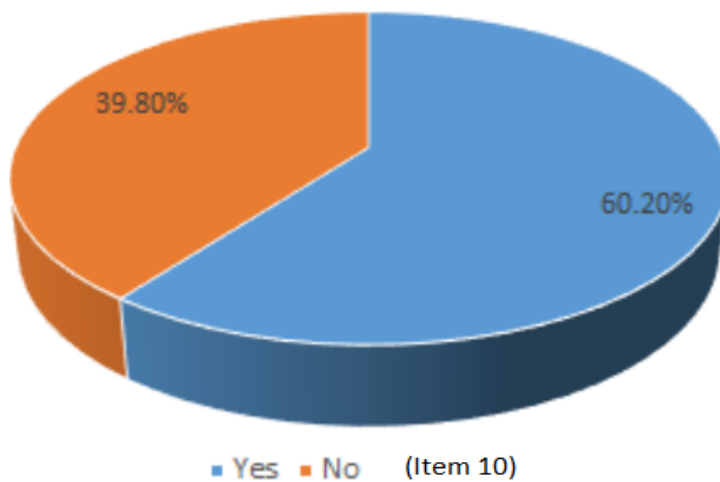


Figure 7. E-learning during the lockdown allows you to save on transportation fees.

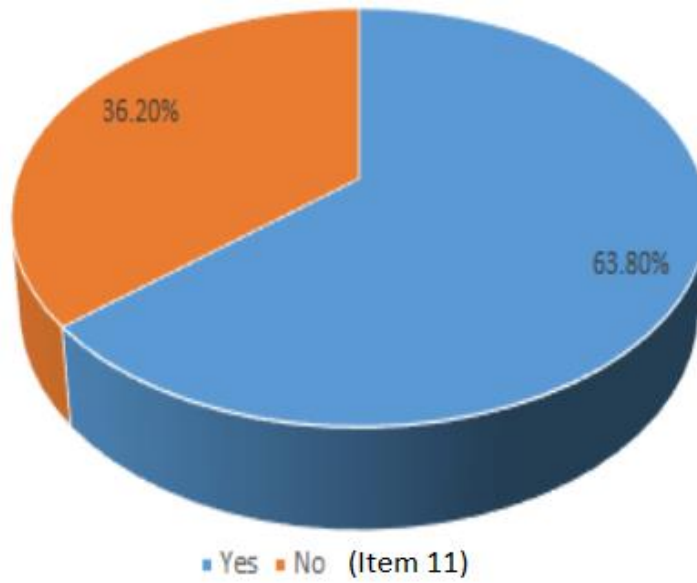


Figure 8. E-learning during the lockdown allows you to save on food expenses.

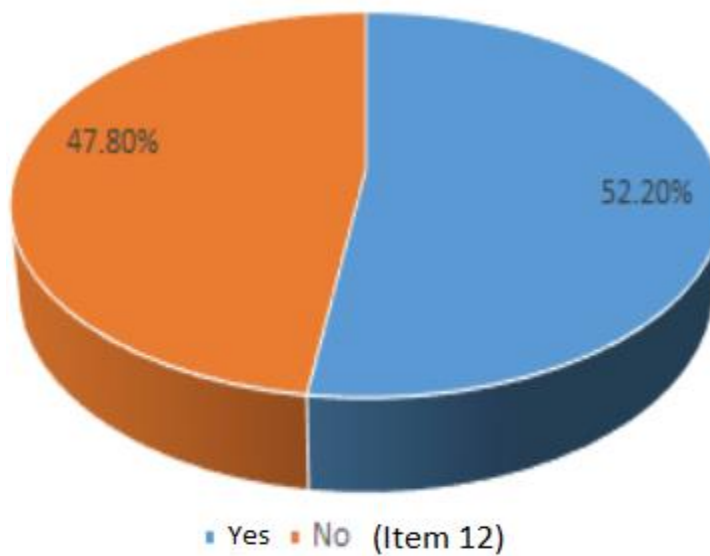


Figure 9. E-learning during the lockdown allows you to save on daily school expenses (printing fees, etc.).

More than half the respondents (62.3%) noted that the COVID-19 lockdown affected their household income, as shown in Figure 6. Overall, they have found e-learning to be cost-effective because they do not need to spend money on transportation, food, or school expenses, see Figures 7, 8 and 9.

From this, we can conclude that e-learning is budget-friendly.

H3: E-learning during the lockdown allows flexibility.

The results relating to this third hypothesis are illustrated in Figure 10 and Figure 11.

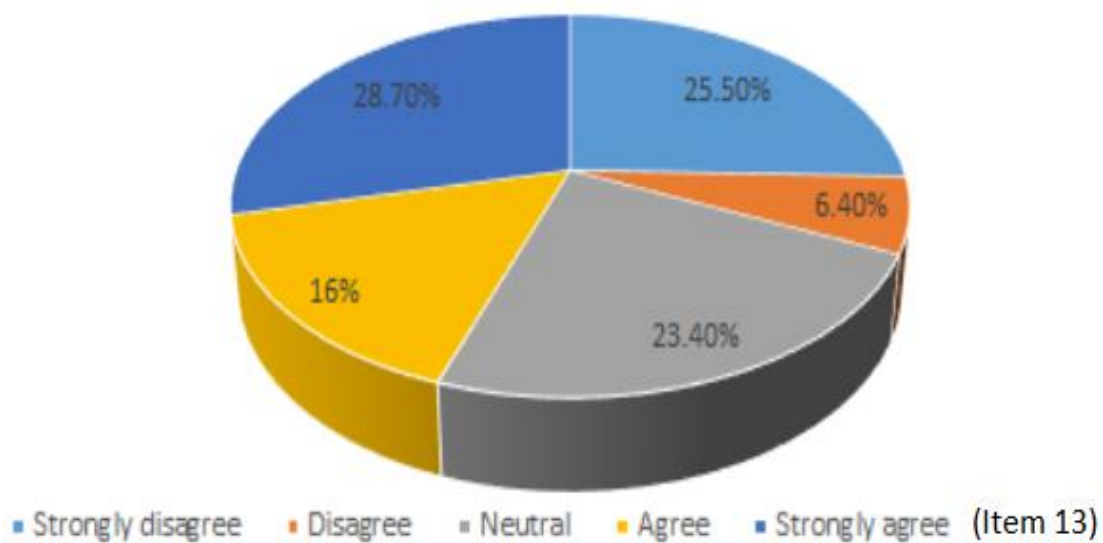


Figure 10. Unlike the face-to-face classroom, e-learning allows you to be more present for your family (participating in family tasks, sharing more moments together, etc. ...).

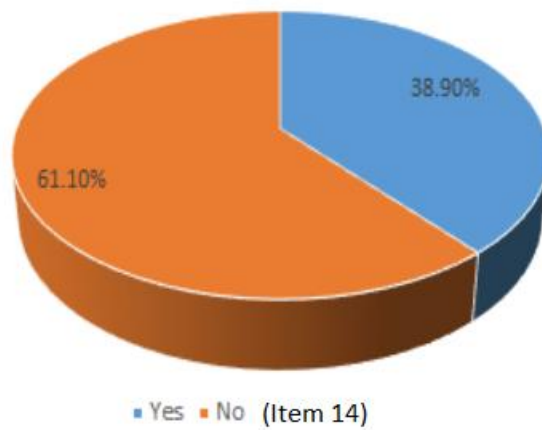


Figure 11. During the COVID-19 lockdown, you are able to access the course via Moodle at any time of day.

Even though a majority of students (61.1%) have the flexibility to access their courses via Moodle at any time of day, they are bothered by distractions when they want to do their homework. Regarding shared moments with family, the findings demonstrate that approximately half of the students felt that e-learning during the pandemic allowed them to be more present for their relatives.

H4: INTTIC students are able to work independently during the COVID-19 lockdown.

The results relating to this fourth hypothesis are illustrated in Table 3 and Figures 12 and 13.

Table 3. Results relating to the fourth hypothesis.

Item	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
15	40.4	24.5	14.9	14.9	5.3
16	18.1	6.4	23.4	29.8	22.3
17	18.9	2.1	13.7	17.9	47.4
18	40.6	22.9	18.8	12.5	5.2
20	36.5	15.6	29.2	12.5	6.3
21	18.8	19.8	24	26	11.5
Mean	28.88	15.22	20.67	18.93	16.33
19	Yes			No	
	31.60			68.40	

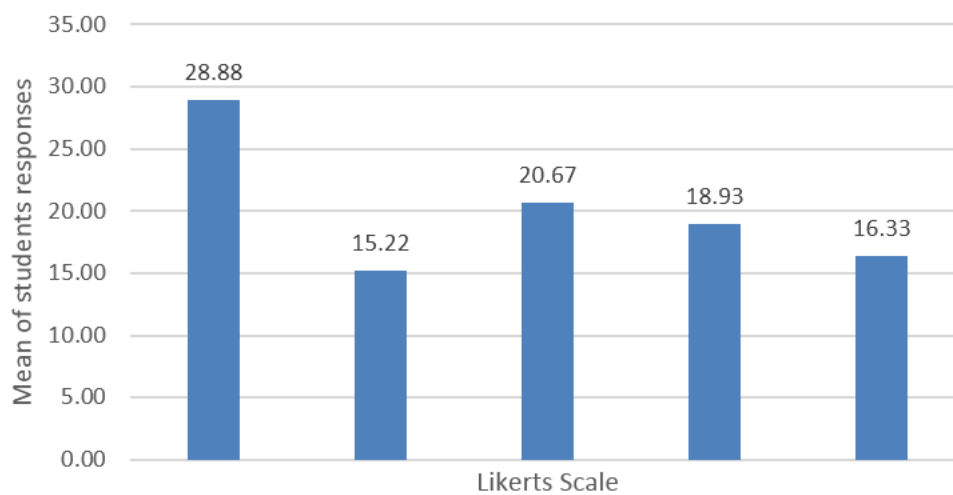


Figure 12. Mean of hypothesis H4 responses.

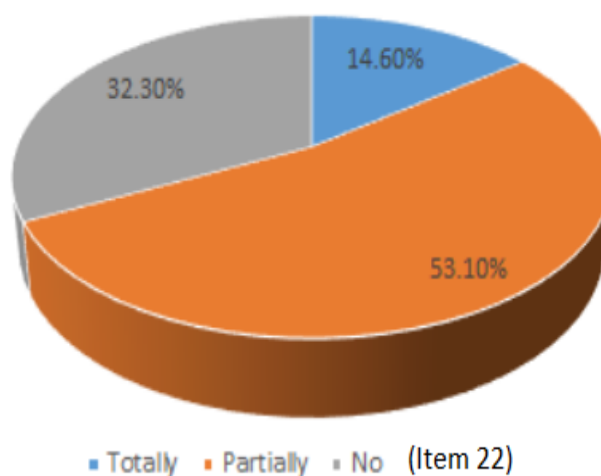


Figure 13. After the COVID-19 lockdown, you would like to continue with e-learning.

The findings show that 68.4% of INTTIC students could not complete their homework on time (item 19, Table 2), because, according to them, the courses and homework are shared at the same time. One student stated: “it is



hard for us to do five to seven homework assignments in a week when the deadlines are very close to each other.” In addition, students have been busy taking the courses and certifications that have been made available online worldwide, usually for free, during the Covid-19 lockdown period.

Almost all students stated that the face-to-face classroom makes it easier for them to do their homework (65.3% in item 17 and 52.1% in item 16). Some noted that during the lockdown, there were no restrictions on when and where to learn, and therefore they neglected to study, unlike when studying in the physical classroom.

In light of these results, we think that students are more confident when courses are conducted with the teacher’s physical presence. Also, we note that since this was the first time courses were held entirely via e-learning, students found it difficult to get used to working independently.

## 5. Conclusion

The COVID-19 pandemic has led Algerian universities, like other universities around the world, to actively use e-learning platforms in order to ensure the continuity of the learning process. As INTTIC has switched from blended learning to total e-learning, we felt that a survey on the use and effectiveness of this method was essential. Therefore, this paper reports the findings of a questionnaire filled out by INTTIC students.

Several factors might affect the respondents’ readiness scores since the online survey was launched during a point in the pandemic where students were stressed and not all able to fill out a questionnaire.

Nevertheless, the obtained results show that video and interactive courses are more attractive and helpful for students’ comprehension. In addition, e-learning during the pandemic lockdown is budget-friendly because it helps students save on food, transportation and school expenses.

We have noticed that for some students access to Moodle content during the lockdown period was difficult due to Internet connectivity issues, which is a common problem in most third-world countries.

To overcome this issue, all telecom companies in Algeria began to offer free access to Moodle platforms just after our survey.

Although e-learning during the lockdown offered students significant flexibility, they still found it challenging to complete their homework on a deadline because the courses were not face-to-face and many students only accessed Moodle once or twice a week; they seemed to need more direct supervision.

As this was INTTIC students’ first experience with total e-learning, we believe the shift, together with the pandemic lockdown situation, was psychologically challenging for them. However, we agree with Lorenzi and Riley (2000) who said that the main success factors in system success are behavioral more than technical (El-gamal & Aziz, 2011).

For the future, we think that a study of the impact of e-learning on teachers during the COVID-19 lockdown would provide useful further results.

Also, we propose that after this lockdown, comodal courses would provide valuable additional tools to meet students’ needs, offer more flexibility (in time and space) and enhance much more the learning process.

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