

Research Article

What does the pandemic mean for experiential learning? Lessons from Latin America

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JEL Codes: A20, A29,

Keywords: Agricultural sciences, educational plans, experiential learning, online education

Abstract

This study presents survey evidence of Latin American college students' perceptions of the switch from in-person instruction toward online instruction due to the COVID-19 pandemic. Three key findings emerge that present a negative outlook for higher education in programs that rely heavily on experiential learning. First, undergraduate students are not fully satisfied with the quality of online education received during the pandemic, especially the quality of experiential learning-based courses. Second, students perceive lower teaching quality independently of the course type as the main factor affecting learning. Third, students who experienced adverse stress and other limitations during the pandemic expressed difficulties in learning and have concerns about their educational paths, although just a small group expressed intentions to switch careers. These findings may affect long-term education in agricultural and applied sciences and show that remote education has not been successfully addressed in many countries of this region.

1 Introduction

The COVID-19 pandemic has created a crisis in the education system, forcing universities to put in place short-term solutions to address school closures, such as moving from face-to-face learning to remote instruction. However, very few universities were adequately prepared to move to a large-scale virtual education model (Houlden and Veletsianos 2020; Mitchell 2020). Thus, the pandemic has negatively affected teaching quality and student learning at most universities and colleges. This is concerning news for Latin America, which since the early 2000s, has faced an unprecedented growth in enrollment and access rates as a result of national policies, scholarships, and student loan programs (Ferreira et al. 2017).

Many educational programs—including business and finance, agricultural sciences, music, and engineering—use experiential learning as a complementary component to theoretical curricula. For example, in agricultural sciences, activities such as hands-on laboratory experiments, fieldwork assignments, and field trips provide a unique opportunity for students to develop metacognitive skills—essential in developing critical thinking¹ (Magno 2010). Canceling or postponing practical activities may have detrimental effects on students' competencies (Baker, Robinson, and Kolb 2012) and mental health (Elmer, Mepham, and Stadtfeld 2020).

Students' limited access to high-quality education are exacerbated by the income inequality gap present in most Latin American countries (Mitchell 2020). Evidence also suggests that academic stresses may affect the career trajectory of Latino college students (Turkewitz 2020). Before the pandemic, agricultural science programs worldwide were already facing multiple challenges, including a declining

¹ Metacognitive skills are abilities for organizing and guiding one's own learning process. Among them are task orientation, goals preparation, monitoring a successful implementation of a plan, and evaluating task outcomes.

trend in enrollment rates, limited resources, difficulties keeping up with global trends, and balancing experiential learning with traditional class settings (Mulder and Kupper 2006; David and Bell 2018).

Online education has endured many challenges during the pandemic, which compounds the pressure facing agricultural programs. First, students and faculty dealt with fatigue of experiencing only online instruction during quarantine (Chakraborty et al. 2020; Mishra, Gupta, and Shree 2020). This alone could dissuade students from enrolling or returning to virtual lessons (Anemona 2020; Lederer et al. 2020). Second, there is a widespread perception that online courses have lower quality of engagement (Jaschik 2020), which could discourage students from engaging in virtual platforms. Notably, for courses with experiential components, fewer laboratory sessions and no field trips likely magnify this belief. Finally, the pandemic has shed light on intergenerational inequalities as many students did not have access to internet during lockdowns (Edelin 2020), which may affect students' mental health and student retention (World Bank 2020).

Emerging literature indicates that although school programs adapted pedagogy and activities to positively shift student perspectives about online learning during the pandemic (Leif, Moore, and Heath 2021), these efforts failed to replicate the experiential learning experience that occurs in the classroom (Danyluk, Kapoyannis, and Kendrick 2021). This shows the need to develop instructor's training and educational tools to impart experiential components in an online format (Liguori and Winkler 2020).

Despite reports and media coverage of education reforms post-COVID-19 and emerging evidence of the pandemic effects on social and applied sciences (see e.g., Pruitt, Tewari, and Mehlhorn 2020; Danyluk et al. 2021; Holderieath et al. 2021; Leif et al. 2021), to our knowledge no research has explicitly explored (i) the opinions and attitudes toward instruction quality during the pandemic for students enrolled in courses that integrate experiential learning components, (ii) the differences in perception of instruction quality when compared to theoretical courses, or (iii) how students' experiences with virtual learning during lockdowns have affected their learning experience and outlook about their educational plans, including their intent of switching academic programs. To address these topics, we focus on how agricultural science education as experiential learning has been a valued component in this multidisciplinary field (Knobloch 2003). This information is relevant for university administrators and program advisors as they work toward reforms in higher education in the post-pandemic world. The outcomes of this study are also significant for applied science programs—such as music, business, engineering, medicine—that offer practical experiences in their curriculum.

Data suggests that practitioners and overall the education community have not met a consensus on how to adapt instruction in a fast-changing world (Li and Lalani 2020; UNESCO 2020). The sudden shift in 2020 to virtual learning exacerbates concerns about the role of education technologies, such as synchronous online meetings, guided videos, tutorials, among others, in the development and quality of instruction. This article explores the students' perception of theoretical courses and contrasts the results with experiential learning classes. More precisely, data were collected in 2020 to examine how Latin American students pursuing an undergraduate degree in agricultural sciences: (1) perceive the switch from traditional in-person instruction to virtual learning; (2) contrast their attitudes toward the changes in different courses—varying in their teaching methodologies; and (3) learn about their perceptions regarding their future educational plans, including how online learning has changed their opinion with respect to their current major.

The outcome of the study aims to enhance the understanding of how online education was perceived by undergraduate students in two large universities in Latin America and how this may represent an opportunity for improvement of current teaching models in experiential-based academic programs.

2 Survey and Sample Characteristics

2.1 Survey Objectives and Sample

Data were collected during October 2020 to examine how Latin American students pursuing an undergraduate degree in agricultural sciences perceive the switch to virtual learning, contrast their perceptions in different courses, and learn about their perceptions regarding their educational plans.

Specifically, for the first two objectives, two types of courses are addressed: (I) *Theoretical Learning Courses* (TLC)—which offer a traditional theoretical-based setting where the instructor provides lectures face-to-face and students participate in discussions and class activities, and (II) *Experiential Learning Courses* (ELC)—which require either fieldwork or in-person labs.

To fulfill these objectives, a survey was conducted with undergraduate students from two universities: (i) Zamorano University, an agricultural-focused university in Honduras known for its diverse student body from 29 countries, with an average enrollment of 1,200 undergraduate students. This university offers a couple of unique characteristics: all students live on campus, and they must participate in daily learning-by-doing activities such as working in the crop fields, feeding cattle, packing vegetables, measuring water quality, among other activities.

(ii) The Pontifical Catholic University of Chile, one of the top universities in Latin America, with an enrollment of more than 25,000 undergraduate students from which about 880 students pursue an agricultural or forestry degree in the Faculty of Agronomy and Forestry Engineering. Students need to complete different activities related to crop and animal production throughout the school years.

An important distinction between both universities is the amount of time devoted to experiential learning, especially fieldwork. The academic program at Zamorano allocates an equal amount of time to practical activities and traditional theoretical settings. The agricultural program at the Chilean university generally allocates more time to theoretical lessons in the classroom, although 60 percent of the courses involve activities in the lab or field. Both universities suffered cancellation of all experiential learning activities during the lockdown. Therefore, surveying these two universities located in two different regions of Latin America and with different curricula provides a more comprehensive analysis.

2.2 Survey Development and Administration

The survey was designed based on previous research of students' satisfaction with online learning and emerging evidence regarding students' learning experiences amid the COVID-19 pandemic (Swan 2001; Rapanta et al. 2020). Participants were limited to undergraduate students who enrolled at both institutions prior to the pandemic, as they were taking the two types of courses and experienced the shift to virtual learning during the first term of the 2020 academic year.

It is important to note that, during the first wave of the pandemic, both universities employed synchronous online teaching supported with asynchronous learning resources (i.e., recorded videos, forums, and simulations). All experiential learning activities (fieldwork, lab sessions, and field trips) were canceled.

Prior to the data collection, a small investigatory process was conducted with students and faculty at both universities to test the survey.² In order to protect students' information and confidentiality, no identifiable information was collected except for their email addresses. To minimize any discomfort to participants and avoid potentially biased responses, respondents were informed that providing their contact information was voluntary, with the only purpose of compensation, and that the data would be anonymized, and personal identifying information removed.

The survey was designed in Typeform to be self-administered on students' electronic devices. Five surveyors conducted online interviews to support the data collection. The surveyors were senior

² The Pontifical Catholic University of Chile Human Research Ethics Committee and authorities of each university approved the study.

undergraduate students at Latin American universities, which allowed them to better relate to the participants and convey the importance of honest responses in the anonymous. All undergraduate students (about 2,080 people) were invited to participate in the online study using both email and social media invitations (Jorrat 2020). As compensation, each participant had a 10 percent chance to win a gift card worth approximately US\$8.00.

The survey questions covered four key aspects: educational plans, perceptions of learning and teaching quality, well-being and learning environment, and sociodemographic information. Students were asked to evaluate both learning and teaching components for the two types of courses: ELC and TLC. We requested respondents to provide examples of each course type to determine whether students could differentiate them. Most respondents were able to correctly classify the courses.

Literature suggests that respondents who believe the survey to be inconsequential are more likely to give trivial answers (Sandorf, Aanesen, and Navrud 2016). Thus, a short script at the beginning of the questionnaire was included to promote truthful responses. An explanation of the relevance of the study was offered, including its potential implications for higher education. A 5-point Likert-scale was included at the end of the survey to verify if respondents perceived it as trustworthy: “*How likely do you think it is that university authorities will use the survey results in the management of education?*” where responses ranged from “*extremely unlikely*” to “*extremely likely*.” As a robustness check, a second analysis was completed, which excluded the data from respondents who believed the survey to be inconsequential.³ Results were similar in both cases.

A total of 141 students (about 7 percent of undergraduate students) fully completed the survey process, which lasted approximately 20 minutes.⁴

2.3 Survey Summary Statistics

Table 1 reports the descriptive measures of factors that were investigated, including perceptions of teaching quality, effort, well-being, and learning environment, based on survey responses. Particularly, a 5-point Likert scale⁵ was used to ask students about their perception of how instruction quality and learning difficulty changed due to the pandemic for ELC and TLC.⁶

The summary statistics in Table 1 show that, independently of the type of course, the quality of teaching and course organization was perceived to be better before the pandemic. This is consistent with the belief that online learning carries a stigma of being lower quality than in-person instruction (Hodges et al. 2020). The case is stronger for ELC (average = 4.6) than TLC (average = 3.6) as students strongly agreed that the quality of teaching of ELC and experiential learning would have been better in the absence of COVID-19, which shows that misconception of virtual instruction is more dramatic for courses that integrate hands-on applications.

In regards to mental health status in Table 1, on average, respondents indicated a neutral sentiment to the statement: “*My mental health has worsened during the pandemic*” (average = 3.5). Furthermore, more than half of students reported low internet speed (62 percent) and lack of a study place (54 percent) as factors that have affected their learning environment. In terms of

³ Specifically, those who answered “*extremely unlikely*” to the debriefing question were excluded in the robustness check.

⁴ Some students skipped a few sociodemographic questions (i.e., household size). In this case, we imputed nearly 18 percent of missing values of the variable household size using predictions from a regression of reported values on individuals’ characteristics. Overall, regression results are robust when excluding missing values. It is possible that those students who were unsatisfied with online instruction were more likely to participate in the study. Nonetheless, students were offered the possibility of winning a gift card when participating in the survey; therefore, they also had other reasons for participating.

⁵ For the 5-point Likert scale, responses ranged from “strongly disagree” to “strongly agree.”

⁶ Four satisfaction statements were asked to compare with a situation without the pandemic: (1) “Teaching quality for ELC would have been better (without pandemic),” (2) “Teaching quality for TLC would have been better,” (3) “Course organization would have been better,” and (4) “Experiential learning would have been better.”

Table 1. Summary Statistics

Variable	Description	Type	Mean	SD
Teaching quality for TLC	Quality for originally theoretical face-to-face courses would have been better without the pandemic	L5	3.61	1.17
Teaching quality for ELC	Switching ELCs to online settings during the pandemic were perceived with lower teaching quality	L5	4.62	0.70
Course organization	Course organization before the pandemic was better	L5	4.15	0.95
Experiential learning	Quality of courses with experiential learning pre-pandemic was better	L5	4.94	0.32
Poor mental health	Mental health has worsened	L5	3.46	1.34
Slow Wi-Fi	Low internet speed (if =1)	BIN	0.62	0.48
No study place	Lack of a place to study (if =1)	BIN	0.54	0.50
Financial support	Family receives financial support (if =1)	BIN	0.24	0.44
Relocation	Student relocated due to pandemic (if =1)	BIN	0.13	0.34
School years	Number of years in college	NUM	2.86	1.09
Household size	Family members in the household	NUM	4.52	1.57
Zamorano	Student is from Zamorano University (if =1)	L5	0.46	0.50

Note: TLC refers to Teaching Learning Courses whereas ELC indicates Experiential Learning Courses.

The type of variables presented are:

- Qualitative variables measured using the 5-point Likert scale (L5), values range from 1 to 5, where 1 = strongly disagree and 5 = strongly agree.
- Binary variable (BIN), where 1 means that the statement is occurring, 0 = otherwise
- Quantitative continuous variable (NUM)

SD refers to one standard deviation from the mean.

sociodemographics, the majority are juniors and seniors (60 percent), and about one quarter have families that receive government financial support (24 percent).

2.4 Survey Limitations

The survey has the following limitations. Although the study has a representative sample size for the study, it is possible that many students that had technical difficulties (e.g., internet connection) could not participate in the survey. The study also surveyed students that were enrolled in both universities in October 2020. Many students may have changed their degrees between March and October 2020. However, as expressed in the 2020 Zamorano report, less than 5 percent of its students dropped school. Furthermore, participation of eligible students was lower than in teaching evaluation surveys (7 percent vs. 26 percent). Considering that the average response rate for teaching evaluation surveys decreased by 27 percentage points over the 2019–2020 period and that both universities were conducting several surveys throughout the academic period of 2020, the low response rate in our study might not be surprising. Nonetheless, different approaches may be needed to encourage students to participate in times when in-person surveys are not possible. For instance, providing students additional incentives to participate or encouraging participating students to motivate their peers to take part in a survey might improve participation.

3 Learning Experience and Educational Plans

Since one of the aims of the study is to better understand students' learning experience during the pandemic, questions regarding their perceptions of learning quality were included in the survey. Using a 5-point Likert scale, participants were asked to rate the extent to which they agree or disagree with the following two statements contrasting a situation without the pandemic: (1) *"I would have experienced less difficulty in learning the course material"* and (2) *"The learning quality, in general, would have been better."* Students were asked to evaluate these statements for both types of courses (TLC and ELC). Responses to these questions are displayed in Figure 1.

For ELC, about half of respondents (47 percent) strongly agreed that learning became more challenging due to the pandemic. In contrast, only one-quarter (27 percent) of students strongly perceived this was the case for TLC. Regarding learning quality and experience, students predominantly expressed that they strongly agreed about the detrimental effects of the pandemic for both types of courses (i.e., 64 percent for ELC vs. 44 percent for TLC). However, it is possible that the shift to virtual learning translates into an increase in learning difficulty depending on the adaptability of the students to online classes (Xu and Jaggars 2013). Interestingly, the difference in perception between ELC and TLC in learning difficulty (20 percent) and quality (20 percent) are consistent, which may suggest that this difference may be partially attributed to the experiential components that students missed due to the pandemic.

The survey also included questions exploring students' change in attitudes toward online learning and educational plans due to the pandemic. Specifically, three statements were considered: (1) *"I feel willing to take more online courses in order to complete my core curricula while studying from home,"* (2) *"I feel more willing to take online elective courses while studying from home,"* and (3) *"I am more likely to change degree."* The first two statements reflect attitudes toward online education, while the last one reveals plans about overall education path choices.⁷ Responses to these questions are presented in Figure 2.

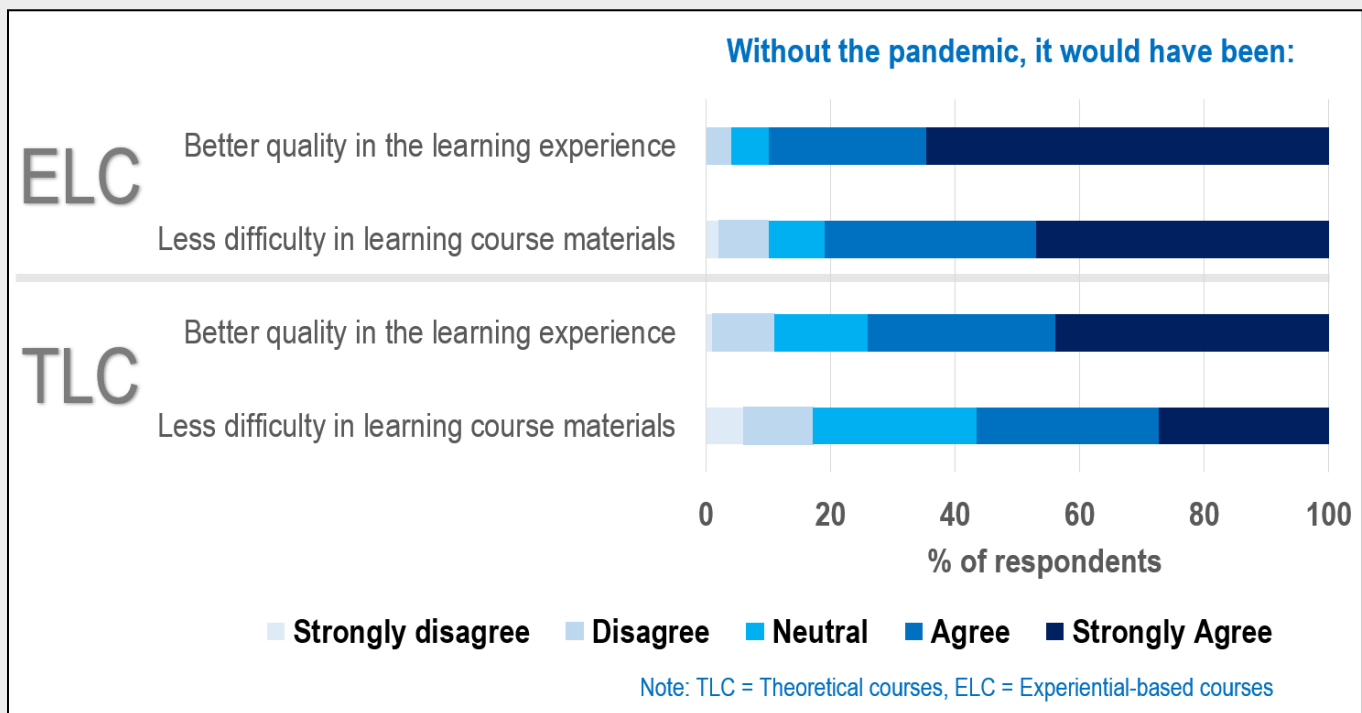


Figure 1. Perceptions of Learning Experience

⁷ Questions regarding likelihood of changing or dropping from college were also asked to provide robustness to our analysis.

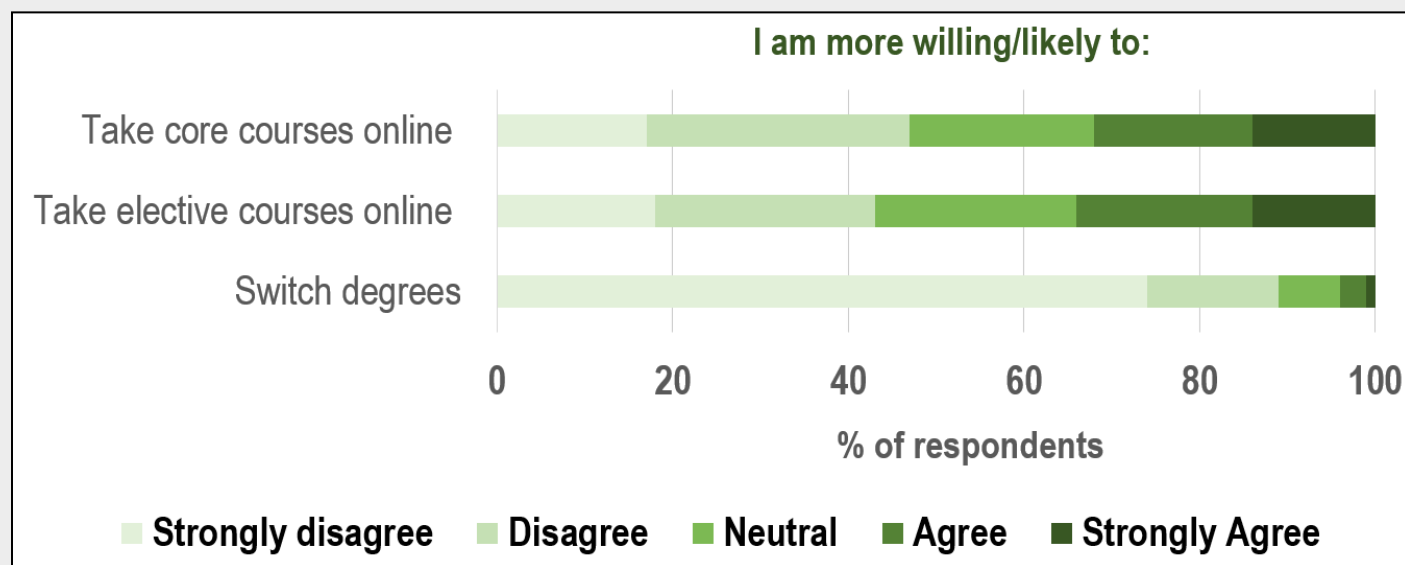


Figure 2. Perceptions of Educational Plans Regarding Future Courses and Career Path

Figure 2 displays that about 30 percent of students would be willing to take additional online courses in their careers. This percentage might not be surprising, given that the majority of students had difficulties with internet connection (62 percent of students faced low internet connection) and finding an adequate place to study (about 54 percent expressed this limitation).

Interestingly, only a small portion of participants (5 percent) stated that they would likely switch degrees, which was expected given that 60 percent of respondents are juniors and seniors. This is in line with previous results from a recent poll that indicated that about 4 percent of students are no longer sure if they will complete their degree or take a gap year (Remote Internships 2020). Likewise, less than 5 percent of students from Zamorano University decided not to continue their studies (S. Morales, personal communication, May 4, 2021), which has been the case for many other colleges across the continent. Consistently, a Fall 2020 report indicated that undergraduate students' enrollment decreased by 3 percent in the United States due to the coronavirus⁸ (Douglas-Gabriel 2020).

4 Determinants of Learning Experience and Educational Plans

This section discusses factors influencing students' opinions of their learning experiences, teaching quality, and educational plans. Econometric analysis was applied to the qualitative responses presented in Figures 1 and 2.⁹ Covariates for the regressions analysis were selected based on existing and new literature indicating that factors such as depression (Islam et al. 2020) limited physical resources (Edelin 2020), and socioeconomic aspects influenced students learning experience during lockdowns (Mitchell 2020).

⁸ It is possible that some students switched to a nonagricultural major prior to the data collection, and, therefore, they were unable to participate in the survey.

⁹ As a robustness check, we tested the possibility of interviewer bias and strategic answering to please the interviewer by including a dummy variable in the models (i.e., equal to 1 whenever the survey was administered by a surveyor, and 0 otherwise in all regressions). The lack of statistical significance of the coefficient on the surveyor dummy variable in all except one regression indicates that interview bias and strategic answering were likely not a significant problem of concern for this study.

4.1 Challenges toward Learning

The pandemic exacerbated the challenges faced by students toward learning, as expressed in Figure 1. Thus, an ordered logistic model (McCullagh 1980) was used to understand how mental health status, technical issues (i.e., low internet speed, lack of study place), demographic aspects, and school years aggravated the difficulties in learning the course materials for both TLC and ELC.

Tables 2 and 3 present the coefficient estimates and corresponding odds ratios, respectively for the two ordered logit models. Using a one-tailed test under an asymptotic normal distribution assumption for a large number of observations ($n = 141$), only three factors were found to be significant. The results suggest that for theoretical courses, students perceived that poor mental health exacerbated the challenges of learning during the pandemic. Likewise, Zamorano students perceived this issue more drastically, with odds of 2.18 times more likely to perceive difficulty in learning than students from the University of Chile. Interestingly, for both types of courses, students felt that relocating was an important factor that increased the difficulty in learning. The odds of experiencing learning difficulty for these students are, on average, twice larger than from those students who did not relocate.

Table 2. Ordered Logit Model Coefficient Estimates Assessing Learning Difficulty

	Theoretical Learning Courses	Experiential Learning Courses
Poor mental health	0.201* (1.66)	0.122 (0.97)
Slow Wi-Fi	-0.083 (-0.23)	-0.457 (-1.26)
No study place	0.173 (0.56)	-0.323 (-0.98)
Financial support	0.417 (0.14)	0.345 (0.91)
Relocation	0.706' (1.42)	0.822' (1.55)
School years	-0.202 (-0.18)	0.048 (0.26)
Household size	-0.020 (-0.19)	-0.002 (-0.02)
Zamorano	0.781* (1.87)	0.553 (1.26)
Cut-off point 1	-2.223* (-2.22)	-3.377** (-2.93)
Cut-off point 2	-1.043 (-1.07)	-1.732 (-1.68)
Cut-off point 3	0.339 (0.35)	-0.952 (-0.94)
Cut-off point 4	1.662 (1.72)	0.657 (0.65)
Log likelihood	-201.503	-169.715
Pseudo R ²	0.039	0.016

Note: T-statistics are in parentheses and * $p < 0.05$, ' $p < 0.1$

P values are based on a one-tailed test asymptotic normal distribution ($n = 141$) with $H_0: \beta_j = 0$ and $H_1: \beta_j > 0$ for $j =$ slow Wi-Fi, no study place, relocation, school years, household size, or Zamorano students; or $H_1: \beta_j < 0$ for $j =$ financial support. P values are based on a two-tailed test asymptotic normal distribution for cut-off points.

Table 3. Odds Ratios for the Ordered Logit Model Assessing Learning Difficulty

	Theoretical Learning Courses	Experiential Learning Courses
Poor mental health	1.223*	1.130
Slow Wi-Fi	0.319	0.230
No study place	1.190	0.724
Financial support	1.519	1.412
Relocation	2.026'	2.277'
School years	0.817	1.049
Household size	0.981	0.998
Zamorano	2.183*	1.739

Note: * $p < 0.05$, ' $p < 0.1$

P values are based on a one-tailed test asymptotic normal distribution ($n = 141$) with $H_0: \beta_j = 0$ and $H_1: \beta_j > 0$ for $j =$ slow Wi-Fi, no study place, relocation, school years, household size, or Zamorano students; or $H_1: \beta_j < 0$ for $j =$ financial support.

4.2 Quality of Learning

Students expressed concerns about learning experience and quality due to the pandemic. Thus, we used an ordered logistic model to assess learning quality, regressing this qualitative variable on teaching quality and control variables (i.e., to account for mental health, technical issues, logistics, and demographic information). The results (presented in Table 4) and the odds ratios (in Table 5) show that for both types of courses—ELC and TLC—teaching quality is statistically significant in explaining students' satisfaction toward learning quality. Its positive coefficient in both models indicates that respondents who agree with the statement "*Teaching quality would have been better without the pandemic*" are more likely to agree that "*Learning would have been better without the pandemic*." Thus, students who were unsatisfied with the quality of instruction are more likely to agree that learning in a virtual format is of lower quality, therefore, more challenging compared to in-person instruction. Their odds of having more negative attitudes toward learning quality are higher by 3.9 and 2.4 times for ELC and TLC, respectively, compared to respondents who were satisfied with their quality of instruction. Thus, when comparing the differences in odd-ratios between both course types, it seems that perception of teaching quality played a more critical role for courses with experiential-learning components.¹⁰ Although these results are correlational in nature, they relate to previous work indicating that learners' prior experience with teaching style is a predictor of their satisfaction with experiential learning (Zhai et al. 2017).

Zamorano students perceived that experiential learning suffered a significant decrease in quality due to the lockdown, with their odds of perceiving a lower teaching quality being 2.6 times larger compared to students from the Chilean university. This was expected, as they devote half of the day to learning-by-doing activities. Interestingly, students without financial support expressed more discomfort with the learning quality of ELC during the pandemic, but this was not the case for TLC. This suggests that students who financially support their education by themselves or through family assistance were more concerned about the lack of experiential learning than theoretical learning. Likewise, there is suggestive evidence that undergraduate students in their first years of education perceived that the lockdown impacted the overall learning experience of theoretical courses.

¹⁰ A side test for the difference in the coefficients of teaching quality for both TLC and ELC was conducted. The results show that the estimate of teaching quality in ELCs is significantly higher than for its respective TLC counterpart.

Table 4. Ordered Logit Model Coefficient Estimates Assessing Learning Quality

	Theoretical Learning Courses	Experiential Learning Courses
Teaching quality	0.857*** (4.97)	1.358*** (5.16)
Poor mental health	0.146 (1.13)	-0.0487 (-0.33)
Slow Wi-Fi	0.0476 (0.13)	-0.360 (-0.85)
No study place	0.395 (1.16)	-0.101 (-0.26)
Financial support	-0.282 (-0.73)	-0.853* (-1.98)
Relocation	0.155 (0.31)	0.877' (1.36)
School years	-0.291' (-1.51)	0.155 (0.73)
Household size	-0.0286 (-0.25)	-0.131 (-1.07)
Zamorano	0.271 (0.60)	0.967* (1.87)
Cut-off point 1	-1.908 (-1.44)	2.131 (1.49)
Cut-off point 2	0.439 (0.38)	3.290* (2.31)
Cut-off point 3	1.649 (1.43)	5.308*** (3.56)
Cut-off point 4	3.283** (2.79)	---
Log likelihood	-159.892	-111.910
Pseudo R ²	0.125	0.154

Note: *T* statistics are in parentheses and *** $p < 0.001$, * $p < 0.05$, ' $p < 0.1$

P values are based on a one-tailed test asymptotic normal distribution ($n = 141$) with $H_0: \beta_j = 0$ and $H_1: \beta_j < 0$ for $j =$ slow Wi-Fi, no study place, relocation, school years, household size; or $H_1: \beta_j > 0$ for $j =$ teaching quality, financial support, Zamorano students. *P* values are based on a two-tailed test asymptotic normal distribution for cut-off points.

4.3 Educational Plans

The third set of ordered logistic regressions was specified to investigate the determinants of educational plans (presented in Figure 2) among Latin American students. Three variables (i.e., willingness to take core or elective courses online and likelihood of changing academic careers) were regressed against selected variables that comprise course organization, experiential learning opportunities—lab or fieldwork, mental health, technical issues, and sociodemographic characteristics.

The coefficient estimates¹¹ (shown in Table 6) and the corresponding odds ratios (shown in Table 7) suggest that a well-organized core course would strongly demotivate students from taking it online. For students that felt that a course was not well organized due to the pandemic, the odds of taking more core online courses are 33 percent lower than their counterpart. Interestingly, experiential learning perceptions did not affect participants' opinions about their curriculum planning for both elective and

¹¹ It is not clear whether explanatory variables have a positive or negative influence on educational plans; therefore, we use a two-tailed test assuming asymptotic normal distribution ($n = 141$).

Table 5. Odds Ratio for the Ordered Logit Model Assessing Learning Quality

	Theoretical Learning Courses	Experiential Learning Courses
Teaching Quality	2.355**	3.887***
Poor mental health	0.149	0.140
Slow Wi-Fi	1.049	0.698
No study place	1.485	0.904
Financial support	0.755	0.426**
Relocation	1.167	2.402
School years	0.747'	1.168
Household size	0.972	0.877
Zamorano	1.311	2.631*

Note: *** $p < 0.001$, * $p < 0.05$, ' $p < 0.1$. P values are based on a one-tailed test asymptotic normal distribution ($n = 141$) with $H_0: \beta_j = 0$ and $H_1: \beta_j < 0$ for $j =$ slow Wi-Fi, no study place, relocation, school years, household size; or $H_1: \beta_j > 0$ for $j =$ teaching quality, financial support, Zamorano students.

core courses. This means that the course structure primarily influences students' attitudes toward taking virtual classes. This finding further reinforces that efforts to maintain instruction quality are necessary, particularly considering the prospect of online learning as a significant part of the education system in a post-COVID-19 world. In addition, this finding may prove challenging to move core courses in applied sciences to virtual settings.

On the other hand, participants who perceived that their mental health deteriorated or relocated during the pandemic are less likely to take more core online courses to complete their major. For these respondents, the odds of taking more online courses are 31 percent and 66 percent lower than their counterparts, respectively. Likewise, students from large households are more unlikely to take core courses virtually, which may be attributed to not having an appropriate place to study or proper internet connection, as large families tend to be poorer (Wodon et al. 2001) and, therefore, fewer resources per child are available, including time and guidance (Downey 1995).

In terms of career paths, only a small portion of students showed willingness to change their current careers. For those who expressed this intention, results indicate that respondents who expressed they had poorer mental health during the pandemic would be more likely to switch degrees. Furthermore, students from larger households are 1.4 times more likely to change careers after the pandemic. Likewise, Zamorano students were about 3.9 times more likely to switch degrees compared to those in the Chilean university.

5 Conclusions

This study highlights the difficulties faced in education due to the switch from experiential learning toward online instruction in Latin America during the COVID-19 pandemic. Three key findings emerge that present a more negative outlook for higher education during the pandemic and potentially post-pandemic. First, the survey results suggest that a sudden switch toward virtual platforms has negatively affected both theoretical and ELCs. Second, students' negative impressions of teaching quality were the primary factor influencing their views regarding their learning experience. Compared to theoretical learning-based courses, the teaching quality of ELCs was a more important factor affecting perceived learning. Third, the article also remarks that the negative effect of the pandemic on mental health may have an adverse impact on the students' education planning and career path, which is supported by previous work (Zheng et al. 2021). Yet, the relationship between mental health and career choice of college students seems to be inconclusive (Gray et al. 2021). Furthermore, participants who reported mental health issues expressed that they were unlikely to take further core courses in a virtual setting.

Table 6. Ordered Logit Model Coefficient Estimates Assessing Educational Plans

	Dependent Variable		
	Taking online a core course	Taking online an elective course	Change degree
Course organization	-0.399* (-2.36)	-0.244 (-1.38)	0.0187 (0.08)
Experiential learning	-0.155 (-0.36)	-0.530 (-1.21)	-0.321 (-0.51)
Poor mental health	-0.369** (-3.05)	-0.231 (-1.96)	0.521** (2.92)
Slow Wi-Fi	0.183 (0.53)	0.440 (1.25)	0.400 (0.78)
No study place	-0.510 (-1.62)	-0.348 (-1.09)	0.496 (1.13)
Financial support	-0.641 (-1.68)	-0.388 (-1.06)	0.100 (0.19)
Relocation	-1.074* (-2.06)	-0.367 (-0.75)	0.566 (0.87)
School years	0.0743 (0.42)	0.119 (0.68)	-0.153 (-0.68)
Household size	-0.203' (-1.88)	-0.156 (-1.52)	0.335* (2.50)
Zamorano	-0.512 (-1.20)	-1.042* (-2.45)	1.363* (2.41)
Cut-off point 1	-6.863** (-2.86)	-7.069** (-2.93)	3.934 (1.20)
Cut-off point 2	-5.203* (-2.19)	-5.645* (-2.37)	5.271 (1.60)
Cut-off point 3	-4.181 (-1.77)	-4.559 (-1.93)	6.685* (2.00)
Cut-off point 4	-2.933 (-1.24)	-3.305 (-1.40)	8.475* (2.43)
Log likelihood	-206.350	-211.392	-101.423
Pseudo R ²	0.070	0.057	0.142

Note: *T* statistics are in parentheses and * $p < 0.05$, ** $p < 0.01$, ' $p < 0.1$

P values are based on a two-tailed test asymptotic normal distribution ($n = 141$).

Table 7. Odds Ratio for the Ordered Logit Model Assessing Education Plans

	Dependent Variable		
	Online course other degrees	Online course other degrees	Change degree
Course organization	0.671*	0.783	1.019
Experiential learning	0.857	0.588	0.725
Poor mental health	0.691**	0.794	1.684**
Slow Wi-Fi	1.200	1.552	1.492
No study place	0.600	0.706	1.641
Financial support	0.527	0.678	1.105
Relocation	0.341*	0.693	1.761
School years	1.077	1.127	0.858
Household size	0.816'	0.856	1.399*
Zamorano	0.599	0.353*	3.909*

Note: * $p < 0.05$, ** $p < 0.01$ P values are based on a two-tailed test asymptotic normal distribution ($n = 141$). P values are based on a one-tailed test asymptotic normal distribution ($n = 141$) with $H_0: \beta_j = 0$ and $H_1: \beta_j < 0$ for $j =$ slow Wi-Fi, no study place, relocation, school years, household size; or $H_1: \beta_j > 0$ for $j =$ teaching quality, financial support, Zamorano students.

These results imply that, in the short term, virtual classes may not be the best substitute for traditional courses with learning-by-doing components and further suggest that educational programs in applied sciences need to be proactive in improving the teaching methods and active learning used in online education. Practitioners and college administrators would need to invest significant resources in order to recreate the hands-on learning experience delivered by in-person instruction in virtual settings. Furthermore, efforts are needed to support and improve the technical challenges faced by students and educators for an optimal online learning experience. These efforts should be devised with an equity lens by offering both online and on-campus support and targeting marginalized collegiate populations (Lederer et al. 2020).

Concerning elective courses—which students are more willing to take online—incorporating a blended approach that integrates both classroom and online learning could be an attractive alternative in the post-pandemic education system of applied sciences (Martínez-Caro and Campuzano-Bolarín 2011; Gregory and Di Trapani 2012).

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Acknowledgements: This work was supported by seed funds from the Pontificia Universidad Católica de Chile and Zamorano University.

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