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Original Article

Cambodian twelfth graders' emotional reactions towards online learning amid COVID-19

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Abstract

Online learning has taken over traditional learning in all schools due to COVID-19. This new normal increases Cambodian 12th graders' concerns about their baccalaureate examination. This study aims to explore and compare their emotional reaction towards online learning. It employed exploratory sequential mixed methods, using a multiphase mixed method design. The study collected data from online focus-group interviews with 10 students, online surveys from 232 public- and private-school students, followed by 32 online semi-structured interviews to probe the central phenomenon. The study unveiled that online learning brought both anxiety and enjoyment to students, which impacted their learning quality. Public-school students were found to have more anxiety than their private-school peers. There was likely to have been less difference in anxiety between science and social science major students. However, students in the science track tended to enjoy online learning better. The findings contribute to the awareness of online learning which can benefit both public and private education. A series of in-service training programs on online teaching pedagogies and a communication channel between schools and parents are recommended to be offered and developed, respectively.

Keywords: Online learning; COVID-19; learning tracks; private education

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Introduction

Traditional learning and teaching methods have been suddenly changed to online learning following the global issue of the COVID-19 pandemic. This sudden switch has brought both opportunities (e.g., flexibility, interactivity, self-pacing) and challenges (e.g., student performance was negatively affected by individual's anxiety, economic differences, family condition, and digital competence) in learning and teaching for both the developed and developing world (e.g., Adedoyin & Soykan, 2020; Feldman, 2020). However, its challenges have become a central focus among all. The quality of education through distance learning, particularly online learning with young students and teachers' pedagogical and technological competence, was raised among educators (Doucet et al., 2020). This boosts many scholarly works conducted to understand the impact of COVID-19 on individuals' perceptions of online learning in various contexts. This present study aims to contribute some new understanding to the issue of COVID-19 and online learning by observing students' emotional reactions at public and private schools in Cambodia.

Cambodia was reported to face challenges in implementing online learning due to a lack of digital infrastructures and skills, teaching pedagogies, and unreliable internet connection (Chea et al., 2020; Leng et al., 2020). World Vision (2020) stated that learning from home raised concerns about poor learning quality. This new learning environment has posed numerous challenges, such as technological infrastructure, capacity, ineffectiveness in some disciplines, and lack of supervision (Adedoyin & Soykan, 2020). These, additionally, affect Cambodian students' learning, especially 12th graders (Soeung & Chim, 2022), who are required to sit for the baccalaureate examination. This examination, currently known as the anti-cheating examination, was subject to educational reforms in 2014 to ensure that only qualified students pass (MoEYS, 2019), after it had been criticized for being corrupt for years (e.g., Francis, 1994; Leng, 2017; Maeda, 2019).

Understanding students' emotional reactions could shed light on policy personnel and educators towards the effective digital readiness program for schoolteachers. COVID-19 seems to bring uniformity in learning and teaching pedagogies at both public and private schools when receiving a sudden call to online learning, albeit private schools have advanced public schools in terms of learning resources. Hence, this empirical study aims to investigate the

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association between the emotional reaction and online learning among 12th graders at Cambodian public and private schools during the pandemic by examining their emotional differences and similarities.

Public and private education in Cambodia

The economic growth has impacted the enrolment rates in the public schools in Cambodia. The growth of Gross Domestic Product from 6% in 2010 to 7.1% in 2019 in Cambodia (World Bank, 2019) can be marked as a growth of the middle-class population. The middle-class and rich families demand better education quality for their children (Hanushek & Wößmann, 2007; Khiev & Ty, 2011). During the school year 2018/2019, 23.51% of total urban upper secondary school students enrolled in private schools nationwide. The number of students enrolled in private upper secondary schools in Phnom Penh increased 1.7 times during the school year 2018/2019 in comparison to that of 2015/2016. Nationwide, 47,153 students enrolled in 225 private secondary schools. Of these, 102 schools – accounting for 45.33% – are in Phnom Penh (Soeung, 2021). Yet, little is known about Cambodian parents' and students' reasons for selecting private schools, and the competition between public and private schools. However, the growth in the number of private schools and that of enrollment rates revealed greater challenges for public schools in maintaining their so-far high enrollment rates, especially in Phnom Penh. For example, in some areas in Phnom Penh, the rates declined by about 50% or more. They were generally from upper-income households (see Bredenberg, 2022). In the Cambodian context, private schools recruit teachers who are working or worked for public schools to operate their services. Cambodian public schoolteachers are not restricted to working for private institutions outside their official hours (MoEYS, 2008). Private school provides additional learning facilities, more instructional time, free remedial classes, and examination-preparation courses.

Regarding online learning, COVID-19 has posed similar challenges to both public and private schools. These challenges may cause 12th graders even more concerns about their preparedness for their baccalaureate examination since additional education and private tutoring classes were forbidden during the COVID pandemic (MoEYS, 2020c).

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Challenges in teaching and learning during COVID-19

COVID-19 affected about 1.6 billion students in more than 190 countries through the closure of all educational institutions, impacting 94% of the world's student population and about 99% in low- and lower-middle-income countries (United Nations, 2020). All countries were called to implement online learning to ensure continuity of education (UNESCO, 2020a). Although online learning plays a vital role during this pandemic, it has brought various challenges as learning quality relies on reliable internet connection and teachers' and students' digital competency (Muthuprasa et al., 2021). Dahoud (2020), additionally, reported that some Jordanian teachers had limited knowledge of using tools/applications for online learning. Sintema (2020) revealed that Zambian 12th graders' academic performance in STEM subjects (mathematics, science, design, and technology) dropped in the standardized examination due to less consultation with teachers and limited technological resources. Therefore, more understanding of the challenges of students by subject or learning tracks can form better inputs for both policymakers and implementers.

Cambodia is not an exception to this pandemic. COVID-19 forced 13,482 schools to close, disrupting 3.2 million students across the country (MoEYS, 2021), and shifting students' educational responsibilities from teachers to families (Khut & Chheang, 2020). Online learning is not novel to Cambodia. However, it was not popular among students and teachers prior to this pandemic due to limited facilities and unreliable internet connectivity. For instance, only 48% of Cambodians had smartphones which were mainly used for entertainment purposes (Phon et al., 2016).

Following COVID-19, Cambodia's local studies reported key challenges for educational institutions, teachers, and students, such as a lack of digital infrastructure, ICT skills, online teaching pedagogies, and unstable internet connection (Chea et al., 2020; Cheam, 2021; Chet et al., 2022; Em, 2021; Heng et al. 2023; Leng et al., 2020; Soeung & Chim, 2022; Uon, 2020). In April 2020, MoEYS requested teachers and students to adapt to this new normal despite being aware of the digital competency gap between rural and urban areas (Flynn & Himel, 2020; MoEYS, 2020a). MoEYS attempted to increase exposure to online learning through different means: a new educational television channel (TVK2/TVK-Education), WiKi TV, MoEYS' Facebook page and e-

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learning websites, Zoom, Google Meet, and social media applications (MoEYS, 2021a). However, a low number of students accessed these online learning platforms (UNESCO, 2020b). Although online learning was prioritized for 9th and 12th graders during the school year 2019/2020, their examinations were cancelled, and all registered candidates were awarded the same pass grade (MoEYS, 2020b).

Like in other contexts, online learning received considerable research attention in Cambodia since the start of COVID-19. The local studies on students' attitudes towards online learning revealed both positive and negative attitudes towards it. With the rapid change, students faced challenges in having convenient internet connectivity and a good learning environment at home, as well as less teacher and student interaction. However, online learning brought greater improvement in students' digital knowledge and skills and new ways of collaborative ways of working and studying (e.g., Chea et al., 2020; Cheam, 2021; Leng et al., 2020; Uon, 2020; Heng et al., 2023). By probing into the specific impacts on science and social science teaching, Soeung and Chim's (2022) study revealed different attitudes of teachers in social science tracks toward online learning. This study found that online teaching and learning offered more benefits to teachers and students than their peers in mathematics and science subjects, except for biology. Online learning helps them be exposed to the various examples of the lessons through using not only social media applications but also different websites, unlike during traditional learning when they could only see black-and-white pictures in their textbooks. However, understanding the attitudes of students in science and social science has remained relatively under-researched in the Cambodian context.

Research methodology

Research design

A multiphase mixed-method design, using an exploratory sequential phase followed by a qualitative phase, was employed owing to the fact that very little is known about the study's intent (Creswell & Creswell, 2018). The findings from the second phase of qualitative data will be reported alongside the quantitative results with the purpose of triangulation and further explanation. The study's findings will enrich the literature amid COVID-19, specifically for diploma-granting grades.

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This study's design was combined by two aspects, namely psychology and perceived benefits of online learning. Psychologically, concepts of *emotion* were used since a new normal way of learning suddenly emerged and affected the learning process at both public and private schools following COVID-19. This sudden change affects students' feelings regardless of their educational type. Reeve (2018) pointed out that emotions are associated with what people do and provide their ongoing activities. Additionally, people's emotions occur in response to a particular event or environment and social phenomena. Although concepts of emotions have rarely been used in previous literature of online learning, gaining insights into students' emotional reactions during this global phenomenon will assist educators and personnel at the central level as well as policymakers to effectively respond to education quality and prepare for the resumption of schools. The emotional reactions are referred to as negative and positive emotions, which are known as *anxiety*—disruption/distraction, nervousness/worry, and *enjoyment*—meet a need, achieve something unexpectedly, respectively (Norton & Abbott, 2016; Csikszentmihalyi, 2008). In this study context, baccalaureate examination and online learning during the pandemic may affect 12th graders' emotions.

Samples and sampling

The samples of this study were selected in three different stages. First, a snowball sampling method was employed to select 10 samples. The first three samples were online tutees of the researcher's colleagues. Then, they asked and introduced some other students to our research team. Second, a convenient sampling method was employed to select research settings; as a result, two private schools and one public school were chosen due to the school closure. Then, cluster random sampling was used to select the respondents for the survey questionnaire. Table 1 illustrates that of the total targeted participants (n = 387), 232 students (public school = 102; private school = 130) responded to the survey, while 83 targeted students (approximately 21.45%) denied participating, and 72 (approximately 18.60%) did not respond at all. Third, 32 informants (15 students: 6 of them were from the public school, 7 parents, 10 teachers) were selected to be the interview informants for the last stage of this present study's data collection stage (see Table 1). Teachers of 12th grade, teaching examination subjects for the science and social science track, were purposively invited for interviews. It is worth noting that all selected teachers

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were teaching in both target public and private schools during the data collection period. Students were randomly selected from the questionnaires among those who preferred a choice: *My parent and I are willing to join the interview*. However, only seven parents could be reached for interviews.

Table 1. *Number of samples*

School ID	Targeted samples			Survey samples (N = 232)				Interview samples (N = 32)					
								Student		Parent		Teacher	
	n	F	%	n	%	F	%	n	F	n	F	n	F
Sch.1	132	83	62.9	102	77.3	75	73.5	6	2	2	2	10	4
Sch.2	153	70	45.8	98	64.1	37	37.8	4	3	3	2	-	-
Sch.3	102	47	46.1	32	31.4	21	65.6	5	2	2	0	-	-
	387	200	51.7	232	59.9	133	57.3	15	7	7	4	10	4

Note. F = Female

Data collection

Data for this study were collected in three different phases. Each phase was conducted online using Zoom, Google Meet, and other social applications (i.e., Telegram, Facebook Messenger). Ethical approvals were received from MoEYS in January 2021, and informants offered written consent for voluntary participation and the use of their collected information.

First, online focus-group interviews were conducted with two groups of five in February 2021 after school closure in Cambodia. An unstructured interview was employed and guided by one open-ended question: *Can you share with us your opinion on* online learning *(challenges and eases) during school closure?*

Second, quantitative data was collected during March 2021. Prior to the data collection, the researchers consulted survey-questionnaire contents with their colleagues whose expertise is the Khmer subject to avoid any misleading statements. The online survey questionnaire was piloted with students in one private school and one public school in Phnom Penh to ensure a valid and reliable instrument before it was sent to the target samples. Seventy-seven 12th graders (private school = 25, public school = 52) among 61 private-school students and 136 public-school students responded to the piloting survey. The piloting survey's reliability ($\propto$ = .757) indicated that the instrument was suitable

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to carry out. Then, a link to the survey questionnaire was sent to all 12th graders (n = 387) in the three selected schools. The study's purpose was clearly informed on the first page and followed by a request for their voluntary participation. Participants could choose to reject or accept by clicking one choice – *agree* or *disagree to join* – before they could proceed to survey questions. As a result, 232 students responded to the survey questionnaire. Respondents were asked to select one out of five scales (1 = strongly disagree, 2 = disagree, 0 = neutral, 3 = agree, 4 = strongly agree) that represented their experiences in online learning (8 statements). Prior to this, they were asked to select choices of their digital devices, internet access availability, when they have their device(s) and internet, and knowledge of using online learning platforms.

Then, online semi-structured interviews were conducted with 32 informants in April 2021 (see Table 1). The interviews were done in the local language, Khmer, and each interview lasted approximately 20 to 30 minutes. These qualitative data were used to triangulate the quantitative results to solidify the study's findings.

Data analysis

Before proceeding to a qualitative analysis, recorded interviews were transcribed. Then, informants were again contacted to verify their transcripts. This stage is crucial in a qualitative study to ensure accurate information (Hagens et al., 2009). We manually coded concepts according to how frequently they appear. These concepts were explicitly coded, and they were used to explain each phenomenon. We employed an interactive model for the qualitative analysis (data collection, data display, data condensation, drawing/verification) because this model provides researchers with a more cyclical process, which ensures complete information, rather than a sequential one (see Miles & Huberman, 1994). To ensure validity and reliability, coding agreement for content analysis was employed. The codings from researchers were compared to see similarities and differences (Anney, 2014). When a coefficient agreement is above 70%, it is considered sufficient agreement or reliable (Miles & Huberman, 1994).

Prior to the quantitative data analysis, collinearity and reliability tests were performed. First, collinearity was checked (Appendix 1). Then, Exploratory Factor Analysis (EFA) using Principal axis factoring with varimax rotation was

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performed to check whether all statements could explain their own construct. The 8 statements (∝ = .825) were divided into two constructs, namely anxiety and enjoyment. *Anxiety* consisted of four statements (∝ = *.635;* KMO = .626; Bartlett's test = 122.207; $p < .001$). *Enjoyment* also contained four statements (∝ = *.583;* KMO = .563; Bartlett's test = 122.207; $p < .001$). Therefore, results of internal consistency and EFA indicated that the instrument was suitable. Descriptive statistics for quantitative data were used to report the study's intent: the association between the emotional reaction and online learning among 12th graders at Cambodia's public and private schools during COVID-19.

Results and discussion

Qualitative findings

Online learning and students' emotional reactions

The focus group interviews showed that online learning raised both anxiety and enjoyment towards learning among Cambodian 12th graders in Phnom Penh. The *anxiety* is embedded in four main themes. First, all respondents from both groups expressed that they had a low foundation of the prescribed knowledge and skills due to a long school closure. Second, this study depicted that online learning caused more tension among 12th graders since online learning was passive (one-way instruction), and they could not learn well. Third, being in a diploma-granting grade increased higher anxiety among 12th graders due to the limited effectiveness of online learning. Last, students seemed to have different viewpoints regarding online learning when focusing on learning tracks (science and social science). Students in social science expressed satisfaction with this learning because their teachers could provide them with more online resources. This was never used in a traditional classroom. However, students in the science track illustrated nervousness towards online learning. They needed more explanations and practices. A female public-school student (S02), in the social science track, explicitly explained that "online learning is better than traditional ones because teachers use YouTube/websites or Google. I have had no such experience so far."

Additionally, we thematised four causes of students' *enjoyment* towards online learning. First, both groups pointed out that online learning gave them less

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pressure (e.g., not being blamed or controlled) compared to traditional learning. However, private-school students seemed to hesitate to express strong agreement with these benefits. Second, more than 50% of informants viewed that online learning assisted them in becoming self-directed learners, as claimed by Passerini and Granger (2000). Third, students viewed online learning as helpful since they could access learning materials uploaded on e-learning websites, given handouts, and recorded voices/videos during lessons, anytime they wished. Fourth, the flexibility of learning (e.g., staying in touch with peers and teachers) was one of the pronounced enjoyment variables of online learning. Relevant studies (e.g., Ventura & Jang, 2010; Liu & Bray, 2018) also showed this advantage.

Conceptual framework and research questions

Relied on the first interview stage's findings, this study's conceptual framework, as shown in Figure 1, is used to capture the relationship of students' emotional reactions towards online learning using two constructs: *anxiety* and *enjoyment*. These constructs were formed based on Reeves' (2018) emotional reaction explanation; however, these emotional reactions in this context were observed from the lens of students' learning tracks. Reeves (2018) explained that people take action as a response towards a particular social phenomenon they are facing in accordance with their emotion (anxiety or enjoyment). The emotion functions in people to facilitate their motivation and adaptation. Negative emotion, *anxiety*, is a warning signal that may thwart people from pursuing their goals or needs. However, despite seeing 'emotion as readout,' the fear or terror produces a strong emotional reaction that provides persons with motivation to act. Positive emotion, *enjoyment*, motivates people to continue to pursue their goals and needs. The present study placed online learning during the COVID-19 pandemic as a particular social phenomenon that affects the 12th graders' emotions. Despite the social phenomenon of online learning, the learning track – social science and science – is placed as another stimulus influencing the 12th graders' emotional reactions. This study will take a novel approach to compare emotional reactions, *anxiety* and *enjoyment*, between private and public-school 12th graders during the COVID-19 pandemic. Therefore, to realize the study's intent, this current study aimed to answer the questions: (1) How does online learning affect the emotional reaction of Cambodian public- and private-school 12th graders during COVID-

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19? (2) Were there any differences in their reaction between students in the science and social science track?

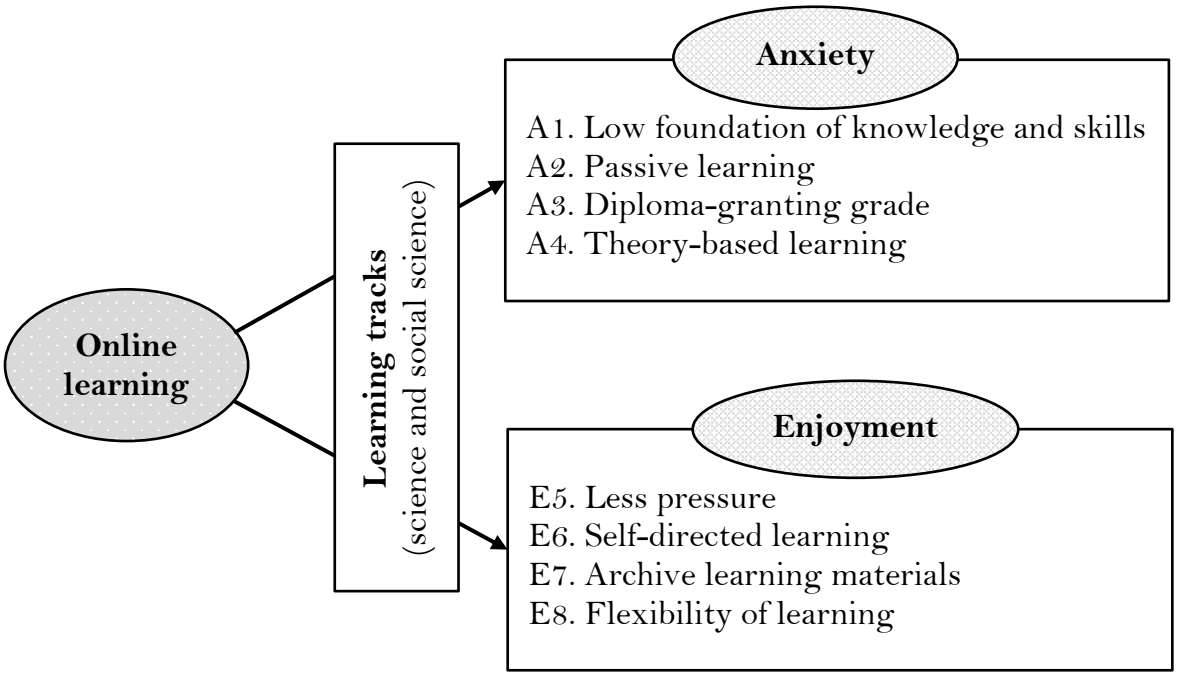


Figure 1. Conceptual framework

Quantitative results

This study showed that about 96% of respondents owned at least one smartphone. Almost one-third (31%) of them had another digital device (i.e., a computer or iPad). About 4% of respondents shared a digital device for online learning with siblings. Only about 52% reported that they used home wireless networks, while the rest used the (pre-paid) phone internet. More than 58% of respondents, furthermore, claimed that their parents bought them a new digital device, and 17% changed to use home wireless networks during the school closure. This implies that parents tended to support children's online learning to ensure their children's learning availability. Qualitative data concurred that more than half of parents who participated in the interviews supported their children's learning as much as they could afford. This seemed to offer a positive signal towards online learning quality since parental engagement was important when there was less supervision from schoolteachers while learning from home (MoEYS, 2021a).

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Around 94% of respondents (public school = 91.18%, private school = 96.15%) reported that they could manage by themselves when accessing online learning website/applications. About 6% (public school = 8.82%, private school = 3.85%) required some support from their relatives/parents in some cases. This relatively high percentage of self-support with online learning access may have resulted from their experience during the last school year (2019/2020). Additionally, at this young age, they are able to adapt themselves faster towards digital usage because they are growing in the digital era (Prensky, 2001). As evidenced by the interview, one private school student (PS05) explicitly expressed:

> *[…] I can access my online classes [materials] by myself now. Last year, I faced some challenges [uploading or saving assignment/videos from MoEYS websites].*

Effects of online learning on students' emotional reactions

The descriptive results revealed the differences in the students' anxiety and enjoyment among the 12th graders. The students at the public school seemed to have more anxiety than their counterparts. As seen in Table 2, there were approximately 32 percentage points more of the public-school students than that of the private school reported that they obtained a low foundation of knowledge and skills due to online learning. This suggests that learning quality through implementing online learning has raised concern across educational institutions. The quality at the public school was likely to be more of a concern than that of the private school. This implies that online learning does not seem to be effective in comparison to traditional learning, especially in public schools. This echoed findings in Cambodia (Soeung & Chim, 2022), Pakistan (Adnan & Anwar, 2020), and Bhutan (Wangdi et al., 2021). The differences may also reflect slow adaptation towards online learning at public schools, especially in terms of facility and pedagogy support, although the same teachers worked for both public and private schools. The interviews, additionally, concurred that both students and teachers showed concerns about the quality of teaching and learning due to a lack of online teaching pedagogies and students' low understanding. This was aligned with the case of Spain (Tejedor et al., 2020) and Soeung and Chim's (2022) study, conducted in the same Cambodian context.

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All public-school informants and 33.33% of their peers at private schools corroborated that their teachers used only text or voice messages enclosed with photos of textbook pages and/or that of handout papers for their online learning during official hours. Tejedor et al. (2020) noted that these were not preferable digital sources or materials for students for online learning. A public-school informant (MS01), for example, explicitly revealed: "[…] [I]n my online class, […] my teachers texted or voiced us with some photos of handouts and pages of the textbook, with brief explanations. Yet, I cannot understand well."

In the same token, about 60% and about 52% of the public-school students expressed higher anxiety towards passive learning and theory-based learning during online learning, respectively, whereas around 43% and about 37% of their peers at the private school felt the same. This result indicated that teachers did not seem to engage students in learning activities during the official hours as found by Adnan and Anwar (2020). All public-school students reported that their teachers only shared pictures of textbook pages with brief explanations, whereas 66.67% of private-school interviewees reported that their teachers used PowerPoint presentations and engaged students by asking questions and group discussion. Yet, not many students responded to the teachers' questions. This implies that online learning poses challenges to teachers to maintain an active learning process. This could suggest that teachers should be offered proper online teaching pedagogies as they were trained for traditional classes. One private-school informant (PS07) plainly described:

> *It [online learning] is boring. Teachers explained, used slide presentations and asked questions, yet only teachers answered their own questions. The class is so quiet.*

Regarding a *theory/formula-based classroom*, this implies that public-school teachers tended to focus much on theories with very few practices during school hours. The interviews also corroborated this phenomenon. A private-school informant expressed that "[…] I think we got fewer practices than we used to have in face-to-face classrooms." This finding seemed to be aligned with previous studies of private tutoring before the rise of COVID-19 (e.g., Brehm & Silova, 2014). However, the study found unclear evidence as to whether this

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was teachers' way to promote tutoring classes or whether it was caused by their limited online teaching pedagogies and digital skills.

Additionally, online learning posed challenges to teachers' teaching skills and classroom management. Online learning pushes teachers to exercise a teacher-centred approach rather than a prescribed teaching pedagogy, namely a learner-centred one. For example, one teacher (T06) stated that "Class is passive because we cannot monitor them. I feel I teach with a blindfold. During online learning, students use only listening, [but] not thinking, asking, or noting because they can refer to handouts or recordings later." He metaphorically called online learning a '*blindfold-teaching*' process, which pushed teaching to be a 'teacher-talking-time' due to the time constraint and inflated syllabus. It also reduced teachers' teaching enthusiasm (Rasmitadila et al., 2020). Regardless of the common issue of internet connection, teachers tended to face other challenges in promoting students' academic engagement and prosocial behaviour when missing the classroom management function in the teaching process (Emmer & Sabornie, 2015). However, it is undeniable that low internet connectivity was an issue, although the study context is in the main capital city, and more than 50% of samples used home-wireless internet. Similarly, MoEYS (2021a) reported that internet connectivity issues were a second barrier after the financial one.

However, both groups of students seemed to have the same anxiety regarding their baccalaureate examination. The public-school students (approximately 86%) and private-school students (approximately 81%) expressed this anxiety as they thought online learning could reduce their chances of gaining passing grades because they could not learn all the intended knowledge and skills properly. The lack of digital capacity and online teaching pedagogies of their teachers, furthermore, contributed towards this emotion (Chea et al., 2020; Sothy, 2021). A public-school student (MS02), for instance, explicitly revealed:

> *I am so worried when thinking about my examination because I don't really trust in my knowledge. Also, I felt that teaching is not good [through online].*

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Table 2. *Twelfth graders' perceptions of online learning by school type (N = 232)*

Variables	Public school (n = 102)				Private school (n = 95)			
	Agree		Disagree		Agree		Disagree	
	n	%	n	%	N	%	n	%
I. Anxiety								
1. Low foundation of knowledge and skills	94	92.16	8	7.84	78	60	34	26.15
2. Passive learning [one-way instruction]	61	59.8	33	32.35	56	43.08	49	37.69
3. Diploma-granting grade	88	86.27	11	10.78	105	80.77	8	6.15
4. Theories-based learning	53	51.96	42	41.18	48	36.92	55	42.31
II. Enjoyment								
5. Less pressure	100	98.04	2	1.96	95	73.08	28	21.54
6. Being a self-directed learner	44	43.14	47	46.08	76	58.46	38	29.23
7. Archive learning material	53	51.96	22	21.57	107	82.31	5	3.85
8. Flexibility of learning	86	84.31	13	12.57	96	73.85	19	15.62

Despite the anxiety, online learning created positive emotion – *enjoyment* – such as less pressure and flexibility, among public-school students than their peers. Table 2 illustrates that around 98% and 84% of public-school students reported that online learning reduced their pressure and provided them with more flexibility, respectively, compared to their counterparts. These results suggested that students had freedom in terms of classroom learning behaviours and being able to join class from where they were. However, private-school students seemed to be distantly controlled by their schools through school-parent communication channels. It indicated that parents whose children are in private schools seemed to actively engage in children's online learning through communicating with the school. During the interview, one teacher of Khmer subject teaching students in both science and social science classes (T08) also expressed the collaboration of parents:

> *We informed the school coordinator and s/he will contact the concerned child's parent if they were late or there was no response when asking for answers.*

Additionally, the descriptive statistic results showed that online learning assisted students to be *self-directed learners* and provided them with various *learning materials*. Over 58% and 82% of private-school students reported having

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this positive emotion of enjoyment, self-directed learning and learning materials, respectively. This implies that private-school students tended to be satisfied with additional learning materials/handouts offered by their teachers through online applications. Also, this offer provided them with more chances to do more studies on their own. Interview data concurred with these results. For instance, one private school student (PS05) described:

> *Online learning gives us more opportunities than traditional learning because we can refer to the uploaded lessons/videos or screen record lessons anytime at home. I like this way of learning. Also, we can expose ourselves to various sources through YouTube and Google.*

Online learning seems to bridge the gap between public and private schools in terms of teachers' technological and pedagogical competence. Notwithstanding, it tended to cause more negative emotion, *anxiety*, among public-school students. Online learning at public schools seems to be more asynchronous than synchronous compared to their private-school peers. Furthermore, public schools seemed to have limited capacity to engage parents with their children's learning, although this engagement was highlighted to be crucial by MoEYS. However, private schools seemed to have better communication with the parents. With this dynamic involvement, but not limited to support for teachers (e.g., financial, technological, and pedagogical), private-school students tended to have a better new normal learning experience.

Student's emotional reactions towards online learning by learning track

Out of 232 selected samples across the school types, 137 students (59.05%) were following the science track during that academic year; whereas 95 students (40.95%) were in social science.

When observing the students' emotional reactions from the perspective of students' learning tracks, Table 3 shows that regardless of learning tracks, 12th graders had relatively similar anxiety towards online learning during the pandemic. As seen in Table 3, 85 students, which is accounted for approximately 62% of all the students in the science track, and about 64% of their peers in the social science track, reported feeling anxious towards online

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learning. However, the results exhibited that more than 75% of students majoring in science stated to have a positive reaction of enjoyment towards online learning, whereas around 67% of their peers in social science feel the same. This could be said online learning was found to be more compatible with science disciplines (Leszczyński et al., 2018). Similarly, Dahoud (2020) found that Jordanian students preferred to participate in only mathematics and science subjects. Contextually, students in science face more challenges in obtaining passing grades than their peers in social science because their mathematics and science tests were more challenging than that of their peers in social science (Soeung, 2021). Thus, this may encourage them to work harder during online learning to ensure success in their baccalaureate examination. Psychologically, Reeze (2018) explained that fear or terror is an immediate source to motivate a person to take action. When the terror takes away one person's emotion, s/he takes away their motivation.

The interview data showed that students following the science track enjoyed online learning. All interviewed teachers concurred that students who followed the science track had higher commitment towards their learning not only in traditional but also online classes. One teacher (T03) explicitly described that "[…] During online class, I observed that students in the science track are as hard-working as they were in traditional classrooms."

Table 3. *Twelfth graders' perceptions of online learning by learning track (N = 232)*

Variables	**Science (n = 137)**				**Social Science (n = 95)**			
	Agree		**Disagree**		**Agree**		**Disagree**	
	n	%	n	%	n	%	n	%
I. Anxiety								
1. Low foundation of knowledge and skills	95	69.34	29	21.17	77	81.05	13	13.68
2. Passive learning [one-way instruction]	70	51.09	46	33.58	47	49.47	36	37.89
3. Diploma-granting grade	117	85.40	7	5.11	76	80	12	12.63
4. Theories-based learning	57	41.61	60	43.80	44	46.32	37	38.95
Grand total in average	**85**	**62.04**	36	26.28	**61**	**64.21**	25	26.32
II. Enjoyment								
5. Less pressure	114	83.21	18	13.14	81	85.26	12	12.63
6. Being a self-directed learner	79	57.66	43	31.39	41	43.16	42	44.21
7. Archive learning material	110	80.29	14	10.22	60	63.16	13	13.68
8. Flexibility of learning	110	80.29	17	12.41	72	75.80	15	15.80
Total	**103**	**75.18**	23	16.79	**64**	**67.37**	21	22.11

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Conclusion and implications

This study intends to explore and compare public-school and private-school students' emotional reactions towards online learning amid COVID-19. It contributes to online learning literature during the pandemic in Cambodia and other developing countries that have limited technology-readiness programs. Although this study's findings are in line with many of the latest studies on online teaching and learning amid COVID-19, it depicts more relevant perceptions within the Cambodian context.

Online learning created both anxiety and enjoyment among students. Specifically, public-school students seemed to have more anxiety towards their learning than their private-school counterparts. Students following the science track, additionally, had greater enjoyment in online learning than their peers in social science.

Concerning anxiety, public-school students had some apprehensions about their low basic knowledge and skills because of online learning (i.e., passive learning and acquiring only theories/formulas with limited practices). This was a result of the low quality of online learning, insufficient digital knowledge and skills, and lack of technical support from schools. However, after struggling with online learning, students can adapt themselves to using online applications better.

In an attempt to maintain their customers' satisfaction, private schools adjusted themselves faster to learning during this COVID-19 pandemic. They communicated well with parents to supervise learning from home, ensure regular class attendance and participation, as well as follow up on homework submissions. This communication maintained private-school students' enjoyment of self-study through making use of additional learning materials. Nevertheless, limited classroom management and a shortfall of communication between schools and parents contributed towards public-school students' enjoyment of online learning. Regardless of emotional reaction types, online learning brought them more worries about their national examinations. This encourages them, especially students in the science track, to become self-directed learners. However, further studies are needed to unpack this phenomenon. Thus, results will be even more meaningful for relevant personnel at the central level to consider for future implementations and

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prepare for any unplanned social phenomenon later. Additionally, to provide more benefits to educational stakeholders, further studies should consider enlarging the number of samples in both types of education through conducting onsite data collection and interviewing other stakeholders.

To reiterate, this study's findings alerted personnel and policymakers at the central level to consider developing communication channels between public schools and parents to promote parental involvement in children's learning (Emerson et al., 2012; MoEYS, 2021a). Moreover, aseries of in-service training programs on online-teaching pedagogies and teaching-related digital skills should be conducted. This may ensure the quality of teaching and learning after the COVID-19 pandemic.

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Appendix 1. Pearson correlation

Variables	A1	A2	A3	A4	E5	E6	E7	E8
A1. Low foundation	-	.280**	.209**	.138*	.226**	.119	.027	.223**
A2. Passive learning		-	.278**	.488**	.241**	.091	.027	.163*
A3. Diploma-granting grade			-	.409**	.388**	.073	.363**	.385**
A4. Theory-based learning				-	.233**	.116	.189**	.250**
E5. Less pressure					-	.136*	.053	.291**
E6. Self-directed learning						-	.255**	.272**
E7. Archive learning materials							-	.529**
E8. Flexibility of learning								-

* = Correlation significant at 0.05 level (2-tailed); ** = Correlation significant at 0.01 level (2-tailed); Cases Listwise (N = 232); A = Anxiety; E = Enjoyment

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