



# Exploring Students' Increased Use of Tablets After Taking Online Courses During the COVID-19 Lockdown

Yuxiong Zhang <sup>1\*</sup>

 0000-0003-0305-0110

<sup>1</sup> Dalian University of Foreign Languages, Dalian, CHINA

\* Corresponding author: [yuxiongzhang@hotmail.com](mailto:yuxiongzhang@hotmail.com)

**Citation:** Zhang, Y. (2022). Exploring Students' Increased Use of Tablets After Taking Online Courses During the COVID-19 Lockdown. *Contemporary Educational Technology*, 14(4), ep380. <https://doi.org/10.30935/cedtech/12283>

## ARTICLE INFO

Received: 5 Apr 2022

Accepted: 17 Jul 2022

## ABSTRACT

The present study aimed to investigate the ownership and usage of Tablets among Chinese foreign language students. Adopted a quantitative approach, this research was considered a case study with exploratory nature. The data were collected from a self-reported questionnaire between May 31<sup>st</sup> and June 6<sup>th</sup>, and 276 valid responses were analyzed utilizing SPSS. Independent samples t-test and Fisher's exact tests were carried out to perform inferential and descriptive analyses. Findings revealed that augmented ownership of tablets did not result from the implementation of online courses after the outbreak of COVID-19. However, some students demonstrated preferences for paperless learning, whose learning style might have changed during the intensive distance learning process for more than one semester. Still, students' opinions towards the introduction of tablets into pedagogical practice weren't overall positive; those who did not have or were not willing to purchase tablet devices were more likely to be unsupportive.

**Keywords:** tablets, COVID-19, individual learning, foreign language learning, paperless learning

## INTRODUCTION

During the precipitate pandemic outbreak in 2020, the education system and pedagogical approaches were challenged worldwide as what happened to the other sectors. Up to June 2020, 114 countries faced school closure caused by COVID-19, directly impacting 863,867,333 learners worldwide<sup>1</sup>. Nevertheless, after resuming the face-to-face classes in the mid-term of the first semester of the 2020-2021 school year, namely from October of 2020 after online courses for 27 weeks, the author noticed an increased use of tablet devices in foreign-language classes by students during the daily teaching activities based on his observations. Many studies are concerned about students' mental disorders, depression, and anxiety issues during the quarantine (Alazzam et al., 2021; Fawaz & Samaha, 2021; López Steinmetz et al., 2021; Pourghaznein et al., 2021). However, no investigation studied the potential changes that occurred on the students' study habits and learning method, especially regarding the use of tablet devices, after the unprecedented distance learning experience with all subjects included more than one semester. The complete alteration of the learning environment and pedagogical practice based on online course setting leads us to consider any essential relation between distance learning during the national lockdown due to Covid-19 and students' increasing use of tablets in foreign-language classes, where the didactic strategies are perceived to be traditional with especial focus on memorization and repetition, especially in China (Água-Mel, 2014).

Meanwhile, it was also reported that research on the actual impact of tablet devices on learning is overall limited. Even though plenty of investigators contribute to building the knowledge base of mobile learning, rare attention is focused on tablet devices (Chen & deNoyelles, 2013; Haßler et al., 2016). Furthermore, it is also believed that severe gaps exist in this field of research, where the empirical studies carried out in

<sup>1</sup> Source: <https://en.unesco.org/covid19/educationresponse#durationschoolclosures>

developed countries are predominant (Fernandez & Mammen, 2020), whose results can differ in other developing economies, considering the different socioeconomic backgrounds and development levels of education. For instance, Lee et al. (2021) studied how undergraduate students made use of tablet devices and digital pens for learning Chemistry in an Australian university; Sage et al. (2019) compared 120 American college students' learning experiences on print and digital readings, which were found to be highly similar; A study focused on 177 first-year British university students' choice of device to access to video lectures carried by Namuddu and Watts (2020) demonstrated that the preference for using tablets lasted only a few months; A mixed-methods study, which involved 292 first-year composition students and 46 instructors at a North-American research university, suggested that offering tablets and implementing a digitized curriculum could facilitate several positive outcomes (Hembrough & Jordan, 2020). Nevertheless, while these studies have discussed the application of tablets in teaching practice and the effect and outcome of their use, all the interventions were created based on the provision of devices, which is not practical to realize in many developing countries, and this also may not reflect students' natural preference or spontaneous use. The students participating in the studies may not have had previous contact with the tablets in the learning context and it is possible to lead to an overly and mistakenly optimistic result due to the novelty (Clark, 1983). At the same time, considering the changes in the way of teaching and learning brought by the pandemic, the use of tablets may take on a different meaning compared to the old days. In this case, we intend to study if the unavoidable promotion of the e-learning modality towards the aggressive pandemic potentially changed Chinese students' study habits and stimulated their use of tablet devices in learning foreign languages.

## THEORETICAL FRAMEWORK

Tablet devices ownership is patently rising (Sage et al., 2019). Since the release of the first generation of tablet devices at the beginning of the second decade of the 21st century, they became worldwide popularized rapidly, whose sales volume has presented an explosive growth (Haßler et al., 2016). The shipment of tablets has overtaken desktop computers and laptops in early 2013<sup>2</sup>. Furthermore, the popularity of mobile technologies in the higher education context in developed economies is also witnessed, and tablets are considered the most popular devices for academic purposes (Sevillano García et al., 2020). Several countries have implemented tablet devices for education use at different scales, including the U.S.A, South Korea, England, Spain, Portugal, Singapore, Turkey (Duran & Aytac, 2016; Semerci, 2018). However, while tablet devices bring new pedagogical approaches and put forward a different point of view of education, the current teaching modalities are also challenged by their emergence. (Litzler & Laborda, 2016; Male & Burden, 2014).

Compared with other sectors, change processes tend to be slower and more incremental in the educational context, and the emerging technologies are believed not fully integrated into current pedagogical methodologies in a holistic way (Coyné & McCoy, 2020; Nguyen et al., 2015). Many teachers turn to using technologies to maintain their current pedagogical goals more efficiently or even merely provide learning content digitally, rather than adopting appropriate strategies to apply tablets in teaching practices or enhance learner-centered approaches (Montrieux et al., 2015; Roblin et al., 2018). The utilization in certain circumstances does not fit the students' expectations (Semerci, 2018). At this point, the proper strategy to align tablets within the academic programs and workflows also remains to be specified (Nguyen et al., 2015). Still, lectures may do not know how to apply the tablet devices effectively in teaching activities or may not be fully conscious of their affordances for educational use, especially without beneficial preconditions, such as supportive policies launched by educational institutions and sufficient knowledge about integrating tablets with course content (Fernandez & Mammen, 2020; Lee et al., 2021; Roblin et al., 2018).

Also, the learning outcome associated with tablet use is still inconclusive, a dearth of empirical research on its potential effect on learning, particularly among higher education students (Fernandez & Mammen, 2020; Nguyen et al., 2015; Wakefield et al., 2018). A good deal of investigations was conducted in a controlled atmosphere where researchers' intervention is more evident than the participation of teachers (Haßler et al., 2016). Moreover, to some extent, tablet devices are still viewed as an underused and unmaturing resource in universities. Its use is limited in accessing course resources and library databases, note-taking, maintaining

<sup>2</sup> Source: <https://www.statista.com/statistics/272595/global-shipments-forecast-for-tablets-laptops-and-desktop-pcs/>

communication, using for presentation and projection, and accomplishing online assessment (Sevillano García et al., 2020). Furthermore, even several investigations reported the high level of technology acceptance by the learner community (e.g., Ally et al., 2017; Nguyen et al., 2015; Sage et al., 2019), the actual situation of students' ownership, usage behavior, attitude, and preference towards tablet devices in other non-developed countries is also not clearly identified. Students can also be underprepared and socioeconomically disadvantaged to integrate tablet devices into their learning and daily life (Hembrough & Jordan, 2020). Few studies are concerned about tablet-based learning in developing countries (Haßler et al., 2016). Thus, it is believed that research on the use of tablets for learning purposes, with a basis on Chinese university students, can undoubtedly contribute to the present education field.

As a potential instrument that can enhance distance learning, the appearance of tablets on campus certainly transforms students learning methods and preferences. Owning a tablet device is viewed to be most beneficial for college learners, enabling an innovative approach for interactions and engagement (Gokmen et al., 2018). Tablets are considered to integrate multiple features within one device, which permits free customization. It allows a versatile and obstruction-free usage (Haßler et al., 2016; Sage et al., 2019; Montrieux et al., 2015). The touch screen is praised for being user-friendly and ergonomically convenient. While equipped with a digital pen, tablet devices can even reduce students' cognitive load and allow retaining information in an easier way (Haßler et al., 2016; Lee et al., 2021). Documentation is also reported enhanced with the use of tablet devices (Zhang & Nouri, 2018). However, reviews rarely focus on digital pens when studying tablet devices (Lee et al., 2021). Also, it was reported that the tactile feature of tablets might draw more attention from kinesthetic learners (Devey et al., 2012), revealing a possible inherent difference among different students.

In general, tablets are considered easy to use with high flexibility, portability, and productivity (Nguyen et al., 2015). Among the rest, portable nature is the most noticeable feature that several investigators highlighted (e.g., Fernandez & Mammen, 2020; Hembrough & Jordan, 2020; Haßler et al., 2016; Zhang & Nouri, 2018). These lightweight mobile devices can somehow prevent the orthopedic damage provoked by heavy print books and materials (Talbot et al., 2009). Meanwhile, tablets are also characterized by their ubiquity, allowing access to information and course materials easily and rapidly (Yalman & Basaran, 2021; Zhang & Nouri, 2018).

Evidence suggests tablets can be used in individual and self-directed learning, allowing learners to manage the learning process at their own pace for effective outcomes and stimulating them to construct their own learning content and process. Enabled data collection function on tablet devices also facilitates inquiry-based learning. Moreover, mobile learning and multimodal learning environments are also possible to build due to the ubiquity nature and different modalities of tablets (Lee et al., 2021; Sevillano García et al., 2020; Zhang & Nouri, 2018). Moreover, in some research, investigators found that incorporating tablet devices in learning increased students' motivation, enthusiasm, interest, and engagement, which turned the learning process more attractive and helped building students' autonomy (Hamhuis et al., 2020; Lee et al., 2021; Montrieux et al., 2015). Students' strong awareness in self-organization, self-regulation, and self-efficacy was found during the tablets' utilization, who might take a more active and leading role in individual learning context (Theunissen & Sieborger, 2019).

Nevertheless, adopting tablet devices does not determine the eventual occurrence of effective learning (Chen & deNoyelles, 2013). While tablet devices motivate learning, it is also concerned that these technologies bring negative consequences and cause potential disruptive behavior and distraction due to the availability of multiple functions (Haßler et al., 2016; Nguyen et al., 2015; Semerci, 2018). A remarkable number of authors emphasized the potential distraction that the use of tablets might cause (e.g., Fernandez & Mammen, 2020; Gokmen et al., 2018; Haßler et al., 2016; Montrieux et al., 2015; Sage et al., 2019; Theunissen & Sieborger, 2019; Thomas, 2020), which can bring negative consequences for students' learning and classroom environment and disruption in teaching activities (Roblin et al., 2018). Under its availability, tablet devices can be used as a means of entertainment rather than an educational tool (Semerci, 2018). Nevertheless, it is also worth pointing out there are certain studies that stated no distraction was observed during the intervention (Sundvik et al., 2016) or participating students were concentrated on their tablets (Ally et al., 2017) or highly focused without off-task behaviors (Lee et al., 2021). As Welsh et al. (2018) concluded in their research, distraction happens on tablet devices generally occurs when students passively participate in pedagogical practices rather than when they are actively learning. Thus, it is believed that the learning effect and outcome

are closely related to teaching and learning strategies applied with tablet devices rather than their usage. However, when adopting tablets in teaching, different capabilities among devices may lead to inequality and inclusivity for students, and incompatibility between the devices, software, and programs can also be obstructive (Thomas, 2020). Also, poor memory, eyestrain, and even headaches are reported as possible negative influences that tablet devices may provoke after long-time utilization (Duran & Aytac, 2016; Sage et al., 2019).

Therefore, the purpose of the present study was to determine Chinese foreign language students' ownership, usage behavior, attitude, and preference towards tablet devices, especially in the learning context. Based on the theoretical background, six research questions were directed:

1. How is students' use of tablet devices after face-to-face class resumption?
2. What is the relation between accessing online classes and purchasing tablet devices?
3. What is the influence of economic conditions on students' ownership of tablet devices?
4. What is the relation between students' personal preference toward tablet devices and their purchase decisions?
5. What are actual attitudes their teachers were adopting in daily teaching practices?
6. What are the students' opinions and attitudes regarding integrating the tablets into teaching and learning practices in the future?

## METHODS

---

### Research Design

Following the objectives of the present study, quantitative methods research consisted of a specifically designed self-report questionnaire based on the theoretical basis and objective factors of tablets usage was employed. Due to the exploratory nature of the present study, the case study method was adopted in this study, which is a comprehensive research strategy and encompasses planning logic and information collection and analysis (Yin, 2007).

Based on the specific research questions of the present study, an item pool aimed at different groups of students were created to collect their demographic information, tablets ownership, and usage, personal preference, and attitude towards the integration of these devices into courses to perceive students' actual usage and objective opinions about tablets. By systematic literature review, items that are not considered significant at the critical level were eliminated; thus 19 items/questions were determined. After verification of content validity by three domain experts, the statement of each item/question was reviewed and modified to reduce ambiguity and ensure that the intended information could be properly obtained. Also, methodological triangulation was adopted utilizing different types of questions in questionnaire design (Table 1). Through an online questionnaire platform, Sojump, the questionnaire was easily distributed to the students and rapidly and broadly spread among them with a single QR code. Each IP address can only answer the questionnaire once. Meanwhile, Sojump enables associating certain items/questions to different options of interviewees, permitting, therefore, customization and personalization of the questionnaire to distinct groups of students. It guarantees the efficient collection of sufficient data while at the same time avoiding overload of unnecessary items/questions to irrelevant groups. Considering the senior students were realizing their graduation study or completing internship off-campus during the data collection, they have not required to answer learning-related questions, such as item C2.

### Study Sample

Based on voluntary response sampling method of the present study, the questionnaire was distributed to the foreign language students of four majors in a Northeast Chinese University. In total, 290 answers were received. After the first round of review, 14 were excluded due to invalid answers filled with single numbers, meaningless letters, or repeated words in open-ended questions. Thus, 276 responses were collected. The interviewees were from four grades whose ages ranged from 17 to 23 years old, with the prominent

**Table 1.** Question design of the questionnaire applied

Code	Question/item	Question type	Target interviewees
A1	Year of study	One-choice	All respondents
A2	Major	One-choice	
A3	Electronic devices owned at university	Multi-choices	
A4	Electronic devices currently brought to class & used in class	Multi-choices	
A5	Electronic devices currently used during off-class study	Multi-choices	
A6	Approximate range of monthly living expenses	One-choice	
B1	Tablet system	One-choice	Tablet holders
B2	If equipped with a digital pen (stylus)	Dichotomous	
B3	Sources of funds for the purchase of equipment	One-choice	
B4	If had discounts on purchase (what kind of discounts was taken?)	One-choice	
B5	Purchase date	Open-ended (in number)	
C1	Intention to purchase a tablet device	Dichotomous	Students without tablet
C2	With the provision of tablet devices, if consider using tablets in their learning (in class & after class)?	Open-ended	Students without tablet (except seniors)
C3	Personal preference compared to handwriting with pen & paper	Open-ended	Students without tablet
D1	Reasons for purchasing tablet devices	Open-ended	Tablet holders
D2	Teachers' attitudes/if is allowed to use tablet on class/if use tablet on class	Open-ended	
D3	If use tablet to complete the assignment and how	Open-ended	
D4	How do they use tablet to learn/if any differences between learning in class & after class	Open-ended	
D5	If support for incorporating the use of tablet devices into daily course teaching	Open-ended	All respondents

**Table 2.** Demographic information of the interviewees

University grade		Major	
Freshmen (82)	29.71%	Spanish studies (162)	58.70%
Sophomores (75)	27.17%	Portuguese studies (88)	31.88%
Juniors (75)	27.17%	Italian studies (18)	6.52%
Seniors (44)	15.94%	Czech studies (5)	1.81%
		Polish studies (3)	1.09%

participation of freshmen, sophomores, and juniors. Students majoring in Spanish Studies contributed to the most answers, followed by Portuguese students (Table 2).

## Data Collection

To safeguard ethical compliances of the questionnaire, all the items and questions involved were submitted to the directors and leaders of the relevant department for review before sending to the students. Students were also informed in the questionnaire that they could choose not to answer if they felt uncomfortable with the statement of items/questions or were not willing to give answers or reveal sensitive information, personal data, or opinions. After obtaining consent, the questionnaire was conducted online on May 31st by distributing a digital poster with the QR code of the questionnaire through the social media, Wechat. The questionnaire was available for one week, and students could access it via scanning the QR code with their mobile devices. The average answer time was 216.9 seconds with a significant variance from 32 seconds to 2605 seconds, which might relate to the different quantity of items/questions needed to be answered.

## Data Analysis

All the answers were exported collectively from the questionnaire platform in excel format. After review, filtration, and grouping, quantitative data were imported in IBM SPSS Statistics 24, and inferential and descriptive analyses were respectively carried out following different research questions. To identify the relevance between tablet devices ownership and living expenses, an independent samples *t*-test was used. A *p*-value less than 0.05 was considered to be statistically significant. Meanwhile, Fisher's exact tests were run to ascertain correlations between purchase propensity and usage tendency, purchase propensity and

**Table 3.** Consistency among alternate forms of instrument

Group	Data source	Test	Table/figure
Students' use of tablets	A3	-	<a href="#">Table 4</a>
	A3, A4, A5	-	<a href="#">Table 5</a>
	B5	-	<a href="#">Figure 1</a>
Relation between accessing online classes & purchasing tablet devices	D1	-	<a href="#">Table 6</a>
	B5, D1,	Chi-square	<a href="#">Table 7</a>
Influence of economic conditions	A6	-	<a href="#">Figure 2</a>
	A3, A6	independent samples t-test	<a href="#">Figure 3</a>
	B3	-	<a href="#">Table 8</a>
	B4	-	<a href="#">Table 9</a>
Relation between students' preference & purchase decisions	C3	-	<a href="#">Table 10</a>
	C1, C3	Fisher' exact test	<a href="#">Table 11, Figure 4</a>
	C2, C3	Fisher' exact test	<a href="#">Table 12, Figure 5</a>
Teachers' attitudes	D2	-	<a href="#">Table 13</a>
Students' attitudes	D5	-	<a href="#">Table 14</a>
	A3, D5	Fisher' exact test	<a href="#">Table 15, Figure 6</a>
	A3, C1, D5	Fisher' exact test	<a href="#">Table 16, Figure 6</a>

preference towards handwriting, accessing online class as purchase reason and purchase date (if it was after the outbreak of COVID-19) and tablets ownership and attitudes about integrating tablets into course teaching. The statistically meaningful results still depended on  $p$ -value of the tests, which should be no more than 0.05.

### Validity and Reliability

In accordance with Heale and Twycross (2015), in a quantitative study, validity is the extent to which a concept is accurately measured, which is determined by a "meaningful and appropriate interpretation of the data obtained from the measuring instrument as a result of the analyses" (Surucu & Maslakci, 2020, p. 2696). Exists three major types, namely, content validity, construct validity, and criterion validity. Among them, construct validity is concerned with the degree to "which a research instrument (or tool) measures the intended construct" (Heale & Twycross, 2015, p. 66).

One type of evidence normally used to demonstrate the construct validity is homogeneity, which means that instrument measures one construct (idem). In the case of the present study, besides gathering demographic information, the questionnaire was designed to collect information about tablets ownership, usage, personal preference, and attitude toward the integration of these devices into courses with the aim of perceiving students' actual usage of tablets, on the whole, concerning about the same issue. In the meanwhile, reliability is related to the consistency of a measure, and it is believed that it is possible to measure reliability in different ways. One of the possible approaches to ensure reliability is based on equivalence, which relates to the consistency among responses of multiple respondents or among alternate forms of an instrument (idem). In the relation to present study, the results were presented in different sections, combing data and responses to distinct questions/items ([Table 3](#)).

## RESULTS

### How Is Students' Use of Tablet Devices After Face-To-Face Class Resumption?

Based on the observation of increased use of tablet devices by students in face-to-face classes after the national lockdown, the present research was carried out to investigate Chinese foreign language students' tablets usage and attitudes toward this technology in their learning. Therefore, first and foremost, it is imperative to verify the ownership and utilization of tablet devices in order to verify the factual situation of their use. According to the self-report data, among the 276 surveyed students, most of them owned smartphones (98.55%), followed by laptops (96.01%). Owners of tablet devices did not exceed half the number ([Table 4](#)).

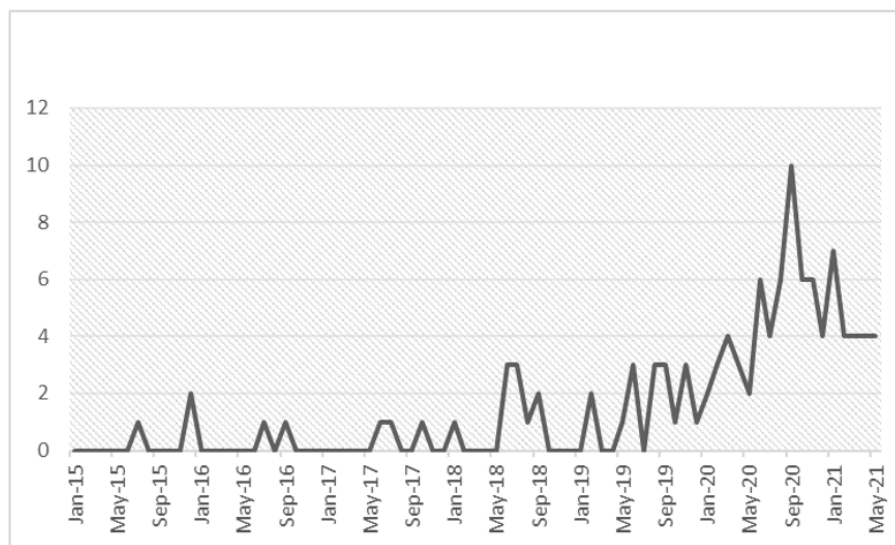
However, even if merely 41.30% of the interviewees owned tablet devices, the utilization rate is remarkable. Following the results, students frequently used smartphones in classes; almost 80% of the students who held tablets used them in the classroom, and it also reflected on our daily observation.

**Table 4.** Students' digital devices ownership

Devices	Number	Percentage
Smartphone	272	98.55%
Desktop computer	7	2.54%
Laptop	265	96.01%
Tablet	114	41.30%
E-reader	20	7.23%

**Table 5.** Devices' utilization rate

	In class		After class	
	Number	Percentage	Number	Percentage
Smartphone	266	97.79%	258	94.85%
Desktop computer	0	0.00%	4	57.14%
Laptop	26	9.81%	219	82.64%
Tablet	91	79.82%	111	97.37%
E-reader	3	15.00%	10	50.00%
None	3	1.09%	3	1.09%

**Figure 1.** Tablet purchase date

As for off-class individual learning, 97.37% of the owners applied tablets, overcoming the percentages of cellphone and laptop utilization (**Table 5**). Meanwhile, we surveyed the date of purchasing the tablet devices. It was found an evident growth after March of 2020, which coincided with the initiation of the national quarantine and online courses. Therefore, the upward trending graph, in conjunction with relatively positive utilization in the classroom, might certainly confirm the growth in tablets usage among students after class resumption (**Figure 1**).

### What Is the Relation Between Accessing Online Classes and Purchasing Tablet Devices?

Nevertheless, although the change of learning environment was perceived as a significant influencing factor for students during the quarantine of COVID-19, other possible reasons could also influence their purchase decision. In this case, students' preconceived perceptions and social influence could also play an important role (Sage et al., 2019). Thus, to ascertain what determined the augmented tablets ownership after the pandemic outbreak, item D1 was used in the questionnaire to collect relevant data. According to the open-ended answers, over 70% of them purchased tablet devices due to their convenient features and availability. Several students exemplified the affordances such as portability, e-reading, paperless learning, and convenience of sorting learning materials and taking notes. Some even positively evaluated tablets' availability for paperless learning, which is more advantageous than printing materials with ease of carrying and organizing. Few students also highlighted the number of their study notes, and it was not realistic to carry around heavy notebooks when they had different classes in succession. Foreign language learners might need

**Table 6.** Tablets purchasing reason

	Frequency	Percentage
Convenient features of tablets devices (portability, e-reading, paperless learning and convenience of sorting learning materials and taking notes)	83	72.81%
Portability	48	42.11%
Sorting learning materials	35	30.70%
E-reading and paperless learning	19	15.67%
Taking notes	18	15.79%
Online course needs	39	34.21%
Recreational use	5	4.39%
Without reason, gift from others	5	4.39%
Courses & assignments needs	4	3.51%
Recommendation from others, social influence	3	2.63%
Specific learning needs (for postgraduate entrance exam)	2	1.57%

**Table 7.** Chi-square tests (Fisher' exact test) between online course needs as the purchasing reason and purchasing date after the beginning of the national lockdown

	Value	df	Asymptotic significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-square	.494 <sup>a</sup>	1	.482		
Continuity correction <sup>b</sup>	.254	1	.614		
Likelihood ratio	.497	1	.481		
Fisher's exact test				.552	.308
Number of valid cases	114				

Note. <sup>a</sup>0 cells (0.0%) have expected count less than 5. The minimum expected count is 16.76 & <sup>b</sup>Computed only for a 2x2 table

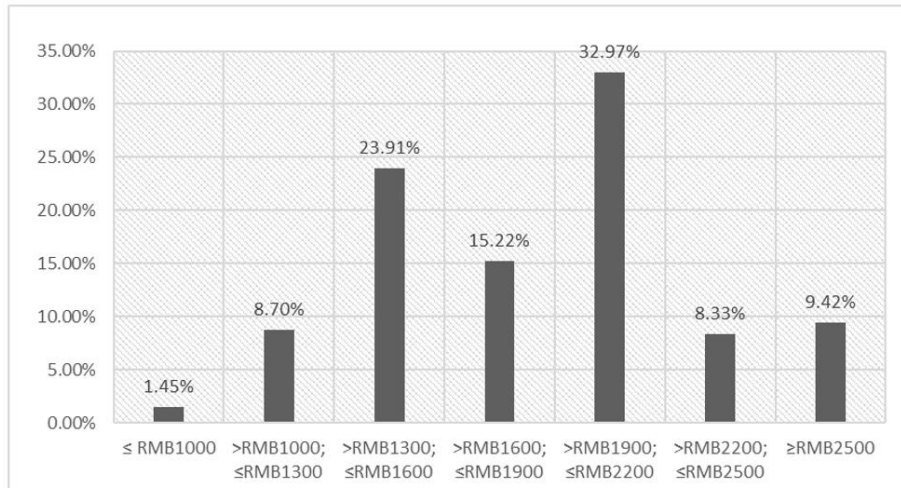
to read texts in the target language, but it was somehow difficult to acquire original books due to unavailability in China. However, tablet devices were viewed as a solution, with which they could purchase and read original books online. Additionally, one interviewee also mentioned the equipment's large screen size in his/her answer, indicating its facilitation for e-reading. Concerning online course needs, 34.21% of the students regarded as their purchasing reason, which wasn't considered as the principal purchasing reason (Table 6).

To study the relationship between distance learning and increased ownership of tablets devices more deeply, the correlation between online course needs as the purchasing reason, and purchasing date was tested (Table 7). Since the online courses partially went on due to the absence of some foreign lectures in the face of the pandemic situation, tablets purchased after the beginning of national quarantine in China, namely, March of 2020, were inclusively considered possible use for accessing online classes. According to the result, the *p*-value of Fisher's exact test was far beyond 0.05 (0.552), indicating that comparing groups were uncorrelated. It revealed that accessing online courses should not be considered the main reason for the growth of tablet ownership during and after the lockdown of COVID-19. Students might buy tablet devices for other reasons. Considering the large scale of the interviewees mentioned convenient features of tablets devices and iPad 8th and iPad Air 4th were released in September of 2020, which coincided with the peak of purchasing in Figure 1, we have reasons to believe devices' functionality might determine students' purchase decision, whose learning strategies and habits could somehow be changed due to the intensive distance learning experience during the national lockdown.

### What Is the Influence of Economic Conditions on Students' Ownership of Tablet Devices?

According to Hembrough and Jordan (2020), an inevitable digital divide exists among students, who are separated by socio-economic level and technological aptitude in using digital devices. Therefore, the questionnaire was also used to investigate students' monthly living costs range through item A6, intending to understand if there was some necessary correlation between students' ownership of tablet devices and economic conditions. Figure 2 shows the approximate range of students' monthly living costs where most of them (32.97%) could dominate RMB1900 to RMB2200, and the common cost of living on campus ranged from RMB1300 to RMB2200 (72.16%). Furthermore, it is also worthy to point out that nearly 10% of interviewees received equal or more than RMB2500 per month as living expenses.





**Figure 2.** Approximate range of students' monthly living cost



**Figure 3.** Boxplot of distribution of students with/without tablets by living expenses (vertical axis numbers indicate different ranges of living costs)

**Table 8.** Sources of funds for purchasing tablets

Source	Frequency	Percentage (%)
Extra support from family	70	61.40%
Savings from daily expenses	20	17.54%
Gift money (from Chinese New Year)	15	13.16%
Savings from wages	9	7.89%

An independent samples t-test was carried out to ascertain any possible correlation between living cost range and tablet device ownership. According to the result, the  $p$ -value (0.913) of the t-test greatly exceeded 0.05, which was close to 1, revealing no statistical correlation between students' economic conditions and tablet ownership. Based on the self-reported data, a boxplot was also generated, from which we can observe two remarkably similar distributions between students with and without tablets (Figure 3). In other words, living expenses should not be viewed as a strong indicator of tablet device ownership.

Moreover, sources of funds for the purchase and purchase discount situation were equally surveyed through the questionnaire. It was found that 61.40% of the interviewees acquired tablet devices by extra financial support from family. In comparison, 7.89% and 17.54% saved money, respectively, from wages or daily expenses to purchase the equipment (Table 8).

**Table 9.** Purchase discounts enjoyed when purchased tablets

Discounts	Frequency	Percentage (%)
Original price	31	27.19%
Brand promotion	52	45.61%
Offline store/ franchise promotion	15	13.61%
E-commerce promotion	9	7.89%
Other discounts	7	6.14%

**Table 10.** Students' preference between handwriting and tablets

Preference	Frequency	Percentage (%)
Pen and paper	113	69.75%
Tablets	36	22.22%
Indifferent/both/depending on situation	10	6.17%
Unsure	1	0.62%

**Table 11.** Chi-square tests (Fisher' exact test) between personal preference between handwriting and tablets and purchase willing

	Value	df	Asymptotic significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-square	8.859 <sup>a</sup>	3	.031	.020	
Likelihood ratio	9.280	3	.026	.022	
Fisher-Freeman-Halton exact test	8.749			.020	
Linear-by-linear association	7.254 <sup>b</sup>	1	.007	.008	.005
Number of valid cases	160				

Note. <sup>a</sup> Cells (37.5%) have expected count less than 5. The minimum expected count is .46 & <sup>b</sup> The standardized statistic is -2.693

As for purchase discounts, 72.81% of the students bought the devices with discounts, while most of them (45.61%) enjoyed promotions from the brands, such as Apple education pricing and student discounts (Table 9). In a certain way, it indicated that sales discounts could be an influencing factor for the purchase decision.

### What Is the Relation Between Students' Personal Preference Toward Tablet Devices and Their Purchase Decisions?

To answer this question, students who did not own tablet devices were questioned about their preference between handwriting with pen and paper and tablets. It turned out that 69.75% of interviewees preferred to write with pen and paper, while 22% stated their preference towards the technology (Table 10).

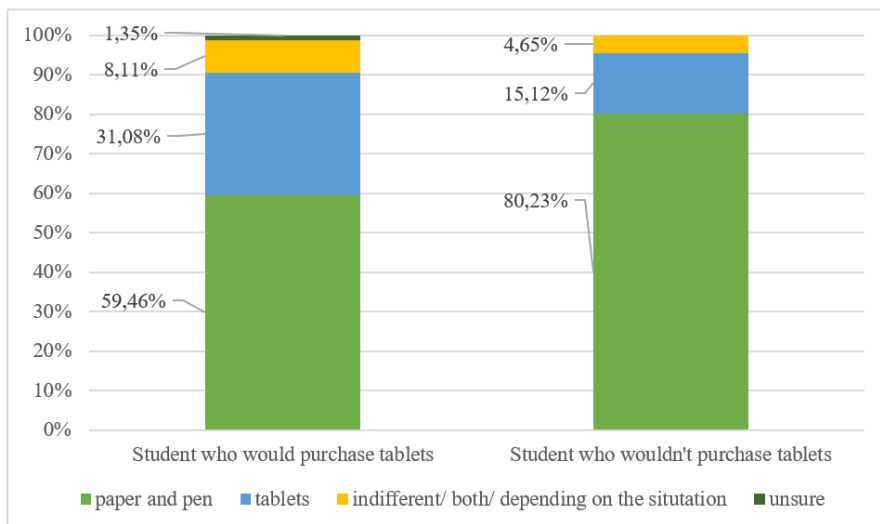
Students who chose pen and paper claimed concerns about loss of writing ability and that writing on paper had more tactile sensation and could help with memorization. As for other students who preferred tablet devices, conveniences for sorting, looking up notes, and modifying errors were highlighted in their answers. Meanwhile, a Fisher's exact test was run to verify any correlation between students' personal preference and their purchase decision. *P*-value was found lower than 0.05 (0.02), proving the existence of relevance between the variances (Table 11).

Furthermore, Figure 4 presents an intuitive bar graph that reveals the differences between students who would purchase tablets and others who would not—learners without purchase tendency more likely preferred handwriting on paper.

Additionally, the same group of students was surveyed if they would consider using tablets in their learning with the precondition of free provision. The majority of them (77.24%) gave a positive answer. Moreover, following the result of the Fisher's exact test carried out between usage tendency and purchase tendency, whose *p*-value was less than 0.05 (0.004), there is a statically meaningful correlation between usage tendency and purchase decision (Table 12). 89.06% of students willing to purchase a tablet device would use the equipment in learning if offered, while merely 68.75% of students who would not purchase tablets would accept using it (Figure 5).

### What Are Real Attitudes Their Teachers Were Adopting in Daily Teaching Practices?

Meanwhile, students were also questioned if they were allowed to use tablets in class and what were teachers' attitudes towards using these devices in the classroom to obtain more objective answers rather than

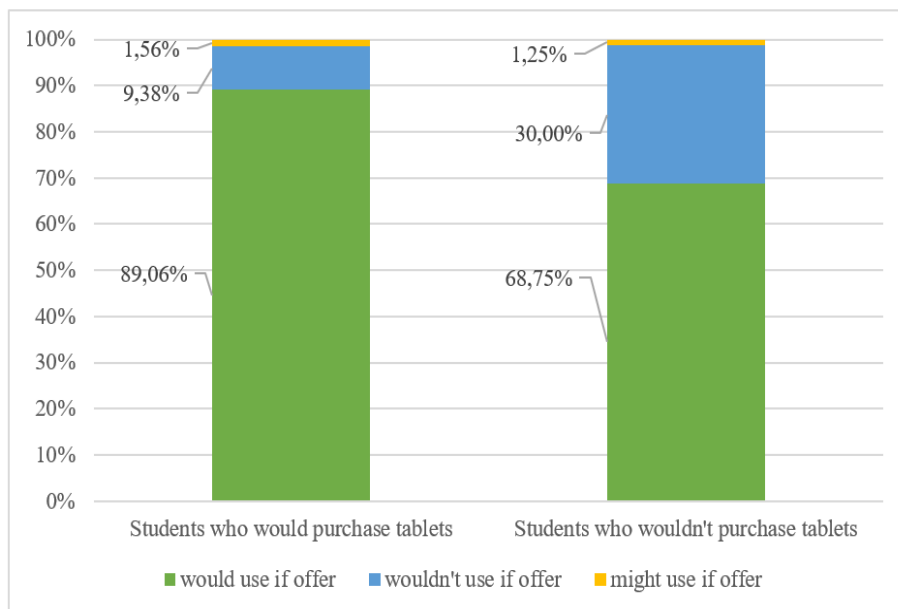


**Figure 4.** Distribution of students with different purchase willingness by personal preference between handwriting and tablets

**Table 12.** Chi-square tests (Fisher' exact test) between usage tendency and purchase decision

	Value	df	Asymptotic significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-square	9.171 <sup>a</sup>	2	.010	.004	
Likelihood ratio	9.819	2	.007	.007	
Fisher-Freeman-Halton exact test	9.681			.004	
Linear-by-linear association	6.786 <sup>b</sup>	1	.009	.010	.006
Number of valid cases	144				

Note. <sup>a</sup>Two cells (33.3%) have expected count less than 5. The minimum expected count is .89 & <sup>b</sup>The standardized statistic is 2.605



**Figure 5.** Distribution of students with different purchase decision by usage tendency

interviewing the faculty members. According to students' statements, 41.18% of interviewees who chose to answer the question claimed that their teachers hold a pretty positive attitude towards tablet usage in in-class learning. In comparison, 39.71% stated that teachers did not have a clear opinion but did not prohibit their use (Table 13). At the same time, 33 students affirmed that they could use tablets in class, while the other 14 students came up with an opposite response that tablet devices were not allowed to be used during classes.

**Table 13.** Teachers' attitudes towards tablets usage

Attitudes	Number of responses	Percentage (%)
Positive/supportive	28	41.18%
Negative/unsupportive	2	2.94%
Indifferent/without clear attitudes	27	39.71%
Partially positive (some teachers were supportive)	11	16.18%

**Table 14.** Students' attitudes towards implementing tablets in pedagogical practice

Attitudes	Number of responses	Percentage (%)
Supportive	190	70.37%
Highly supportive	5	1.85%
Unsupportive/opposing	60	22.22%
Indifferent	12	4.44%
Depending on situation	3	1.11%

**Table 15.** Chi-square tests (Fisher' exact test) between tablets ownership and attitudes towards promotion

	Value	df	Asymptotic significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-square	10.950 <sup>a</sup>	4	.027	.019	
Likelihood ratio	12.405	4	.015	.022	
Fisher-Freeman-Halton exact test	10.148			.025	
Linear-by-linear association	.006 <sup>b</sup>	1	.939	.941	.503
Number of valid cases	270				

Note. <sup>a</sup>Five cells (50%) have expected count less than 5. The minimum expected count is 1.23 & <sup>b</sup>The standardized statistic is -0.76

### What Are the Students' Opinions and Attitudes Regarding Integrating the Tablets into Teaching and Learning Practices in the Future?

Nevertheless, whether owned tablets or not, all the students were solicited to express their opinions freely concerning the integration of tablets into teaching and learning, and 270 of them left their responses. According to the students' answers, 72.22% were glad to see the implementation of tablet devices in pedagogical practices, of which 1.85% highly agreed with it. However, the dissenting voice occupied 22.22% and, in this case, several students claimed about their concerns on personal preferences and economic situations, indicating that not every student had the condition and willingness to purchase tablet devices and the promotion of tablets utilization could be difficult to be realized in large scale (Table 14).

Some of them also suggested that the provision of equipment or subsidies from the institution might be a possible solution but taking the provided devices outside the classroom was pointed out as a problem for their use in individual learning. Still, there is no assurance that all the students would find electronic devices enjoyable. Some students might not be comfortable nor willing to stare at the digital screen constantly, and also, not all the learners were ready for the shift in learning brought from the introduction of tablets (idem). To promote massively tablet devices in learning and teaching and implement them in daily pedagogical practice should equally consider issues like data security, device safety and regulation, relevant policy creation, and in-service training (Gokmen et al., 2018; Thomas, 2020), which require a substantial time a financial investment.

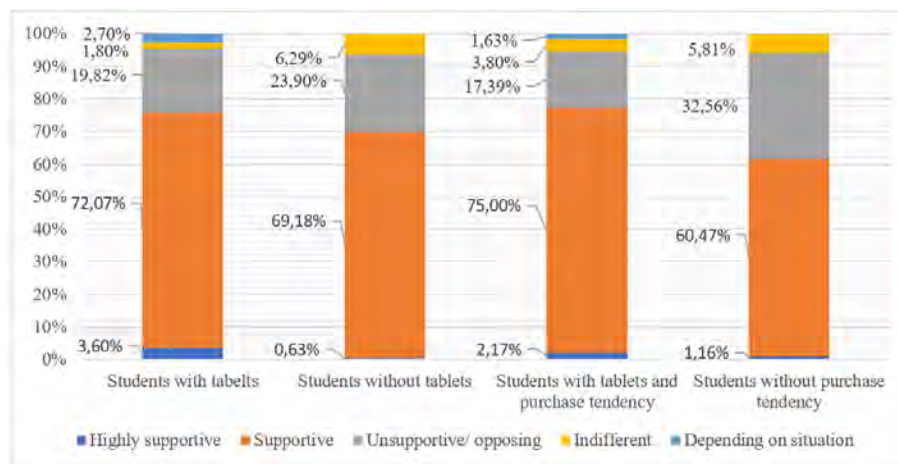
To perceive any necessary relativity between acceptance of tablet devices and attitude towards promotion of their utilization in practice, two Fisher's exact tests were carried out with variances of tablets ownership and purchase tendency (including tablets ownership). It was found that *p*-values of both tests were below 0.05, revealing that possession and willingness to purchase tablets indeed determined learners' attitudes towards their extensive use in teaching and learning (Table 15 and Table 16).

Based on Figure 6, students who did not own tablet devices nor manifest purchase tendency were most opposed to the introduction of the technology in the classroom, whose percentage achieved 32.56%, followed by students without tablets by the proportion of 23.90%. Both groups of tablet users and students who did not have one but demonstrated purchase tendency generally agreed with their extensive use in teaching and learning, and respectively 75.68% and 77.17% were found supportive or highly supportive. In contrast, favorable attitudes were less than 70% in the other two groups, presenting a pretty patent difference.

**Table 16.** Chi-square tests (Fisher' exact test) between tablets ownership plus purchase tendency and attitudes towards promotion

	Value	df	Asymptotic significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-square	10.084 <sup>a</sup>	4	.039	.033	
Likelihood ratio	10.671	4	.031	.043	
Fisher-Freeman-Halton exact test	9.342			.036	
Linear-by-linear association	1.368 <sup>b</sup>	1	.242	.271	.139
Number of valid cases	270				

Note. <sup>a</sup>Five cells (50%) have expected count less than 5. The minimum expected count is .96 & <sup>b</sup>The standardized statistic is -1.170

**Figure 6.** Distribution of students with different acceptance of tablets by attitudes towards promotion of tablets usage

## DISCUSSION

According to the results obtained, 41.30% of the respondents owned tablets and demonstrated a common usage in their learning; respectively 79.82% and 97.37% of students were accustomed to using tablets in and outside the classroom. In the contrast to the conclusion drawn by Hembrough and Jordan (2020) that students could still be underprepared to integrate tablets into their learning and daily life, for who owned the device, tablets were considered as an efficient instrument for their learning. A possible reason may relate to the changes occurred in learning style during the pandemic. Nonetheless, it doesn't indicate a widespread acceptance among learners argued, such as by Ally et al. (2017), Nguyen et al. (2015), or Sage et al. (2019), students who preferred to use pen and paper were found to be unlikely to purchase tablet devices, revealing a strong personal preference to use this equipment in their learning. Thus, it can be said that tablets are not wholly welcomed by the students without exception, different students may manifest different attitudes toward its usage in learning contexts. In our study, we also found that there is no correlation between students' economic conditions and tablet ownership, which was brought to a different conclusion from Hembrough and Jordan (2020). However, the living standard can differ according to distinct regions in China, the results can be different in other areas, especially considering that 61.40% of families supported the students to purchase the tablet devices and only 25.43% of students bought the equipment with saving from daily expenses and wages.

Regarding the motives for purchasing tablets, portability was one of the most frequently mentioned reasons, corresponding to the studies carried out by Fernandez and Mammen (2020), Hembrough and Jordan (2020), Haßler et al. (2016), and Zhang and Nouri (2018). Meanwhile, considering the number of heavy manual and notebooks the students needed to carry, the light-weight nature of tablets can be a benefit for students' daily use which is convenient to carry and allows easy and rapid access to course materials, complementing the prior findings by Talbott et al. (2009), Yalman and Basaran (2021), and Zhang and Nouri (2018). In addition, documentation features, such as e-reading and note-taking were also considered as the common reasons why the students chose to bring tablets to their learning, as Zhang and Nouri (2018) argued previously.

Moreover, according to the students, even the all-over acceptance of tablets usage in class was relatively positive on the part of the lectures. The use of tablets in the classroom may somehow alter traditional forms of interactions in class and challenge teachers' pedagogical beliefs since students can acquire sufficient information online (Roblin et al., 2018). Some lectures could be more instrumental and adopt a more conservative and teacher-centered approach or directly avoid tablet devices in class due to the fear of losing control of managing the atmosphere and rhythm of teaching (Montrieux et al., 2015). From the learners' point of view, they may choose not to use tablet devices unless they perceive a sense of usefulness and feel comfortable with the technology. Those who believe that they master the use of tablets are more inclined to find the equipment useful and convenient for their learning (Zhang & Li, 2020). However, 9.38% of students with purchase tendency chose not to use the tablets for learning, indicating that they might not feel at ease utilizing tablet devices for academic purposes (Sage et al., 2019).

## CONCLUSION

---

Based on the data collected from the self-reported questionnaire, our observation of the augmented use of tablet devices among students in classes was verified. However, access to online courses was not the main reason for the increased use of tablets after the outbreak of COVID-19, students purchased the devices mainly due to the functionality. Some of them demonstrated preferences for paperless learning, which could be a change caused by distance learning during the national lockdown. Students' use of tablets in learning, especially in individual learning outside the classroom, was remarkable, and lectures usually allowed or gave tacit consent to using tablet devices in classes—most of the students equipped with a digital pen used the tablets to take notes.

Different from other studies, it was found that not all the learners held supportive attitudes towards implementing tablets in pedagogical practice. Students who did not have or were not willing to purchase tablet devices were more unlikely to be supportive; they were concerned about the economic level and personal preference that might obstruct the promotion of this technology on a large scale. Nevertheless, the financial situation was not a real influencing factor for the ownership of tablets, which related more to personal preference, in accordance with the data collected in the present research.

## Limitation and Future Directions

The present study adopted a case study methodology to investigate Chinese foreign language students' use of tablet devices after resuming face-to-face class from the COVID-19 pandemic. Students of other majors may have different learning objectives, methods, and habits and utilize tablets in their learning differently. It's suggested that future research can focus on tablets usage by learners of other areas. Still, students' and their families' economic situation could range widely from one region or one country to another. Thus, this study may solely represent the tablet devices ownership of the investigated university.

**Author notes:** The author approves final version of the article.

**Funding:** The author received no financial support for the research and/or authorship of this article.

**Declaration of interest:** The author declares no competing interest. The present research involved 276 human participants from a university in the north of China. And all the participants were informed that their answers would be used in present research when they filled out the questionnaire online and all the data was collected anonymously.

**Compliance with ethical standards:** The present research involved 276 human participants from a university in the north of China. All the participants were informed that their answers would be used in present research when they filled out the questionnaire online and all the data was collected anonymously.

**Data availability:** Data generated or analyzed during this study are available from the author on request.

## REFERENCES

---

- Água-Mel, C. (2014). O ensino do Português em Macau: Por que razão aprender só a escrever não chega? [Teaching Portuguese in Macao: Why learning just to write is not enough?] In M. J. Grosso & A. P. C. Godinho (Eds.), *O Português na China [Portuguese in China]*. Lidel.

- AlAzzam, M., Abuhammad, S., Abdalrahim, A., & Hamdan-Mansour, A. M. (2021). Predictors of depression and anxiety among senior high school students during COVID-19 pandemic: The context of home quarantine and online education. *The Journal of School Nursing: The Official Publication of the National Association of School Nurses*, 37(4), 241-248. <https://doi.org/10.1177/1059840520988548>
- Ally, M., Balaji, V., Abdelbaki, A., & Cheng, R. (2017). Use of tablet computers to improve access to education in a remote location. *Journal of Learning for Development*, 4(2), 221-228. <https://doi.org/10.56059/jl4d.v4i2.219>
- Chen, B., & deNoyelles, A. (2013). Exploring students' mobile learning practices in higher education. *Educause Review*, 48(5).
- Clark, R. E. (1983). Reconsidering research on learning from media. *Review of Educational Research*, 53(4). <https://doi.org/10.2307/1170217>
- Coyne, B., & McCoy, S. (2020). Forbidden fruit? Student views on the use of tablet PCs in education. *Technology, Pedagogy and Education*, 29(3), 347-360. <https://doi.org/10.1080/1475939X.2020.1754897>
- Devey, A., Hicks, M., Gunaratnam, S., Pan, Y., & Plecan, A. (2012). Precious "MeTL": Reflections on the use of tablet PCs and collaborative interactive software in peer-assisted study sessions. *Journal of Peer Learning*, 5, 6-19.
- Duran, M., & Aytac, T. (2016). Students' opinions on the use of tablet computers in education. *European Journal of Contemporary Education*, 15(1), 65-75. <https://doi.org/10.13187/ejced.2016.15.65>
- Fawaz, M., & Samaha, A. (2021). E-learning: Depression, anxiety, and stress symptomatology among Lebanese university students during COVID-19 quarantine. *Nursing Forum*, 56(1), 52-57. <https://doi.org/10.1111/nuf.12521>
- Fernandez, S. C., & Mammen, K. J. (2020). Selected stakeholders' views on the use of tablets for university learning: A South African case study. *Journal of Technology Education*, 31(2), 5-18. <https://doi.org/10.21061/jte.v31i2.a.1>
- Gokmen, O. F., Duman, I., & Akgun, O. E. (2018). Teachers' views about the use of tablet computers distributed in schools as part of the faith project. *Malaysian Online Journal of Educational Technology*, 6(2), 21-37. <https://doi.org/10.17220/mojet.2018.02.002>
- Hamhuis, E., Glas, C., & Meelissen, M. (2020). Tablet assessment in primary education: Are there performance differences between TIMSS' paper-and-pencil test and tablet test among Dutch grade-four students? *British Journal of Educational Technology*, 51(6), 2340-2358 <https://doi.org/10.1111/bjet.12914>
- Haßler, B., Major, L., & Hennessy, S. (2016). Tablet use in schools: A critical review of the evidence for learning outcomes. *Journal of Computer Assisted Learning*, 32(2), 139-156. <https://doi.org/10.1111/jcal.12123>
- Heale, R., & Twycross, A. (2015). Validity and reliability in quantitative studies. *Evidence-Based Nursing*, 18(3), 66-67. <https://doi.org/10.1136/eb-2015-102129>
- Hembrough, T., & Jordan, J. (2020). Creating a digital writing classroom: A mixed methods study about a first-year composition tablet initiative. *International Journal of Instruction*, 13(2), 567-586. <https://doi.org/10.29333/iji.2020.13239a>
- Lee, C. B., Hanham, J., Kannangara, K., & Qi, J. (2021). Exploring user experience of digital pen and tablet technology for learning chemistry: Applying an activity theory lens. *Heliyon*, 7(1), e06020. <https://doi.org/10.1016/j.heliyon.2021.e06020>
- Litzler, M. F., & Laborda, J. G. (2016). Students' opinions about ubiquitous delivery of standardized English exams. *Porta Linguarum: Revista Internacional de Didáctica de las Lenguas Extranjeras [Porta Linguarum: International Journal of Foreign Language Didactics]*, 1, 99-110. <https://doi.org/10.1080/1475939X.2017.1414714>
- López Steinmetz, L. C., Fong, S. B., & Godoy, J. C. (2021). Longitudinal evidence on mental health changes of college students with and without mental disorder background during the Argentina's lengthy mandatory quarantine. *Progress in Neuro-Psychopharmacology & Biological Psychiatry*, 110, 110308. <https://doi.org/10.1016/j.pnpbp.2021.110308>
- Male, T., & Burden, T. (2014). Access denied? Twenty-first century technology in schools. *Technology, Pedagogy and Education*, 23(4), 423-437. <https://doi.org/10.1080/1475939X.2013.864697>
- Montrieux, H., Vanderlinde, R., Schellens, T., & De Marez, L. (2015). Teaching and learning with mobile technology: A qualitative explorative study about the introduction of tablet devices in secondary education. *PLoS ONE*, 10(12), e0144008. <https://doi.org/10.1371/journal.pone.0144008>

- Namuddu, J., & Watts, P. N. (2020). Choice of device to view video lectures: An analysis of two independent cohorts of first-year university students. *Research in Learning Technology*, 28. <https://doi.org/10.25304/rlt.v28.2324>
- Nguyen, L., Barton, S. M., & Nguyen, L. T. (2015). iPads in higher education-hype and hope. *British Journal of Educational Technology*, 46(1), 190-203. <https://doi.org/10.1111/bjet.12137>
- Pourghaznein, T., Salati, S., Jamali, J., Rangani, F., & Khazaei, E. (2021). Study of behaviors and psychological indicators in Iranian medical students during the COVID-19 pandemic self-quarantine. *Savād-i Salāmat*, 6(1), 61-71. <https://doi.org/10.22038/jhl.2021.55831.1151>
- Roblin, N. P., Tondeur, J., van Braak, J., Voogt, J., Bruggeman, B., & Mathieu, G. (2018). Practical considerations informing teachers' technology integration decisions: The case of tablet PCs. *Technology, Pedagogy and Education*, 27(2), 165-181. <https://doi.org/10.1080/1475939X.2017.1414714>
- Sage, K., Augustine, H., Shand, H., Bakner, K., & Rayne, S. (2019). Reading from print, computer, and tablet: Equivalent learning in the digital age. *Education and Information Technologies*, 24(4), 2477-2502. <https://doi.org/10.1007/s10639-019-09887-2>
- Semerçi, A. (2018). Students' views on the use of tablet computers in education. *World Journal on Educational Technology: Current Issues*, 10(2), 104-114. <https://doi.org/10.18844/wjet.v10i2.3420>
- Sevillano García, M. L., Espinel De Segura, B. I., Sáez López, J. M., & Sánchez Romero, C. (2020). Tablet devices. Dynamic strategy to promote significant learning at university. *Pixel-Bit, Revista de Medios y Educacion [Pixel-Bit, Media and Education Magazine]*, 59, 97-123. <https://doi.org/10.12795/pixelbit.77407>
- Sundvik, M., Masalin, T., & Hervonen, H. (2016). Tutors' perceptions of use of tablet computers in PBL sessions. *MedEdPublish*, 5(2). <https://doi.org/10.15694/mep.2016.000032>
- Surucu, L., & Maslakci, A. (2020). Validity and reliability in quantitative research. *Business & Management Studies: An International Journal*, 8(3), 2694-2726. <https://doi.org/10.15295/bmij.v8i3.1540>
- Talbott, N., Bhattacharya, A., Davis, K., Shukla, R., & Levin, L. (2009). School backpacks: It's more than just a weight problem. *Work*, 34, 481-494. <https://doi.org/10.3233/WOR-2009-0949>
- Theunissen, K., & Sieborger, I. (2019). The potential use of tablet computers to support teaching and learning activities in South African schools. In *Proceedings of the 2019 Conference on Information Communications Technology and Society*. <https://doi.org/10.1109/ICTAS.2019.8703614>
- Thomas, S. (2020). Student's evaluation of a classroom bring-your-own-device (BYOD) policy. *JALT CALL Journal*, 16(1), 29-49. <https://doi.org/10.29140/jaltcall.v16n1.208>
- Wakefield, J., Frawley, J. K., Tyler, J., & Dyson, L. E. (2018). The impact of an iPad-supported annotation and sharing technology on university students' learning. *Computers and Education*, 122, 243-259. <https://doi.org/10.1016/j.compedu.2018.03.013/s11625-011-0132-6>
- Welsh, K. E., Mauchline, A. L., France, D., Powell, V., Whalley, W. B., & Park, J. (2018). Would bring your own device (BYOD) be welcomed by undergraduate students to support their learning during fieldwork? *Journal of Geography in Higher Education*, 42(3), 356-371. <https://doi.org/10.1080/03098265.2018.1437396>
- Yalman, M., & Basaran, B. (2021). Examining preservice teachers' use of smartboard and pc tablets in lessons. *Education and Information Technologies*, 26, 1435-1453. <https://doi.org/10.1007/s10639-020-10292-3>
- Yin, R. K. (2007). *Estudo de caso: Planejamento e métodos [Case study: Planning and methods]*. Bookman.
- Zhang, L., & Nouri, J. (2018). A systematic review of learning and teaching with tablets. In *Proceedings of the 14<sup>th</sup> International Conference Mobile Learning 2018* (pp. 79-88).

