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Article

Study on Knowledge Attitude and Practice Tablet on Wheel for Teaching and Learning in Upper Secondary Resource Schools

Chhinh Nyda[*1], Channara Iv [2], Rithivong Chhim[3]

[*1]*Royal University of Phnom Penh, Cambodia, Corresponding author's email: chhinh.nyda@rupp.edu.kh*

[23]*Department of Policy, Ministry of Education, Youth and Sport, Cambodia*

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Abstract

Learning and Teaching entail an interactive process between three major factors: teachers, students and learning materials. These three factors are essential for the quality of learning and teaching at the level of secondary education. In early 2020, as part of the upper secondary school education sector development project supported by the Asian Development Bank, the Ministry of Education provided tablet computers on wheels to Upper Secondary Resource Schools and invited science teachers to attend a training course on the using of tablets and apps. This study will focus on four main points: 1) Measuring general knowledge of students and teachers related to learning by assistance from the information and telecommunication system 2) Measuring knowledge on curriculum utilization after participating in training conducted by the Department of Information and Technology of Ministry of Education. 3) Measuring the attitude of teachers and students related to using the App, such as the level of awareness of the value of App for learning and teaching; and 4) Measuring the use of tablets to impart the educational curriculum established by the Ministry. According to research findings, teachers in resource schools were not yet ready in teaching through app and Rachel (a piece of electronic devise to storge contents and share the contents to tablets or smart phone). There was some obstruction in teaching process including limited IT skills and the English language. Whereas Rachel, the majority of teachers think that Rachel is great for their teaching because they able to show students about concept more easily with usual explanations. It would likely be

premature to conclude that teachers and students do not find the use of Rachel or the App to satisfactorily improve pedagogy. In additional to initial instruction, teachers use it to better explain ideas. Besides teaching, teacher use it in demonstrate the lessons while student use it in verify their answers. On the other hand, teachers claim that the app was very easy to use because were able to they be able to use anytime and anywhere, even without the Internet.

Keywords: Tablet; study of science; internet; distance education; app

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1. Introduction

Learning and Teaching entail an interactive process between three major factors: teachers, students and learning materials. These three factors are inseparable when we talk about the quality of learning and teaching at the level of secondary education. Within the measurement framework of PISA (Program for International Student Assessment), it can be seen that there are many indicators that cover the above three factors, for example see, OECD (2010). Based on the necessity of these three factors, we observe that Cambodia has been strengthening and expanding these three factors simultaneously, especially in mandates of the last education strategic plans (MoEYS, 2019). In order to clarify whether or not the quality of education has changed, the balance of these three factors must be examined. However, given the scope of strengthening and expanding of the quality of teachers and students was too wide for a single investigation, this study focuses on the study materials, namely the effects of tablet utilization which is has been deployed by Ministry of Education as part of upper secondary school education sector development project (USESDP).

In the past, the Ministry of Education Youth and Sports has modernized in steps, including the equipping of school supplies, especially the establishment of resource schools including large buildings for STEM education and experimental equipment.

Recently, the Ministry of Education has also begun using in schools another modern device for the facilitation of science and math teaching and learning. The Tablet on Wheel (ToW) is a small tablet computer that can be taken from one classroom to another. The Tablets on Wheels

(ToW) program includes 30 tablets and a storage unit that can transmit data or lessons to the tablets on wheels via the WiFi network from Rachel. Each tablet includes many apps that contain the curriculum in different subjects and for many levels, especially the upper secondary level.

In early 2020, as part of upper secondary school education sector development supported by the Asian Development Bank, the Ministry of Education provided tablets on wheel to Upper Secondary Resource Schools and invited science teachers to attended training courses on tablets on wheels and app utilization by a trainer from Department of Information Technology and a national trainer by subject. After this capacity-building, these teachers of science and math would instruct their subjects using App in their classroom as needed.

1.1 Rationale

To advance and excel in technological progress and economic growth, each country competes across sectors, with the education sector at the forefront of the competition. Some countries have modified the curriculum and changed teaching methods by including the use of information technology in the curriculum. Some studies have shown that tablets improve reading skills, especially for slow learners (Berson, Berson, & McGlinn Manfra, 2012; Thoermer & Williams, 2012), and facilitate teaching (Berson et al., 2012). A pilot test in United State showed that it was effective in using the tablet in learning and teaching maths among many students because students could write a note on the tablets and the lessons in the tablets are colorful (Fister & McCarthy, 2008).

In the era of industry 4.0 and the expansive employment of information and communication technology (ICT), some studies looked at the use of technology to support learning for science subjects. According to experiments of Finkelstein, Adams, Keller, Perkins, and Wieman (2006) showed that the results of physics students were higher if tablets were used instead of traditional teaching. Doering, Koseoglu, Scharber, Henrickson claim that teaching and learning of science subjects were very effective when supported by information systems, and in particular it was more enjoyable for students, and Lanegran (2014) made similar claims for the subject of geography Shim et al. (2003), and Biology and Huang (2015) for Chemistry.

According to Hu and Garimella (2014) affirmed that knowledge of tablets from a training course enhanced STEM teachers' ability to instruct and evaluate their students. A detailed study of 33 research reports related to the use of tablets in the classroom by Major, Haßler, and Hennessy (2017) showed that tablet use generally correlates with better student performance.

While developed countries have succeeded in using information technology in education, the questions remain, at what stage is Cambodia in using ICT and how can we use it in education? At the time of drafting this research article, the internet system in Cambodia covered almost the entire country through mobile operators such as Cellcard or cable networks including EZECOM. By 2018, Cambodia has had 12 million registered Internet users. This number of internet users does not inform us of the details regarding user use, such as the reason for use, but it is known that some educators have created and enhanced lesson education for students through online learning, such as e-School Cambodia Or sangapac.com. Importantly the Ministry of Education has created apps and websites for learning and teaching including the MoEYS app Scan and http://www.krou.moeys.gov.kh/kh/.

1.2 Research questions and objectives

The research questions of this study are: To what extent the tablet can be used in teaching and learning in Cambodia? and how can tablet use be implemented successfully?

In this study, we will examine the knowledge, behavior, and practice of tablet utilization in teaching and learning at Resource Schools related to STEM subjects. This study will focus on four main issues: 1) Measuring knowledge on the general aspects of students and teachers related to learning with the assistance of information and telecommunication systems; 2) Measuring knowledge on curriculum utilization after training from the Department of Information and Technology of Ministry of Education; 3) Measuring the behavior of teachers and students in terms of app use or the level of awareness of the value of using the app for learning and teaching, and 4) Measuring the practice of Tablets on Wheels for the instruction of. In addition to those four dimensions, this study also examines challenges and opportunities by using SWOT1 analysis related to strengthening and expanding app usage, especially student self-study in cases of online teaching with Online learning Facilities.

2. Reviewing literature

Since the 1980s, information and communication technology (ICT) was included in the education sector of some developed countries such as Italy and the United States (Sharples,

1 A SWOT analysis is a compilation of the teaching-learning's strengths, weaknesses, opportunities and threats by using Tablets on Wheel (ToW). The primary objective of a SWOT analysis is to help the use of ToW develop a full awareness of all the factors contributing to materialize the USESDP outcomes.

Taylor, & Vavoula, 2010). The Figure below showed the evolution of ICT use in the classroom which can be divided into four major stages before the emergence of tablet technology. First, learning via voice, and through the use of radio, film, and slide projectors (Figure 1). Second, teaching through video in the form of TV videotapes, and the last two phases were the use of computers (especially laptops) for pedagogy and study.

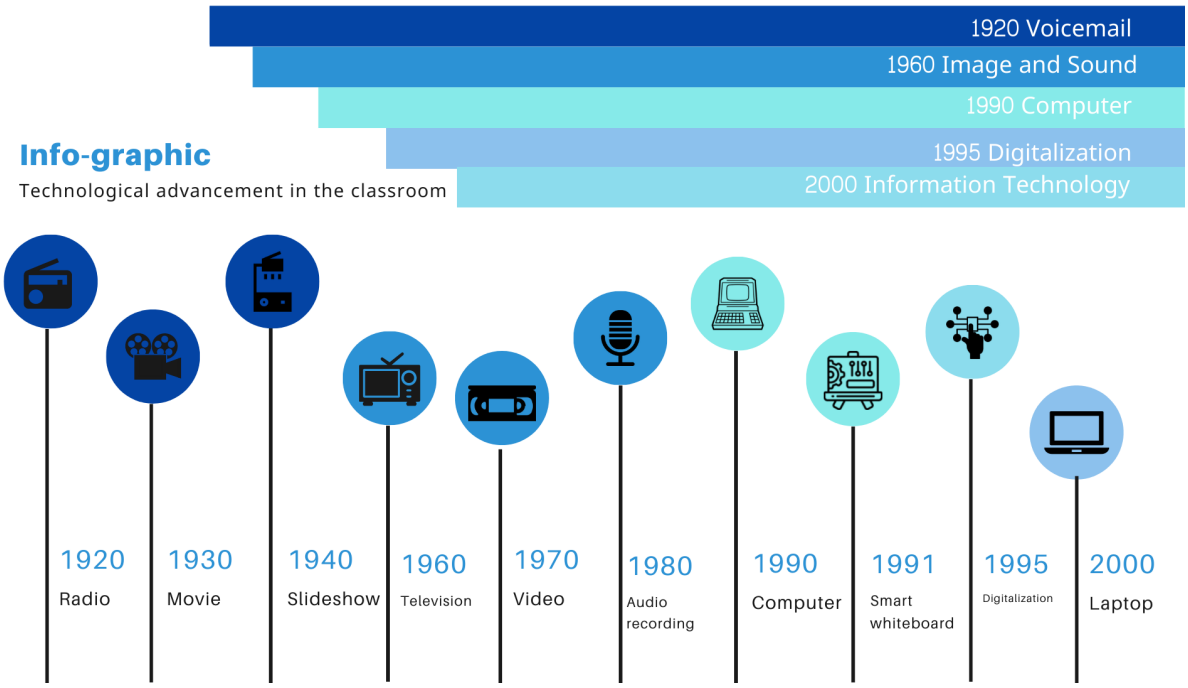

Figure 1: Timeline - Evolution of Technology in the Classroom

It is predicted that every student in the United States will have a tablet by 2020 (Norris & Soloway, 2015). The integration of technology in the education sector increased further following the introduction of tablet computers and widespread app availability with online services such as the Google Play Store and Apple Apps. According to a study by Clayton and Murphy (2016), the use of apps opens up freedom for students to gain more knowledge and build on what they have learned in the classroom, for example, Khan Academy. There are at least 1,000 free apps for education in the Apple Store (Watlington, 2011). In the USESDP, the Department of Information technology has assigned App in Maths, Physics, Chemistry, Biology and Earth Science are 9 App, 1 App, 4 Apps, 10 Apps, and 4 Apps, respectively in resource schools.

Because of the aid of tablets and apps for various subjects, today's classrooms are not the same as in the past, students are more able to seek knowledge on their own, with guidance from teachers. The study of Hagevik and Cherner (2016) on math and science teaching in rural

schools showed that current technology and learning with apps enable students to practice inquiry-based learning (IBL) and student learning outcomes are achieved specifically when the teacher integrates the Lesson Study Plan into an app.

3. Research methodology

This research study will use qualitative and quantitative data (students and teachers are scored by using the Likert Scale), open-ended questions, Yes/No questions, and qualitative data based on students' and teachers' perceptions on the use of tablets as well as online learning and teaching. We administered questionnaires at the resource schools and observed regular schools in the provinces and rural areas from May to August 2020. After analyzing the data and finalizing the draft research report, we invited the school principals and teacher trainers to disseminate the work to validate the research findings with the target beneficiaries.

After measuring the above four aspects and the scope of online learning of teachers and students, the study will provide conclusions regarding how to implement the project successfully. Furthermore, it will map out the way to provide educational services through online learning, especially during periods of school closure, such as in the case of a force majeure like in the case of the Covid-19 pandemic, or during vacation.

We asked students and teachers to complete the questionnaire to find out: 1) general knowledge related to learning with the help of ICT; 2) ability to use the app after the training from the Department of Information Technology of the Ministry of Education; 3) the attitude of teachers and students toward using the App in terms of the level of recognition of the value of using the App for learning and teaching, and 4) the practice of using the tablet for imparting the curriculum established by the Ministry of Education. Meanwhile, we invited teacher trainers and policymakers related to ICT systems to share their experiences and insights on strengthening and expanding learning with the assistance of tablet technology.

4. Research findings

The Resource Schools under the ADB-sponsored (loan) in the USESDP project received 30 tablets per school. The tablets are stored in a tablet on wheel that allows users to easily move the tablet from one room to another. The USESDP project also equipped schools with RACHEL-Plus and an LCD projector. RACHEL enables access to a full range of lesson materials in line with the Ministry's curriculum (with some materials written in some Khmer and some English). The files are contained in the same format as the general education website

and can be viewed without the need for an internet connection. Normally, 50 users can access RACHEL at a time, if necessary, IT experts divide up Intranet access for students to use on-demand throughout the school.

To access Rachel, users must have some basic knowledge of ICT, such as registering on a tablet and typing a web address (code) such as www.krou.moeys.gov.kh:8090 and www.krou.moeys.gov.kh:9090. Both addresses can only work if the tablet has a Wi-fi connection that broadcasts from Rachel (this piece of equipment acts as a home router). The officials from the Information Technology Department of the Ministry of Education have trained trainers (ToT) from 10 different resource schools.

The research findings are divided into five main areas: 1) the ICT capabilities of teachers and students; 2) knowledge of tablet use; 3) attitudes toward tablets; 4) practical usage of tablets; 5) the installation of tablets or other devices into teaching and learning during the Covid-19 pandemic.

4.1 Overview of the sample

There were 145 participants (48 teachers) from 9 provinces (a resource school in Kampot was selected to pilot the research tools) who have a resource school that received tablets (including the science teachers that received training on the use of those tools. Students from the ages of 15 to 22 years old and teachers from the ages of 24 to 50 years old were included in this study. Among all the respondents, more than 52% were female. All students are studying from 9th to 12th grade. Most of the teachers have a bachelor's degree and the highest level of education being a MA degree, held by 7 teachers. In Kratie and Tbong Khmum provinces, there are no students to answer the question because the students have not learned through the tablets yet. More than half of the respondents do not have email, especially students, while most teachers do. The number of people with strong English language abilities is about 20%, while another 20% have little or no English language skills. About 25% of the sample is computer literate, while another 30% can use MS Excel.

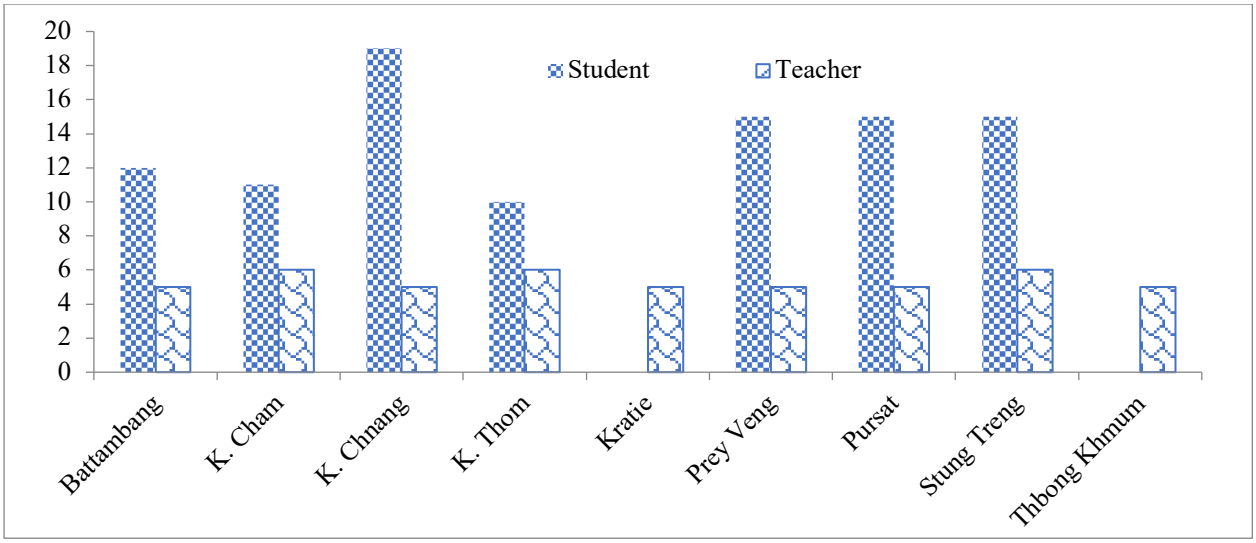

Figure 2: Respondents by Province

The total sample is in table 1. Some students and teachers were asked for separate interviews to get detailed answers to the questionnaire, such as "why were it that it was perceived as easy to learn through App but the student still wanted direct teaching from the teacher?" (Questions for students). For teachers, we asked, "why do you want other schools to gain the use of similar tablets?".

Table 1

Respondents to the Questionnaire

Type	**Female**	**Male**	**Total**
Teacher	17	31	48
Student	59	38	97
Total	76	68	145

4.2 Information about the tablet

Information and Communication Technologies, namely a desktop computer which was placed in a resource room in a school building. Following the completion of the EEQP project, the USESDP project also distributed about 30 tablets with resource schools in provinces across the country that are part of the Enhancing Education Quality Project (EEQP 2008-2014). In addition to tablets, a slide projector and Rachel were also equipped in each school.

To teach with tablets, the schools are required to equip with Rachel, tablets, and a slide projector. Apart from Rachel, various programs and apps such as Photo math or E-School Cambodia can also be installed on tablets. These Apps can be run independently from Rachel

and can also be installed on smartphones. Both Rachel and apps are new to students and teachers in Cambodia especially for those areas outside of Phnom Penh. Based on our observation students in Phnom Penh can access more apps than students in rural areas.

Schools that have been trained on how to use tablets have not yet implemented or taught students using these novel devices. Although some schools have already taught, it has been practiced only two or three times. Most of the tutorials are limited only to how to access and register on the device. Those responsible for teaching the use of the tablets in the schools are trainers (who also serve as math/science teachers at the schools in the program) who have been trained by the Ministry of Education, Youth, and Sports. Those teachers can manipulate tablets because they have moderate competency in English or their lessons are so simple to teach using the tablet.

4.3 Basic knowledge about ICT of the respondents selected as sample

In general, the capacity of teachers and students involved in ICT is limited. Most teachers and students do not have ICT equipment such as laptops, tablets, or good internet service. The good thing is that students and teachers all have smartphones. According to Table 2, we observed that teachers had more ICT devices than students at an index value of 2.35 versus 1.66. This figure means that most teachers have two devices (smartphone and laptop with WiFi at home), however, most students have only smartphones. The other figures confirm that teachers have better skills than students, especially for ICT or computer skills. For English competency, teachers and students have similar levels of English skills. Some secondary resource school principals claim that only children in the city can afford to buy ICT devices but the children in rural areas can hardly afford it or cannot afford it at all. The cost of internet service is also a challenge. Although some students and teachers have modern equipment, they have to remain close to the resource building to get internet access. On the other hand, students' English abilities are still very limited (especially the English language used in the lessons), making it difficult for students to use ICT to learn (according to some teachers).

It should also be noted that the smartphones that students and teachers have are not compatible with some applications especially students' smartphones with low storage. Students' ICT skills and practices show that students make little use of electronic devices. Teachers, students, and principals claim that the schools still lack these devices, especially tablets. By calculating the ratio between the number of tablets compared to the number of

students studying from grades 10 to 12 grade, it varies from high school to high school. The lowest tablets to student ratio are 1:26 (26 students have one tablet for Kratie Krong High School) and the highest is 1:74 (for Sihanoukville High School, Kampong Cham Province). There are three other provinces where more than 50 students have a tablet: Battambang, Pursat, and Kampong Chhnang. Because of this ratio, teachers and students claim that more tablets should be added to the schools to ensure that students use them more often.

Table 2

Average Score of Basic Knowledge of ICT of Respondents

Indicators	Teacher	Student	Total
Possessing equipment (max 5)	2.35	1.66	1.89
Level of English Competency (max 4)	2.1	2.02	2.05
ICT knowledge fluency (max 2)	1.42	0.89	1.07
Total	2.71	2.24	1.67*

* Note: Maximum value of ICT basic knowledge in this model is 3.66

4.4 Knowledge of Tablets

The knowledge in this study refers to the respondents' understanding of the benefits of and means for the use Apps and Rachel, such as what are the advantages of using Apps and Rachel, what are the requirements to use those tools, and where can Rachel and related apps be used. The measurement of this knowledge was based on three major indicators: 1) The number of Khmer apps (recommended by the Ministry and in the instruction manual of the Department of Information) that teachers and students use, such as Khmer Academy; 2) The number of lessons that can be used Rachel; 3) The number of people to whom that the respondents shared their knowledge of the app with.

In terms of the frequencies of the use of Tablet and App, figure 4 did not generally indicate any differences between teachers and students. Furthermore, more than half of the respondents did not use or had little use of the system installed at the resource high school. Failure to use the device is mainly due to the Covid-19 epidemic which led to the closure of the school after training.

Those who have used it in the past noted that the advantage of the app or Rachel is that it is open-source and available on mobile devices, which allows students to use it anytime and anywhere. Students can watch video lessons and repeat experimental processes on their own,

in addition, students can verify their homework answers with the app when they have finished any of the exercises. This enhances student independent learning and increases flexibility in current studies.

After the Covid-19 pandemic subsided sufficiently, following the direction of the RGC, the school reinitiated at the beginning of September, for 12th and 9th grades only, to prepare students for the final exams or BacII. The instruction is limited to the lessons on the subjects required for the examination. Tablet teaching was viewed by teachers as an additional demonstration to enhance students' understanding, and it was decided that time was too limited to utilize the technology for pedagogy at that time.

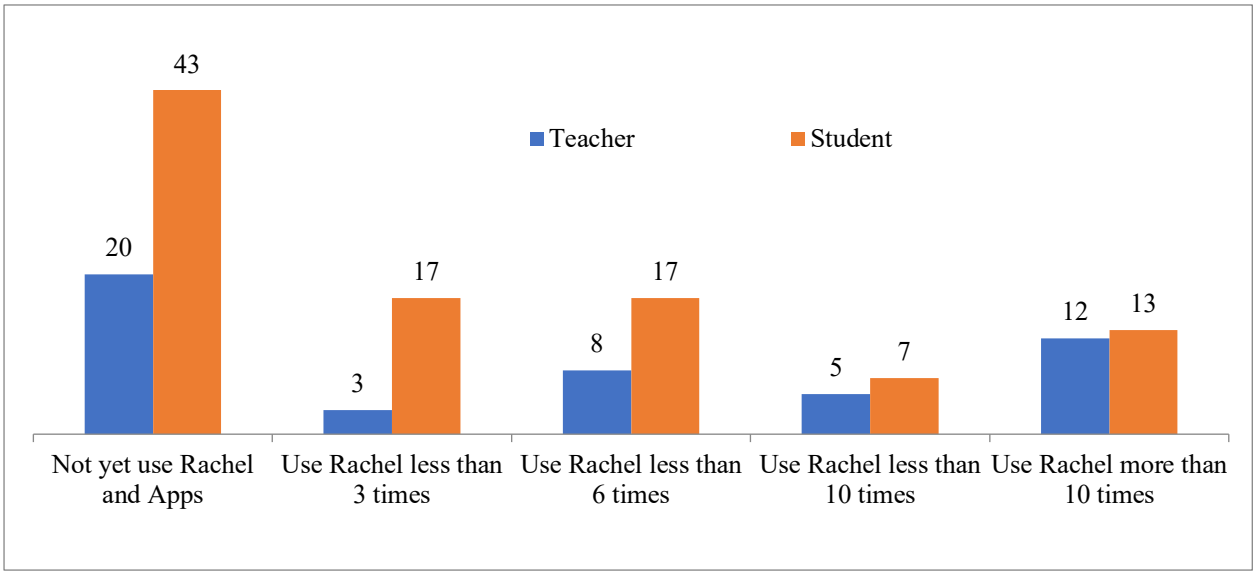

Figure 3: Lessons that Can Use Rachel for Learning and Teaching

Based on some respondents, they claimed that the app we have used in the past is very difficult to use because it is in English, we cannot understand how to best employ the app fully because of limitations in language abilities. Also, teachers indicated that adding more Khmer language material to the map is necessary to make it more accessible to students as well as increase their interest in the study.

The largest single challenge for learning with apps is the internet service, which is limited in rural areas, making it difficult to watch videos or download content with a high load. Sometimes devices could not run specific software. For example, when attempts were made to show the operation or solution of detailed equations, the phones would shut down, according to one teacher.

According to the researchers' observation, teachers with good English proficiency and medium computer skills (mostly young people) prefer to use ICT for teaching. However, for the older generation of teachers, the use of Rachel and apps in the Khmer language is necessary, along with more instructions on how to use them. In addition, it was found that there should be a more detailed handbook on the synchronization of lessons in Rachel and lessons in textbooks. Most students and teachers prefer e-School (See Figure 5, note that respondents could choose multiple answers) because this app is in Khmer and has lessons following the curriculum of the Ministry.

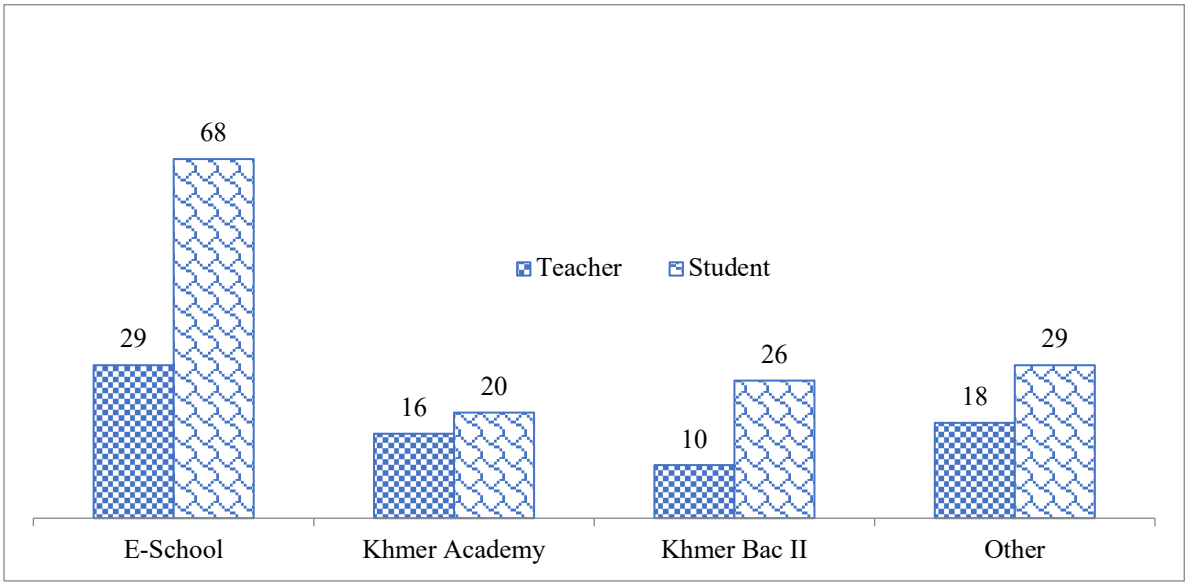

Figure 4: Apps Used by Students and Teachers for Learning or Teaching

It was also observed that all resource schools have trainers who can continue to train teachers in secondary resource high schools on how to use Rachel and teaching practices using apps and Rachel. But most of this training is done informally, that is, it is being taught from one teacher to another teacher and so on unless instructed to do so by the school principal. Figure 6 shows the percentage of people who shared knowledge among teachers and students. As the information in the Figure indicates, teachers and students want to share knowledge with others who have similar competencies. Utilizing a Chi-square test no statistical differences were found linked to gender or whether the sampled individual was a teacher or student.

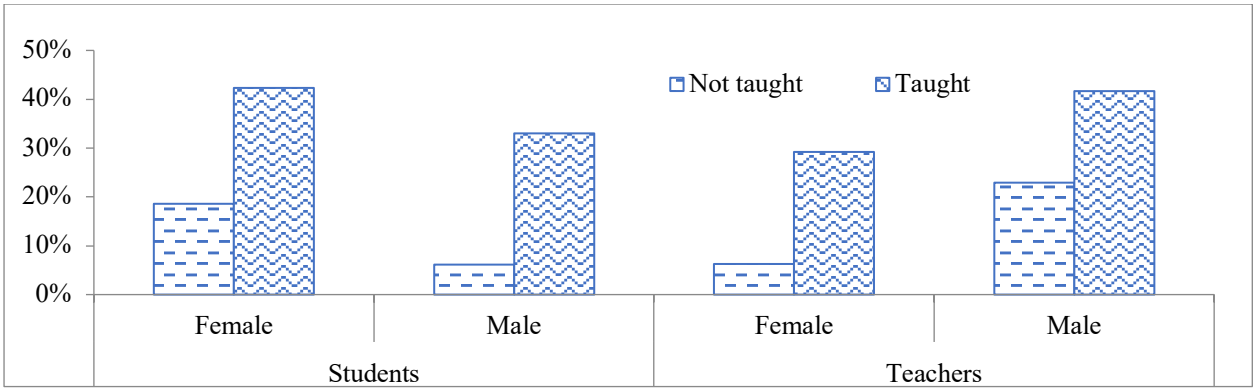

Figure 5: People Who Have Shared Their Knowledge of Tablet/App

Some teachers are still confused about the use of Rachel and Apps in tablets. Sometimes they think that Rachel is an app Also, they claim that the ministry should install more apps in Rachel so that they do not need to search for additional documents from other sources. However, teachers who have attended the training are more knowledgeable regarding the apps installed on the tablet. According to the survey, teachers have installed various apps into their mobile phones for further study. Even during the Covid-19 pandemic, some teachers advise students to use apps, especially in mathematics, such as PhotoMaths. This app makes it easy for both teachers and students to verify the answer. A student at one Resource High School claimed, "*I did a lot of homework because this app helps me do my homework and I can verify immediately without the need for a teacher to give answers*." At the time of this study, "*knowledge of the use of tablets among trainers is still difficult to estimate because we have just received new training*," according to one trainer. Tablet training for teachers took place shortly before Covid-19, and all schools have been closed but continue to teach with distance learning.

4.5 Attitudes on tablet use

The attitude towards tablets refers to the appreciation of or satisfaction with the apps and Rachel, such as how many downloaded apps are later put to use, the perception of the ease of teaching and learning using apps and Rachel compared to teaching without them, and whether or not the teachers or students have recommended that other teachers or students use these tools. According to Table 3, we find that more than 50% of respondents claim that Rachel and the apps are easy to use. However, most students answer that they do not like learning with apps, whereas most teachers were found to want to teach using the app. (The Chi-Square Test shows that $\chi 2$ (1, N = 145) = 16.178, p = 0.000). In terms of the recommendation of Rachel

and apps set to other schools and students, the students and teachers are not very different, but this data shows that students seem reluctant to recommend Rachel and apps set to other schools. The following is the qualitative data related to Table 3

Table 3
The number of respondents on use of app and Rachel

Question	Teachers		Students	
	Female	Male	Female	Male
Are the apps easy to use?	15	19	22	13
Are you satisfied with the use of the apps	13	17	6	4
Do you want other schools to have the Rachel and apps set?	17	26	37	27

Students who did not attend official Rachel and app training commented that Rachel helps learn faster, teaches concretely, and catch up on lessons quickly. One can find lessons without spending money like learning online, and it can be learned in conjunction with the support of a teacher. But at the same time, they view the tablet to have remaining shortcomings, such as Rachel remains less effective than blackboard instruction is more effective than Rachel, Rachel content in foreign languages is difficult to understand.

In particular, students who had been instructed using Rachel found that, for those students with sufficient English language knowledge, Rachel was are more effective than teaching using a blackboard. Rachel makes possible clear experimental study and makes it easier for students to independently take notes on the lessons. Moreover, Rachel facilitates learning science subjects. At the same time, some respondents found negative aspects of using Rachel, such as spending a lot of time setting Rachel up and turning on and off the tablet, which lead to wasted study time. Rachel often displayed programs or apps that were irrelevant to the lessons which resulted in distraction for the students' attention (advertisement on the flight). Additionally, more study time is needed when using Rachel for teaching. Rachel teaching requires more study time than teaching on a blackboard, and both study time and tablet access were limited

There are now apps in the Khmer language for all grade levels and all subjects. Fortunately, these apps do not need the internet to get access all the time, and they can work offline once the apps are installed on the tablet or the smartphone. In addition to the Ministry of Education's apps, distance learning services for all grade levels are provided through the website. It should also be noted that very few YouTube Channels, apps, and websites of MoEYS are included on Rachel. This reflects the policy choice to exclude publicly available content that has not been reviewed and verified by the Ministry to ensure quality standards are met.

As a result of the growth of ICT, during periods of school closure, it is possible to practice distance learning smoothly, especially where there is good internet access, due to the potential use of YouTube Channels, apps, and tutorials on the Facebook Page of the Ministry of Education. According to the survey, respondents held that there are no less than 100 YouTube Channels posted on the Internet, offering content appropriate to grades 1 to 12. Some public and private schools have produced content and posted it publicly, while others have posted videos online of their teachers giving lessons.

Overall, teachers and students have shown a very positive attitude towards tablets. Although teachers and students have not yet made full use of tablets on wheels, they recognize the essential utility of the ToW in the context of Covid-19. Some teachers and students purchased smartphones and installed apps similar to what is included with the tablets supporting schoolwork or for independent learning. According to some teachers and students, they have advised those who can afford it to use tablets or smartphones, because they can be used for daily operation and can be equipped for learning as well as assistance in teaching. One physics teacher claimed, "*With this app, I can easily teach and I can save half the time compared to traditional teaching*." Most science teachers were found to be satisfied with apps for teaching because apps make it easier to teach.

4.6 The practice of tablets

Measurement of Tablet performance refers to the use of the **app** and **Rachel** by students and teachers. Information was sought regarding the number of apps currently used, the number of hours they spent using them, and the necessity of the App or Rachel to design a lesson plan or for learning. We also learned about the challenges when teachers and students start using these apps. Table 4 shows that, following the onset of the Covid-19 pandemic and school closures, most of the teachers and students (57%) did not use the tablet set after the training. However, some teachers with more capacity, such as trainers, have been using the tools.

Table 4
Tablet Set Use in the Classroom

	Not used yet	Rarely	Medium	Often	Very often
Students	22	35	36	3	
Teachers	15	9	19	3	1
Total	37	44	55	6	1

Some physics teachers asserted that some lessons took six hours to teach, but using Rachel can save about three hours without compromising the quality of teaching. They also opined those students prefer the more modern teaching method since they can do any experiment and rotate 3D images. Seeing the benefits of Rachel, one teacher wanted to download lessons from Rachel to the mobile phone, but it was not possible yet.

Some science teachers asserted that Rachel contains about 50 percent of the lessons following the curriculum, which saves about 30 percent of their time if they taught by using Rachel because students can understand the lesson faster than when the teacher using traditional practices of instruction. One teacher found Rachel to be a good complement to his teaching process, especially in the third step. They also claimed that the number of tablets was still very low if all students had to learn using tablets.

However, such assertions seemingly contradict student claims that learning by tablet was very difficult because it took a lot of time to operate it. Their assertions may partly reflect limited experience in using the app and Rachel. Empirical findings show that a limited understanding of English was the main barrier to use. The barriers respondents face are the barriers that respondents asserted (Table 5).

Table 5
Reported Barriers Encountered by Users

Barriers to learning or teaching with the tablet set	**Teachers**	**Students**	**Total**
Do not know where to find the relevant lessons	18	24	42
Student lack of English knowledge	30	46	76
Difficulty connecting the tablet to slide projector	14	18	32
Too little study time	30	45	75
Unable to prepare lesson due to the Rachel is at school	21	38	59
Some parts are locked, unusable (must be purchased)	22	49	71

Note: The sample size for this question was 124 (the question was not asked in Kampong Chhnang)

Table 5 shows that students' insufficient knowledge of English (76 out of 124 respondents) of them said English is a Barrier) and too little study time were the main barriers to learning or teaching with tablets. Both teachers and students asserted that English proficiency is the main factor in smooth learning and teaching. The Chi-Square test between the variables in Table 5 (including the gender of the respondents) did not indicate differences between teachers and

students or between males and females, supporting the conclusion that this problem was common among respondents.

According to some students, what would be most helpful is an app that comes directly from the Ministry of Education, Youth and Sport for the 12th-grade exam, which allows them to study independently despite the closure of the school. Some indicated that they do not have confidence in the apps released by teachers or other companies yet, even if the apps are in Khmer. Additionally, respondents indicated the view that the app used in schools must be following the Ministry's curriculum to strengthen the quality of learning and teaching. Table 6, in addition to the above barriers, we need to ensure that the app is in Khmer, with extra study time and more tablets.

Table 6
Report of responses on app improvement

Tablet Set	Teachers	Students	Total
App is in Khmer	41	77	118
Extra study time	30	52	82
Add more tablets	32	47	79

Note: The sample size that answered this question was 124 (these questions were not asked in Kampong Chhnang)

Based on the survey, regarding the knowledge of tablet use and the behavior and practice of those sampled, we can generally say that the practice of teachers is delayed only by the pandemic-related school closure.

The first indication that it will be widely used among teachers and students is that the modern teaching techniques provided clear instruction regarding concepts to students using video-based learning via Rachel. According to a female student, "*Studying like this makes me very interested and I am more eager to study medicine because it makes me more confident*". One teacher claimed that he wants to teach using the app, but has not yet had the opportunity.

Some teachers and students insisted that the number of tablets was insufficient for students and teachers to practice. Some principals the improvement in the quality of learning offered by the app may be limited because of restrictions on study time, with students able to access the computer room only two times per year.

4.7 Digital Education Opportunities

The study also explores the distance learning that teachers and students at secondary resource schools have conducted during the Covid-19 pandemic. The aim was to investigate questions related to the use of internet service, ICT by teachers and students so on.

Most school principals asserted that tablets are valuable for teaching students about experimental lessons, as they allow students to see the real experimental activities. Formerly, learning and teaching were very abstract. Thus, having a tablet makes students interested in learning, and makes it easier to observe and understand practical aspects of the study. For example, chemical reactions are usually difficult to perform directly due to a lack of materials and the danger involved. Teaching via the app, especially using Rachel, enables students to understand the concept of chemical reactions by watching experimental videos. If possible, then the teacher could directly repeat the experiment. Moreover, some experimental processes, especially in Biology, take a lot of time and money, and so Rachel can help a lot in terms of time and expense. Learning by the textbook alone makes lessons less interesting and able to keep the attention of students. But via the app, students can see 3D pictures, which makes lessons more interesting, and ultimately enables more confidence in students.

This study shows that learning and teaching using ICT through App and Rachel is still limited, but many students and teachers are also more aware of ICT, which means it is a good time to integrate ICT into learning and teaching (as shown in Table 7). ICT is used in the daily lives of students and teachers which means that the use of ICT in pedagogy means the education sector is being updated as well.

Table 7

SWOT Analysis Table on Tablet Use

Internal factors	**Strengths**	**Weaknesses**
	1. Teachers and students can use the tablet at all times 2. Tablet teaching schedule required 3. Organised training course on the use of tablets	1. Few IT teachers 2. More tablets needed 3. Tablet maintenance (update software)
External	**Opportunities**	**Threats**
	1. App learning or distance learning is popular 2. Almost all students have a smartphone	1. App in English

3. Improve English and ICT skills	2. App does not match the lessons of the Ministry of Education, Youth and Sport 3. At home, students and teachers cannot use Rachel

Generally, studies show that students are more interested in learning when ICT is used, namely, smartphones and tablets with responsive apps or dynamic apps. This study also found that students enjoyed learning from apps and Rachel, especially in math and science.

Indeed, the ICT is still in the early stages for developing countries such as Cambodia. Moreover, at all levels, there are no teaching methods for teaching by using ICT, even in pedagogical schools.

There was a lot of discussion about apps used on smartphones and tablets. There are usually available apps for education, but it is not certain that such apps are effective for teachers and students. Some Apps are no different from e-books or YouTube. To increase the effectiveness of an app, the Ministry of Education, Youth and Sport have to evaluate integrating it into the curriculum. Previously, the Ministry did not have the policy to manage and evaluate these apps.

In general, training on the use of tablets is necessary for the schools to run even in the context of Covid-19 because teachers and students have the basic knowledge to use the apps. Some secondary resource school principals asserted that we know in advance that there is a need for distance learning and that we have tablets with apps for learning, so it is essential to have new capacities such as using Zoom or Google Meey. Importantly, some teachers also understand that this is a step towards achieving a digital education.

5. Conclusions

The research findings are divided into five main areas: 1) the ICT capabilities of teachers and students; 2) knowledge of the use of tablets; 3) attitudes towards tablets; 4) the practice of tablets, and 5) integration of tablets or other devices in learning and teaching during the Covid-19 pandemic.

In general, the capacity of teachers and students involved in ICT is limited. Most teachers and students do not have ICT devices such as smartphones, tablets, or good internet service.

Some school principals asserted that "only urban children are capable but children in rural areas children find access difficult". The cost of internet service is also a challenge. Although some students and teachers have a modern devices, they also come to access the internet at the resource building. On the other hand, the English language proficiency of students is insufficient, which makes ICT learning difficult.

"Knowledge of the use of tablets among trainers is still difficult because we have just received new training," said one trainer. The training on the use of the tablets took place shortly before the Covid-19 pandemic, and all schools closed in began to operate through distance learning. However, teachers who have attended the training are more aware of the apps installed on the tablet. According to the survey, teachers have installed apps on their smartphones for further study. Even during Covid-19, some teachers introduced students to using apps, especially for mathematics, such as PhotoMaths. Apps make it is easy for both teachers and students to verify the answers. A student at secondary resource school asserted, "I did a lot of homework due to the help of this app; I can verify the answers without the teacher having to make the solution."

Teachers and students have shown a very positive attitude towards tablets. Although teachers and students have not used them extensively due to the Covid-19 pandemic, there are trends that the device is necessary for improving education. Already, some students and teachers have bought smartphones for installing apps to support learning and teaching, especially for independent learning. According to some respondents, they have advised others who can afford it to use tablets or smartphones, because they can be used daily and can be installed with apps for learning as well as for teaching. One physics teacher asserted, "With this app, it is very easy to teach and I can save half the time compared to regular teaching". Most science teachers like to use apps for teaching because they enable practical demonstrations and observable experimentation.

The practice use of teachers and students with tablets is just waiting for the time when schools are no longer closed as a result of the pandemic. The first indication that it will be widely used among teachers and students was observed when teachers and students gained an understanding by watching the video via Rachel. According to a female student, "Studying like this makes me very interested and I am more eager to study medicine because it makes me more confident". One teacher claimed that he wants to teach using the app, but has not yet had the opportunity. Some teachers and students insisted that the number of tablets is insufficient

and that schools should have more to enable students and teachers to practice more often. Some principals said that it is difficult to say that this tablet will greatly improve the quality of learning and teaching because of too little study time per year, given that a student can enter the computer room at most twice a year.

In general, training on the use of tablets is necessary for the schools to run even in the context of Covid-19 because teachers and students have the basic knowledge to use the apps. Some secondary resource school principals asserted that we know in advance that there is a need for distance learning and that we have tablets with apps for learning, so it is essential to have new capacities such as using Zoom or Google. Importantly, some teachers also understand that this is a step towards achieving a digital education.

6. Recommendations

Ministry of Education: Students and teachers argued that there is too little time to access tablets, and they can only use them in the resource room. If possible, students and teachers should have Rachel in their respective classrooms, which would allow for use anytime during lessons.

There are a lot of free apps and videos for education available online. If the Ministry of Education can review and upload apps and videos to Rachel, it will greatly enhance the learning and teaching materials available and improve user experience.

If possible, the ministry of education should translate the English contents in Rachel into Khmer, as teachers and students in rural areas do not yet have extensive language skills. It is noted that the documents in Rachel are in both Khmer and English, but the documents in English are more attractive with better quality.

Teaching using ICT is not yet widespread, so the Ministry of education should add ICT or embed ICT into all subjects at the general education level, and into professional development at pedagogical schools at all levels. In addition, the curriculum should include ICT, so all teachers must teach by using the ICT. Teachers and principals now understand that teaching by using ICT are optional.

ICT training is still lacking, especially for teachers ages 45 and over who are reluctant to use ICT for teaching, as they do not seem to trust the system. Therefore, to be widely used,

ICT training should be conducted as much as possible among general teachers. In addition, the Ministry of Education should publish a guidebook on the use of tablets to support teaching and learning, or, if possible, should include these activities in the Ministry's textbooks.

Teachers: Should improve ICT and English skills because it will help to enhance learning and teaching, as the documents in Rachel are mostly in English, and of good quality compared to locally produced documents.

Teachers of all subjects at the secondary resource school should be trained as trainers, and they will become trainers at their school, the network schools, and the cluster schools. If possible, these trainers should be subsidized for this extra work as an incentive to strengthen and expand ICT for teaching and learning.

Previously, teachers in each subject relied on IT teachers to use the tablet set-up in the resource room, and if the IT teacher was not there, it was very difficult to operate the tablet. Therefore, we should have a guidebook on the use of tablets for teachers and students. All teachers and students should be able to use these tools independently, with this guidebook.

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