"What's the Tab's Apps?": Piloting Low-Priced-Tablet-Aided Course Delivery in Teacher Education

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Abstract—Mobile learning generally offers delivery of blended learning or simply as tool for course enhancement in university setting. A small teacher education institution piloted a low-priced-tablet-aided instruction in its language courses via exploratory case study. Through focus groups and journal writings, students favorably reported most aspects of mobile-aided learning experiences and confirmed some challenging technical issues. Moreover, qualitative analyses on the device, learners' engagement and course-activities revealed these five aggregated key categories: (1) tableting pros and cons; (2) making adjustments and connectivity issues; (3) moodling, googling and strategizing use; (4) trending apps and functionalities; and (5) changing views on technologies and pedagogies. Finally, lessons learned and future works on the tablet adoption, applications and strategic implementation in aid of teacher education course delivery and related disciplines are suggested.

Keywords—mobile learning, blended learning, learning management system, pre-service teachers' education

1 Introduction

Mobile learning has been a buzz in education as ushered by the unprecedented advancement in mobile technologies. iPads use in higher education worldwide is increasingly becoming popular particularly in delivering and facilitating learning [19]. Mobile student-user learns at one's preference of time and place [5]; different mobile applications (also known as 'apps') can be taken advantage for various purposes. With the arrival of innovative mobile technologies enabling wide array of learning activities [29], university students have embraced mobile learning due to its perceived usefulness [4, 20]. Exploring learning activities and outcomes through different kind of mobile devices has become a current research agenda [29].

Various studies [12, 17, 20] have found benefits in using mobile technology in the classroom. Not only that mobile device can enable learners to become active participants [16, 21, 29] but it also encourages teacher educators to apply blended learning in their professional development [7, 8]. But, this does not occur without its share of challenges. Internet connection comes with its social media disruptive tendencies or potential addiction to gaming apps [19]. Having internet connection which was not

always stable [16, 25, 26] and smartphone small screen limitation [13] were some frequent concerns. Moreover, [23] noted that mobile learning studies were still in exploration phase because of infrastructure and technical support challenges. Connectivity and accessibility of materials in multiple devices [29] need also to be considered. Mobile learning is not just giving the mobile devices to teachers and students. Teachers have to learn and demonstrate the skill sets to integrate course content in handheld devices [16]. Researches on using mobile devices in education [6, 9, 19, 27] generally report on collaboration and interactivity. Moreover, [12] found that problems do not only rest with resources, conflicting perception and beliefs but more on the difficulties encountered by learners.

Learners' difficulties are not just rooted with their attitude toward technology; teachers have crucial role. Teacher educators have to be mobile literate or become mobile learners themselves in order to integrate mobile technologies in their course content [4]. Utilizing mainstream and emerging educational technologies in the teacher preparation program and balancing teacher educators' Technological Pedagogical Content Knowledge (TPCK) [15] could mean flexibility of teachers to navigate the affordances and constraints in infusing current technologies in learning [3]. Although there exists handful of models and frameworks, mobile learning in teacher education and higher education setting has yet to be fully explored [10] to keep universities in track to a "changed and mobile society" [23] that implement relevant programs converting theories or models into practical guides for curriculum specialists, apps and tech developers, teachers and students.

1.1 Purpose and Design

Most studies in mobile learning were conducted either through survey or experiments [2] and minimal on case studies which mostly fixed in the use of branded tablet (also known as *'tab'* in this paper). Hence, the "moves beyond branded technologies is necessary" [19]. Much more, little to limited research was published about the use of low-cost brand units as supplemental tool in instruction; hence there is a knowledge gap in exploring and evaluating the usability and engagement toward affordable tablets delivered in teacher education courses. Consequently, we piloted the usability of affordable tablet and explored significant learning experiences to share lessons learned in its adoption or potential place in teacher education program.

Conducting a research project on the engagement and perspectives of participants in the use of low-cost tablets cannot be simplified in an experimental method due to various contextual and overlapping factors that could not be controlled within the natural setting. Approaching the project through a case study strategy would be better off since we investigated current phenomena within the natural context where boundaries and contextual variables are not very much apparent [28]. Thus, we opted to undertake an exploratory case study of a pilot project to a class of student teachers; generalizations within a class or a program implementation can be empirically justified since the "peculiar strength lies in their attention to subtlety and complexity of the case in its own right" [1].

1.2 The Tablets

The tabs were primarily chosen for their low price and reasonable hardware specifications. Although affordability of the tablet was a major consideration, what it had to offer in terms of functionalities was also given attention. We surveyed online sites and read thoroughly reviews about the prospective tab being offered within the project budget and target number of users. Since almost all students in campus are Android smartphone users, we chose Android tablet. Once we found the prospective device, we then tried it for two weeks. Having been convinced of its features and potentials, we made the bulk order online. The tab was *Nextbook 7.85" WiFi Tablet with Android 4.4 Kikkat OS*. Such device is considerably cheaper than its branded counterparts. It had one year of limited warranty on service only and replacement of defective unit within 1 month after delivery. The third-party service provider is based in Manila (249 km away from the campus).

1.3 Pilot Participants and Procedures

The implementation took place in a small teacher education university in the Philippines during the first semester 2015-2016. A regular class consisting of twenty-three (23) students in their third-year all enrolled in the Bachelor of Secondary Education (BSE) major in English program was chosen and invited to participate. Twenty (20) were smartphone users/owners while half of the class had laptop computers. The principal researcher taught the two courses (Literary Theory and Criticism and Introduction to Language Testing). The tablets (tabs) were primarily integrated as supplement for regular face-to-face sessions, content delivery and course activity engagement online and offline. The other two co-authors served as corroborators in the data gathering and analyses. The study was exclusively undertaken and purposively selected for this group of participants primarily because of its manageable size, and considering also the control and access of the researchers.

All participants received the same tablets. The nature, benefits, potential risks like privacy issues and what were asked from them in return—including journal writing at the initial, middle and concluding stages, and participation in focus group interviews—were clearly explained. They were also allowed to use their own devices except for some in-class activities that were strictly dedicated to the tabs. Before hand, we pre-loaded the tabs with course reading files and useful apps students could tinker on like dictionary, free pdf ebooks, grammar and literature quizzes to name a few. Unlike in [19] where iPads were strictly for classroom use, we let students bring the tablets inside and outside the campus to give them a sense of ownership. We also allowed them to explore the device for a week and install apps they found useful. Moreover, we connected the tabs to the university Wi-Fi for internet access but was limited to certain places in the campus. Meanwhile, off-campus connection depended on their resources.

Since the tablet was intentionally used to supplement the regular course works in their two specialization courses for the semester, we created a module via university Learning Management System (LMS) website called *PNU SL Learning Enrichment*

(See Figure 1, LMS screenshots and sample modular activities). One module had two different sections allotted for the two courses. It contained links of useful content (like pdf documents, YouTube Videos, etc.) which students could download or view online, graded discussion forum where they could participate to augment face-to-face discussion. Purposefully, the LMS also served as assessment site where students could take online quizzes and could get the results online or through instructor's notification. Aside from the LMS, we utilized the students' existing Facebook group called *The Grammarian* to share course works and communicate also through its messenger. Activities in the LMS were updated weekly or as needed. Although the tabs should be used in specific classroom works like answering online quiz at the same time and place, we also allowed utilizing their own devices particularly when some tablets malfunctioned in some instances

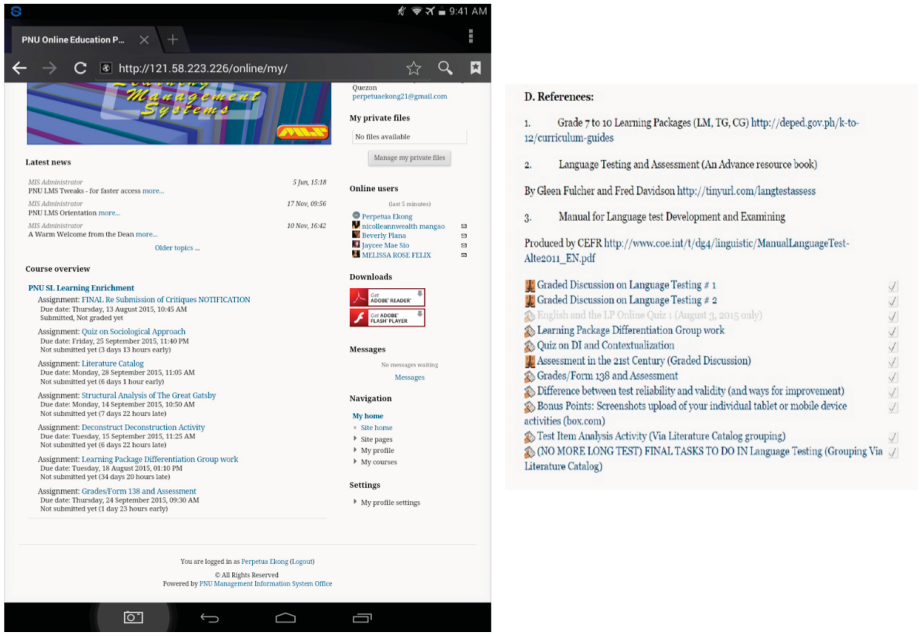

Fig. 1. Screenshots of the LMS interface with modular activities

1.4 Data Collection and Analysis

In total, six focus group discussions (FGD) were conducted which were strategically scheduled and clustered in two groups with 13 and 10 members each—the first two meetings, 3 weeks after the implementation; the second two, mid of the semester; and the last two sessions, before the final examination. On the average, focus group interviews lasted for an hour. We also collected brief yet substantial 64 reflective journal entries which they submitted at least 3 days before the FGD; inputs from the reflective journal were the topics for clarification or elaboration during the discussions. Practically, the meetings also became avenue for sharing tab tips and tricks like a

formalized community of practice. We also conversed from time to time with individual participant.

Since the principal author served as the instructor for the two courses and FGDs moderator, his co-authors closely monitored the discussion. The debriefing after every FGD also helped in identifying key themes or factors emergent in the group interviews. Then, in three occasions the two co-authors observed and corroborated how the instructor implemented actual integration of the tablets for online assessment, collaborative writing, and topic discussions in the classroom. They were also given access to observe online activities in the LMS. Transcribing the collective interviews into text was not that complicated since we built it on their reflective journal entries.

Data were triangulated with the tablet digital artifacts (See Figure 2, typically installed apps) which are not limited to LMS activity reports and Google Form quiz submissions. Heeding the recommendations of [14, 22], we repetitively read the journals, transcripts, memo and notes. Then, we coded statements from various data sets into documentary and print databases using keywords. Explicating the thematic narratives, we synthesized broader themes and emerging ones to a particular or transcending category in our deliberations. As new and overlapping themes and/or categories evolved, we referred back to our data. We even presented the results to the participants for member checking. The findings presented in categories were the outputs of strategic iterative analytic procedures triangulated from multiple data sources.

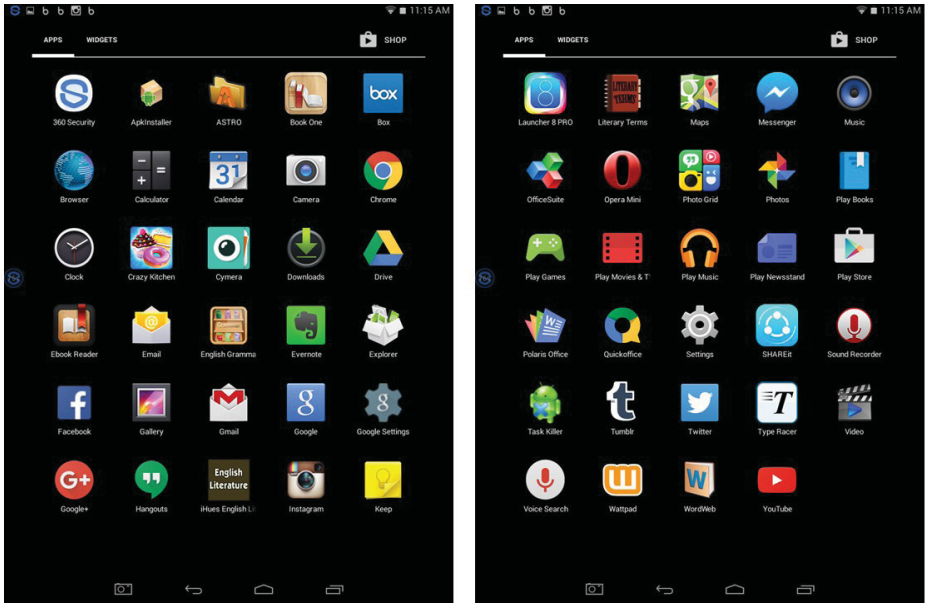

Fig. 2. Typically installed tablet apps

2 Findings

This section reports on the five aggregated categories generated from the emerging and common themes of the pilot data: (1) tableting pros and cons; (2) making adjustments and connectivity issues; (3) moodling, googling and strategizing use; (4) trending apps and functionalities; and (5) changing views on technologies and pedagogies (See Table 1, for summary of the five aggregated categories and key indicators). Finally, lessons learned and future works on the tablet adoption, applications and strategic implementation in aid of teacher education course delivery and related disciplines are forwarded in the concluding discussion.

Table 1. Summary of five aggregated categories with key indicators

Five categories	Key Indicators/Responses
(A) tableting pros and (B) cons	(A) store documents/files; devices lessen concerns for mobility; notetaking/data capture; open any type of documents, download useful materials; connect to the web
	(B) unresponsive screen; malfunctioning apps; long hour charging time; internal storage not enough; durability issues
(C) making adjustments and (D) connectivity issues	(C) inclined to reading in printouts; luring game apps; initial adjustment issues dsue to novelty of the device
	(D) Poor/slow internet connection (wifi source); no-internet like 'dead tablet'; access to internet, a must have
(E) moodling, (F) googling (including strategizing use)	(E) classroom setting extended online; portability of materials saved or stored; flexibility to review past lessons; tool for interaction
	(F) online quiz using Google drive form and *flubaroo* add on; discussion-based activity; collaborative writing documents; not doing, the more activities file up.
(G) trending apps and (H) functionalities *(with overlap on evolving technology use perspectives)*	(G) *Facebook**;** Messenger; Polaris; Quickoffice; WordWeb; Merriam Webster**;** Opera Mini; Chrome; SHAREit; 360 Security*; course-related apps like *English Grammar, English Tagalog dictionary, Idioms, LET Review; Wattpad, BookOne, Literary Terms, Literary Quotes*; and other video streaming apps and other game apps
	(H) communication on the go due to access to public wifi in buses and other public places; the tabs becoming *study buddy, google, buddy mobile, ideal partner, and 21st century device*
(I) changing views on technologies and (J) pedagogies	(I) discovering applications and educational websites; device dexterity- multi-device activities juggling the use of tablets, smartphones and laptops
	(J) better supplement to traditional learning materials; teacher educators portraying multiple roles as *facilitator, guide, validator, evaluator, planter, giver, source of information, regulator, observer, and reminder*

2.1 Tableting Pros and Cons

The preliminary focus group conversations and journals expressed students' initial impressions. Several were glad to be part of the project because they used the tabs

like their own, free to explore and test the limits. They recognized that its wide screen, connectivity, portability, memory storage, multifunction built-in ports, presentation capability with its *High-Definition Multimedia Interface (*HDMI), and useful apps are its proud strengths considering its low price.

It helped me store my documents/files which I needed for reviewing, reporting and reading. (S1)

It was a great help in studying because I can open any type of documents in the tablet, word, pdf, power point and excel. (S14)

We no longer need to photocopy the materials (S5) no more hustle experiences going to computer shops. (S7)

The tablets had also some fair share of issues. Technical difficulties surfaced in some instances as students actively engaged the devices. With low-cost price, certain limitations were expected to emerge. However, they responded proactively. Glitches were common during the exploration phase; two tablets were immediately replaced by the suppliers. Certain problems like battery draining fast, touch panel unresponsiveness, lagging/freezing interface, learner's adaptive challenges and durability kept on frustrating some students.

I can't express my thoughts [online activity] because the tablet's screen is hard to touch at times. (S13).

I felt disappointed with the tablet…It gave me a little bit of stress because the tablet was malfunctioning and easy to drain from the start [battery issue]. (S19)

I noticed the battery drains fast and it keeps on lagging everytime I browse or type something...charging needs more than 5 hours against the suggested charging time. (S5)

These technicalities spoiled few of students' interests and enthusiasm toward the devices. Furthermore, such circumstances aggravated students' positive engagement like the technological frustrations experienced in similar study [17]. On the other hand, physical durability was tested. At the end of the semester, four (4) students returned their tablets with cracks on the screen. The first two reported that it accidentally fell down and the others were caused by carrying problems, either put in a loaded knapsack or stressed in carrying bag due to commuting activities. Moreover, five (5) units had frequent battery or malfunctioning issues. Fortunately, these ill-fated incidents broke earliest eight (8) weeks, and the latest was just one (1) week before the semester ended. Students with erratic tablets had smartphones or laptops they used as alternatives; all students technically participated from the start up to project completion.

2.2 Making Adjustments and Connectivity Issues

Many had smartphones of their own so they seemed to be mobile literate in using their devices so adjusting with the tablet was not a big problem. However, this was not the case to a few who encountered difficulties. One student had initial impression that the tablet and online learning enhancement was *"hideous"*.

The first month of using the tablet for learning really messed my learning life. I was groping and crawling (literally) on how to accomplish the online task. I was not that mobilize to do such and I was not that into online activities… (S22)

Understandably, participant's technical adjustments could be rooted for being first time user as one sincerely admitted in the initial interviews. On one hand, another student had no difficulties manipulating the device but reading content on it was the concern. If this student initially had hard time reading on his tablet and learning other technicalities, one student demanded for more hardware capabilities so she could do more.

I'm not the kind of learner who reads his references on gadgets like tablets. I am more inclined in learning topics by reading in print. (S6)

Technically, I have to make some adjustments in managing the gadget because it has its limits when it comes to battery life, RAM and storage capacity. I need more power and file space for my materials. (S1)

Learning the tab for academic, communication, productivity and leisure purposes was not cumbersome for most of them. What they found a bit fuzzy was which apps to install, to try and to uninstall. Some considered the tab had 'distractive tendencies' like the game apps. But not all game apps were debilitating others were enjoyingly informative. We however cautioned them in dealing with game apps that they had to be mindful of the time spent and possible consequences.

The games I downloaded are distracting and if I didn't watch time I always end up not doing anything else but playing. (S21)

I play True or False [App] in my tablet, these game is about the history, grammar and literature. (S13)

For all participants, internet connection was a must-have. Connection, however, was limited to certain areas in campus—the reason why we held most of our class sessions near the Wi-Fi antennae. Admittedly, there were times that connection in campus was slow particularly during peak time; hence this added up to our students' dismay. Ameliorating this situation, one student brought with him in some occasions his own mobile Wi-Fi device and generously shared his connection. Indeed, internet connection played a pivotal role inside and outside the campus. These notes and complains were understandable:

No internet, then there goes dead tablet! (S9)

It is stressful sometimes because activities online pile up…not everyone has free access to internet [while on the go]. (S11)

The most terrible part is I have typed it several times [concerning online discussion] because of poor connection. (S22)

Outside the campus, I can't collaborate on the discussion [in Moodle] because I don't have internet connection. (S7)

Without dedicated or reliable connections, the tablets appeared not to be very useful. The tablet provided other offline functionalities related or not related to the course works. These adjustment problems emerging from technical literacy, device limitations, and, internet connectivity issues which were consistent to the findings of [13, 26] could be properly addressed given robust infrastructure and readiness or preparation programs before and during technological implementation.

2.3 Moodling, Googling and Strategizing Use

The pilot utilized two primary platforms intended to complement each other. The main platform was the university learning management system (LMS) powered through the Modular Object-Oriented Dynamic Learning Environment (MOODLE). Interestingly, most students were fascinated with this system because it was a novel course engagement strategy for them. They found it innovative, helpful and at times challenging. What made it innovative could be justified because it was used to deliver content (through links, documents, videos, etc.), to submit files/documents, participate in online discussion (graded and non-graded) and to take online quizzes. A significant number of students responded with the LMS activities positively because of resource accessibility yet with some indications of anxiety over working with others and time management among other things:

Our classroom setting was changed…We were busy exploring the apps, the reference uploaded in the tablet and the online activity we have in LMS.(S23)

It was awesome, because I can read our past lessons again and my classmate's insights [referring to module content and discussion thread]. (S11)

The group forum in the LMS challenge me to collaborate to my classmates. (S2)

The more I didn't do it [graded forum] on time the more I will be late on what they've already taken. (S3)

While several actively engaged in the graded forum, others found it challenging. Intriguingly, one observed the instructor's frequent prompts or follow up queries in the forum caused more confusion. Another participant realized that it was not just the online discussion he should be more concerned with before *moodling*; reading required texts was also important. The need for more organized modular activities in the LMS should also be considered, because for some new sections created meant unfinished task filing up another unfinished task; procrastinating LMS activities was openly admitted specially when face-to-face sessions were occasionally converted to off-campus activity.

I just find some questions to be quite difficult to understand because there are always follow up questions [instructor's] and it is really confusing. (S21)

…we can't answer the discussion [graded forum] if we did not read and if we know nothing. (S4)

Google Drive apps were incorporated in the LMS through collaborative online document and online quizzes for students to work on after class lecture or discussions. Many found the online collective writing via Google doc very engaging and useful; they could open a document and share it to desired collaborator. One even called it *"Academy"*.

I could say the online writing activity in Google Docs Academy [Just Google Docs] is very useful because this academy let us do the group work simultaneously. (S26)

In one collaborative writing activity, one, however, expressed ill remarks citing that it was "complicated and very demanding." But several reported that sometimes it was better than doing face-to-face session. They confirmed writing online gave them more time to organize their thoughts and to share their opinions in an equally levelled

ground just like in the graded forum. Furthermore, participants were also asked about which online activity they found most academically interesting. The common view was that the online quiz through *Google* drive form and checked using *Flubaroo* was regarded to be very thought-provoking and responsive because feedbacks were timely given.

Every time we took the quiz our professor can check it as easy as it, check it online and the result is sent in our e-mail address. (S7)

The most interesting online course related activity is the online quiz because its motivating to learn/ listen during our discussion to have a good result of quiz based from it. (S9)

It is fun to answer the online quiz because it measures our knowledge if we listen during the discussion. (S15)

Several suggested, however, that if the online quizzes were done in the classroom using the tabs, there should be dedicated internet connection and enough test-taking time in some occasions. Moreover, they liked to have it also in off-classroom format so they could compare and share answers in practice mode wherever and whenever. We then reopened quiz links weeks before the final examination for review purposes; they found such module feature very useful and informative increasing their retention and thinking skills through reviewing the materials online or offline.

Overall, the discussion, collaborative writing, and online quizzes were not all taken by the students using their tabs. Inevitably, we allowed the use of student-owned smartphones and/or laptops in some occasions taking consideration for those who had problematic or erratic tabs. For many who had to heavily rely with the tabs, bearing and working their way with the devices paid off as they managed to master its functionalities in the process. For students with alternative smartphones or laptops, using their existing devices supported with the tab's preloaded course references was a better alternative rather than strictly using their own devices except for tablet-issued-only-inside-classroom activities. For some classroom quizzes, we strategically devised batch-by-batch test format, where the first group (n=13) took a 15-minute-10-item-multiple type quiz. Upon completion, it was followed by the next group (n=10) using the same sets of tabs. In this way, only the reliable and less problematic tabs were strategically used to meet the needs of all students. Generally, the students found this particular set-up favorable especially when internet speed dwindled.

2.4 Trending Apps and Functionalities

As semester progressed, mobile learning flourished with various discoveries each had to share. Tips and tricks in optimizing the tablet apps flowed freely from journal entries, within group meetings, and through online and in-class engagement. Curiously, we asked them which tablet apps they often used for communication, production (like docs, project etc.), sharing or collaboration and course content related. Apparently, *Facebook* found to be trending in all tab activities. Indeed, Facebook app with its messenger is a platform that all participants were actively connected. For this reason, we tapped the class existing Facebook group *(The Grammarian)* in posting announcements or conversing with students about course updates through wall posting

or group chat app via *Messenger*. Even on the go, several students remained updated. One time, a student narrated that he received Facebook update and email notifications by connecting his tab via transport bus free Wi-Fi service on his way home.

When I had the chance to ride on a Wi-Fi ready bus, I checked my messenger for the updates in the LMS. (S12)

Discovering useful tablet applications was not limited to communication or social networking purposes. Some techy students explored word processing apps like *Polaris and Quickoffice* which were not just utilized for encoding but also for presentation in other courses they were taking by utilizing the HDMI port to connect the tab with the classroom wide screen television. Moreover, several used the dictionary apps, *WordWeb, and Merriam Webster* to improve their understanding, writing and research needs. They usually accessed the LMS site through browsing applications like *Opera Mini*, *Chrome,* or the tab default web browser though some students wished to directly access it through an executable app designed for the university LMS.

In sharing files, all used the *SHAREit* app, a non-internet dependent, wireless way of sharing different sort of files, applications, images, videos, etc. One student called it the 'ultimate solution to sharing problems'. On the other hand, some students were cautious of the files they received and shared from their classmates. Based on participants' recommendation, installing a security app like *360 Security* app was better than not have one's tab protected. Privacy was also a priority for this project; students while in possession of the tabs had enabled passcodes. Using 360 Security app, some figured out how to protect a document or image from being seen. Also, this app cleaned unwanted files optimizing the tab limited storage space.

A significant number of students relied doing screenshots on the tab particularly when they needed to save files for online to offline reading while others would prefer saving the files through their browser. In terms of capturing image, almost all who had reliable tablet found ways to maximize the 2MP back camera. They took images of teachers' notes on the board, classmate's writing, and any sort of things. Since the tabs were primarily integrated to their two language and literature specialization courses, other tablet enthusiasts busied themselves discovering other apps to try and share with their classmates. Overwhelmingly, they found and kept various sort of course-related apps like *English Grammar, English Tagalog dictionary, Idioms, LET Review (testing certification review materials), Wattpad, BookOne, Literary Terms, Literary Quotes* among others. More than the apps, the tablet also served like a portable library and entertainment console:

When I have the tablet, I become dependent to it for studying and for leisure. I didn't go to library anymore, I became addicted to games and it serves as my buddy. (S7)

Understanding that students needed also to have fun; we gave them space to install music, video streaming apps and other game apps. As they argued, some games had educational content like *True or False and Who wants to be a millionaire* while others were purely for entertainment values—simulating cooking, taking care of pet, building a city, among others.

2.5 Changing Views on Technologies and Pedagogies

The introduction of tabs altered students' thoughts on how mobile technologies play in classroom or informal environments. In a semester-time implementation, several students regarded the tablet as their *"study buddy", "google", "buddy mobile", "ideal partner", and "21st century device"* notwithstanding some had problematic tablets at times. Interestingly, the narrative locus was not just the tab per se because it transcended to all emerging portable technologies within the instructor's and more so students' multi-device activities—juggling the use of tablets, smartphones and laptops to accomplish course works as need arose. Consequently, synching their available devices with tabs increased productivity and communication efficiency.

Concerning their views about the instructors' role in using mobile technologies in aid of course delivery, they recommended that teacher educators should be *"facilitator", "guide", "validator", "evaluator", "planter", "giver", "source of information", "regulator", "observer", and "reminder"*. Not necessarily very techy as one described, but being able to model even a simple course task with the use the tabs was a perceived condition students were delighted to see from their teachers. Moreover, most of the students were positive to the LMS administrator role of their instructor. But, some got frustrated if due dates filed up. To early dismay of one, she complained: *"I just see him [instructor] giving requirements"* (S12). For this matter, we guided and constantly reminded students about the things they procrastinated. Hence, we also adjusted giving and posting quiz or forum to give students ample time. On a more positive note, mobile learning proved to be ubiquitous and beneficial when some students answered quiz and responded to the forum at home because they could not come to school due to inclement weather and for others who were recuperating from illness, and other circumstances beyond their control.

We are training future teachers. As would-be teachers, our students have become more cognizant in the use of technologies in learning. One could not help but proudly expressed how the experience changed her view in technology, the other two on enhancing book reading strategy.

It helps me to be aware or more conscious in using technology … There are lots of applications and educational websites that I discovered. (S19)

Learning with the books are good but learning with books with the help of technology is better and very helpful. (S17)

…a good alternative for actual book, reading pdf. (S22).

Multiple data sources revealed that all participants have generally improved their technological and pedagogical knowledge levels. They openly shared that they have augmented their skill sets in optimizing the use of the tablets including their own mobile tools, in choosing which device to buy in the future, in categorizing which apps can be course-related, relevant and for enjoyment, in enhancing presentation of content for better understanding, in enhancing learning and working productively, and finally, in reinforcing traditional learning and teaching practices. Truly, learning and teaching in the 21st century has metamorphosed not only in sharing relevant, accurate content but also including the ways available handheld technologies usually students

possess are institutionalized in a teacher education courses to produce the desirable outcomes. Take it from the words of one reflective student in this project:

… it is part of the alignment program of the system [institution] …It helps students to be competitive and productive in terms of using e-technology in education. It also incorporates globalization since it will mold current semestral classes to be globally competitive and flexible. (S21)

3 Concluding Discussion

This article presents the outcomes of an exploratory case study that documented the low-cost tablet technicalities, significant learning experiences, and views including the implementation strategies adopted by the instructor. The pilot turned to the use of various relevant tab compatible platforms and Android-based applications. The findings were consistent to the offshore studies particularly on the technical challenges and learners' adjustment issues [9, 11, 13, 17, 18, 19, 26, 27]. Inarguably, some students seemed to have initial negative attitude about the mobile learning experiences primarily due to some erratic devices and project implementation complexities, but eventually became positive upon continuous adaptive utilization. Their habits and views toward the device, and on-and-offline learning experiences also changed although several would prefer to use the tablets alternatingly with their own devices to increase their technological dexterity and productivity, and enhance their course-related content knowledge. Generally, the learners appeared to enjoy the tablet-aided pedagogy because of the many useful apps to optimize not just limited to communicating, sharing, reading, and viewing but also for fun-filled and personally enriching activities. Although the tabs could still be used offline, students appreciated more to have dedicated internet connectivity, highly durable device and timely technical supports in a more community of practice style where teacher and students learned from each other. Finally, being prospective teachers in technology-driven and highly-connected environment means being able to deliver pedagogical strategies with emerging handheld technologies.

3.1 Lessons Learned

This was a small-scale qualitative study from a developing country, but it has engendered lessons learned for national and international audience who are keen to introduce mobile-aided strategies for teacher education or other related areas:

- Many tablets or equivalent devices surge in the market; choosing which unit to adopt could be based on its sound specifications considering multiple compatibilities with other devices and functionalities like being able to connect to wide screen TV and other unlikely technologies or accessories, executing single to multiple applications, and having clearer camera capture and bigger storage space to name a few.

- Longer battery life and fast charging cycle are also important factors we should always look for. Ironically, the more one runs apps the more it consumes energy. Nonetheless, there are ways like turning off unused apps, running airplane mode when one is offline, and decreasing the screen brightness under shade are just some tips.
- Durability and dedicated technical support cannot be overlooked. Shock-and-water proof devices should be on the checklist; if not, protective accessory could be another option. Other on-demand specifications would entail bigger budget yet the return of investment could be enjoyed for a longer period and tried in other projects.
- Internet connectivity should be almost everywhere in the campus and be freely accessible in all key public places since this is the essence of learning on the go. It enables updating the device firmware, downloading certain apps or files, and communicating online.
- In any technology implementation, exploring the device and understanding the relevant content and apps are paramount. It is like fitting the device with the course activities or vice versa, but technology should not be in control; face-to-face classroom use of mobile devices in learning should outnumber off-classroom works or depending on purpose. Technology user guide policy however should be in place and clearly communicated to all users.
- Generally, activities created in the LMS module should be in linear progression; a readiness module could be undertaken to orient students further with this virtual learning environment. Calendaring forum, quizzes, submission links and dues dates should be slated in realistic yet not too flexible time frame so unfinished task would not file up.
- Google Drive and apps though not fully optimized in project were found to be a good complement for the LMS because it could also serve as cloud storage thereby increasing space for saving or securing important documents like the *Box app*. Google has wide variety of apps for different purposes that could be explored further.
- Next to Google platform is a social networking site *Facebook*. Students need reminder of LMS activities and course updates. And the best way to do it is through the app that they always use. Nonetheless, this should be used with care and caution since the platform is susceptible to personal vulnerabilities like privacy issue.
- Other instructors particularly teaching the same student participants could be hooked up with this intervention. For sure, there are plenty of course tasks which could be streamlined into an integrative project. Communicating, authoring, researching, documenting and organizing project tab apps are very useful.
- Finally, mobile learning is not about the device itself; it is more on the mobility of teachers and learners to make use of whatever resources they have on hand and more importantly in mind that matter working independently and in a community anytime, anywhere.

3.2 Limitation and Future Works

This study was implemented in a small university in the Philippines covering one group of participants through low-cost-tablet-aided language and literature course enrichment activities. The intervention revolved on the main use of *Nextbook* tablet alongside other alternative mobile devices. The tab primarily supplemented the face-to-face session and off-campus activities. With heavy reliance to open reflective journal, FGDs, and direct engagements, authors might not have detected nuisance yet significant individual experiences, views and attitudes; hence the project may incline for a follow-up study with much more depth into individual case. Since this study is a pilot run, a large-scale program with larger cohort could also be undertaken to include participation of parallel institutions local and/or abroad but with the use of more reliable, connected and robust mobile devices on familiar platforms, and enough room for participants to use of their own devices. Moving forward, development and testing of the university LMS mobile app including the formulation and implementation of related technology or mobile learning polices are suggested.

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5 References

[1] Adelman, C., Kemmis, S. & Jenkins, D. (1980). Rethinking case study: notes from the second Camdridge conference. In H. Simon (ed.) Towards a Science of the Singular. Norwich: Centre for Applied Research in Education, University of East Anglia, 45-61.

[2] Baran, E. (2014). A Review of Research on Mobile Learning in Teacher Education. Journal of Educational Technology & Society, 17(4), 17–32.

[3] Cacho, R. M. (2014). TPCK Assessment of Pre-service Teachers toward Enhancing Teacher Educators' Modeling. Asian Journal of Education and E-Learning, 2(4), 349-356.

[4] Cacho, R. M. (2017). Exploring the potentials and essentials of mobile-aided pedagogy in teacher education. The Normal Lights, 11(1), 1 – 17.

[5] Cobcroft, R. S., Towers, S., & Smith, J. (2006). Mobile learning in review: Opportunities and challenges for learners, teachers, and institutions. Proceedings of the Online Learning and Teaching Conference 2006, 21-30.

[6] Drouin, M., Vartanian, L. R., & Birk, S. (2014). A Community of Practice Model for Introducing Mobile Tablets to University Faculty. Innov High Educ, (39), 231–245. https://doi.org/10.1007/s10755-013-9270-3

[7] Geist, E. (2011).The game changer: using iPads in college teacher education classes. College Student Journal, 45(4).

[8] Güzer, B., & Caner, H. (2014). The Past, Present and Future of Blended Learning: An in Depth Analysis of Literature. Procedia - Social and Behavioral Sciences, 116, 4596–4603. https://doi.org/10.1016/j.sbspro.2014.01.992

[9] Johnston, N., & Marsh, S. (2014). Using iBooks and iPad apps to embed information literacy into an EFL foundations course. New Library World, 115(1/2), 51–60. https://doi.org/10.1108/NLW-09-2013-0071

[10] Kearney, M. and Maher, D. (2013) Mobile Learning in Maths Teacher Education: Using Ipads to support pre-service teachers' professional development. Australian Educational Computing, 27(3).

[11] Kyu, Y. L. (2011). What does the tablet PC mean to you? A phenomenological research. Innovations in Education and Teaching International. 48(3), 323-333. https://doi.org/10.1080/14703297.2011.593708

[12] Li, L., Worch, E., Aguiton, R., & Zhou, Y. (2015). How and Why Digital Generation Teachers Use Technology in the Classroom : An Explanatory Sequential Mixed Methods Study. International Journal for the Scholarship of Teaching and Learning, 9(2), 1–9. https://doi.org/10.20429/ijsotl.2015.090209

[13] Martyn, J., Larkin, K., Sander, T., Yuginovich, T., & Jamieson-Proctor, R. (2014). Distance and devices - Potential barriers to use of wireless handheld devices. Nurse Education Today, 34(3), 457–461. https://doi.org/10.1016/j.nedt.2013.04.021

[14] Miles, M. & Huberman, M.A. (1984) Qualitative Data Analysis: A Source Book of New Methods. Sages Publications, Beverly Hills, CA, USA.

[15] Mishra, P., & Koehler, M.J. (2006). Technological pedagogical content knowledge: A framework for teacher knowledge. Teachers College Record, 108(6), 1017–1054. https://doi.org/10.1111/j.1467-9620.2006.00684.x

[16] 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

[17] Osgerby, J. (2013). Students' Perceptions of the Introduction of a Blended Learning Environment: An Exploratory Case Study, 22(1), 85–99.

[18] Park, J. & Han, S. (2013) Defining user value: A case study of smartphone. International Journal of Industrial Ergonomics, 43 (2013) 274-282. https://doi.org/10.1016/j.ergon.2013.04.005

[19] Rossing, J., Miller, W., Cecil, A., & Stamper, S. (2012). iLearning : The Future of Higher Education? Student Perceptions on Learning with Mobile Tablets. Journal of the Scholarship of Teaching and Learning, 12(2), 1–26.

[20] Shin, W. S., & Kang, M. (2015). The Use of a Mobile Learning Management System at an Online University and Its Effect on Learning Satisfaction and Achievement. International Review of Research in Open and Distributed Learning, 16(3), 110–130. https://doi.org/10.19173/irrodl.v16i3.1984

[21] Sung, Y., Chang, K., & Yang, J. (2015). How effective are mobile devices for language learning ? Educational Research Review, 16, 68–84.

[22] Taylor, S. J., Bogdan, R., & DeVault, M. L. (2016). Introduction to qualitative research methods: A guidebook and resource. John Wiley & Sons, Inc.

[23] Traxler, J. (2007). Defining, Discussing and Evaluating Mobile Learning: The moving finger writes and having writ . *The International Review of Research in Open and Distributed Learning, 8*(2). https://doi.org/10.19173/irrodl.v8i2.346

[24] Traxler, J. (2010). Will Student Devices Deliver Innovation, Inclusion, and Transformation? Journal of the Research Center for Educational Technology, 6(1), 3–15.

[25] Wang, R., Wiesemes, R., & Gibbons, C. (2012). Developing digital fluency through ubiquitous mobile devices: Findings from a small-scale study. Computers & Education, 58(1), 570-578. https://doi.org/10.1016/j.compedu.2011.04.013

[26] Wang, Y., Wu, M., Wang, H., (2009). Investigating the determinants and age and gender differences in the acceptance of mobile learning. British Journal of Educational Technology 40(1), 92-118. https://doi.org/10.1111/j.1467-8535.2007.00809.x

[27] Wong, W. (2012), Tools of the trade: how mobile devices are changing the face of higher education, Community College Journal. April/May. pp. 55-60.

[28] Yin, R.K. (1994) Case Study Research: Design and Methods. Sage, Thousand Oaks, CA, USA.

[29] Young, S. S. C., & Hung, H. C. (2014). Coping with the challenges of open online education in Chinese societies in the mobile era: NTHU OCW as a case study. International Review of Research in Open and Distance Learning, 15(3), 158–184. https://doi.org/10.19173/irrodl.v15i3.1742

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