Readiness and Perception of Pacific Students to Mobile Phones for Higher Education

Emmenual V. Reddy[1] · **Pritika Reddy**[2] · **Bibhya Sharma**[1] · **Karuna Reddy**[1,3] · **Mohammed G. M. Khan**[1]

Abstract

The emergence and advancement of Information Communication Technologies have transformed facilitation and content delivery in higher education worldwide, the Pacific region being no exception. The extensive use of mobile phones in the Pacific, especially with the student-aged populace, is gradually creating a niche for mobile learning in the education landscape. However, there is a growing concern on the effectiveness of this innovative intervention keeping in mind the digital intelligence of Pacific students. This paper explores the readiness and perception of the Pacific students using mobile devices for learning. An online questionnaire was used to collect data for this exploratory research. While the results revealed the student's willingness and positive perception to leverage on mobile phones for learning in higher education, their readiness for the mobile-driven education is rather dependent on various factors which are explored in detail. The paper concludes with recommendations for the higher education institutes and education ministries in the Pacific region.

Keywords Mobile Learning · Readiness · Perception · Pacific · Higher Education

1 Introduction

The emerging growth of wireless technologies and the escalating subscriptions to Internet have intensified the use of mobile devices in various human endeavors and aspects of their livelihood such as communication, healthcare, scheduling personal work and education (Bachmair & Pachler, 2015; Tsinakos, 2014; Sharma et al., 2017). The use of mobile devices in education or m-learning is increasingly conspicuous at all levels of education worldwide, and is transforming the eduscape of higher education institutes (HEI) (Geer, 2012). Nevertheless, sincere commitment at the infrastructural, pedagogical, faculty, budgetary and leadership levels is warranted from HEI (Farley & Murphy, 2013), education ministries in governments and from the governments themselves (Imtian et al., 2012) if mobile learn-

---

Extended author information available on the last page of the article

ing is to be fully embraced and interwoven with the learning and teaching processes of any state, country, region or continent.

O'Malley et al. (2005) define m-learning as "any sort of learning that happens when the learner is not at a fixed, predetermined location, or learning that happens when the learner takes advantage of the learning opportunities offered by mobile technologies". Melhuish and Fallon (2010) and Mirri and Salomoni (2011) define the tool as the ability of the learner to learn when on the move in his or her own time and space, while Haag (2011) defines m-learning as the use of handheld computing devices to provide access to learning content and information resources. Sharma et al. (2015) further state that m-learning stands on the 3 pillars of learning; just-in-time, just-enough, and just-for-me, while the literature commonly suggests that m-learning can be self-paced, self-directed, personalized and either subscriptive or micro-learning. With the growing demand for m-learning, numerous educational mobile apps are made available to students and teachers freely for usage (StatCounter, 2016). In addition, a number of mobile learning projects are being deployed across the globe such as MOBIlearn which was funded by European Commission, EMAPPS (Motivating Active Participation of Primary School Children) in digital online technologies for creative opportunities through multimedia, MOLENET (Mobile Learning Network) program in UK (UNESCO, 2012), MLearn- a pilot project undertaken at Fiji National University (Kumar & Mohite, 2017), Mobile Kindy (mobile kindergartens) initiative by UNICEF in Fiji and mobile learning projects such as SMS notification, course finder and edutainment by The University of the South Pacific (Reddy & Sharma, 2015; Sharma et al. 2015; Sharma et al. 2017, Reddy et al., 2021a).

In the developing countries the uptake of mobile learning has been shown to have improved the educational standards, made educational services available in remote areas and created cost efficient and flexible learning solutions (Bachmair & Pachler, 2015; Sharma et al., 2019; Reddy et al., 2020, Reddy et al., 2021b). A research conducted in Malaysia found that mobile phones are the most popular types of technology that are owned by students (Hussin et al., 2012). According to Sharma et al. (2017), the concept of mobile learning in the Pacific region is still an emerging concept, yet leading to innovative learning strategies that point in the direction of sustainable and quality learning. In the Pacific, mobile service is seen as a driver of socio-economic development, particularly in the areas of financial inclusion, disaster preparedness and response, and as a medium to address the gender gap and digital divide issues (Reddy & Sharma, 2016; Reddy et al., 2017; Sharma et al., 2015, Reddy et al., 2020). We note from the literature that the reasons for introducing mobile devices in the Pacific remain the same as the ones garnered outside of the Pacific, especially in the developing countries. These are, but not limited to, low costs, better management and utilization of resources, enhanced collaboration and providing the students with their own learning space (Gong & Wallace, 2012; Reddy & Sharma, 2016; Reddy & Sharma, 2018; Sharma et al., 2015; Reddy et al., 2020).

The use of mobile devices for learning has become possible in the Pacific region due to the improved network infrastructure and connectivity, wider availability of electricity, and improved user competency. According to GSMA (2015), the Pacific region has shown a tremendous growth in mobile subscription, from 2.3 million in 2009 to 4.1 million in 2014, and it is expected that this number will increase fourfold by 2020. Since the usage and ownership of mobile phones is increasing, it is very important that the educators and HEI look for possibilities of nourishing the eduscape with increased m-learning services and tools

(Hussin et al., 2012; Sharma et al., 2015; Reddy & Sharma, 2016). However, Bachmair and Pachler (2015), eCyclebest (2015), and Rodriguez (2015) state that while the 21st century learners are well versed with the use of mobile devices in their daily lives, it remains to be seen if this assistive technology is making a positive impact in education. While there is high proliferation and ownership of mobile devices, the same trend is not seen in education (eCyclebest 2015). There is a dearth of researched evidence and analytics to prove the effectiveness of mobile devices in current education. Initiatives and innovations in m-learning will only be successful if the learners are ready to accept and use the mobile devices as a learning and pedagogical tool.

Literature Review.

1.1 ICT and Education

The acronym ICT refers to information and communication technologies, which can also be described as human interaction via the use of computing or technological devices (Margaret, 2005). The impact of the ICT is now deeply rooted in education (Bachmair & Pachler, 2015). Its integration into education has brought a variety of learning environments that is from a stand-alone computer in classrooms to facilitation through pre-packaged computer technology (Margaret, 2005; Traxler, 2010; Bachmair & Pachler, 2015). Ahmadi et al. (2011), Yu (2012) and Geer (2012) state that integrating ICT tools and technologies in education has; improved capabilities and scope of instructors, changed the educational delivery, created opportunities for greater and more comprehensive learning, supported learners and enhanced the quality of education. ICT has transformed learning at all levels of education and changed the pedagogical approaches to make ICT less peripheral to schooling and more student-centered.

The ICT- driven learning environments have facilitated a shift from traditional face-to-face learning to virtual learning to reach the distance learners, enhancing content delivery and better supporting these learners (Geer, 2012; Lavery, 2012; Sharma et al., 2017; Reddy et al., 2020, 2021a). Therefore, the traditional distance learning changed to a real-time web-facilitated learning, whereby ICT tools are integrated to deliver educational content to students. This change in the facilitation of distance learning was essential because of issues such as; lack of support from facilitators, feeling of isolation, lack of student motivation, and student insecurities about learning which all led to high attritions and dropouts (Haag, 2011; Rosenblit & Gros, 2011; Sharma et al., 2017; Reddy et al., 2020).

1.2 Evolution and Mobile Learning

With the growing demand for timely access to resources from students and the need to improve learner experiences at higher education, the concept of e-learning was adopted and adapted by the education providers. Shopova (2012) and Nkechinyere (2011) state that the e-learning approach opened new opportunities to raise standards, widened participation in lifelong learning and enabled the facilitators to transform the ways of delivering content to students. The process of e-learning also allowed students to design their own study programs based on their interest and time hence driving the learners to be self-direct and autonomous (Rosenblit & Gros, 2011). Despite the apparent benefits, e-learning also has problems such as the rapidly paced technological developments, digital divide, competen-

cies and professional development of the facilitators and Internet connectivity (Oye et al., 2011; Rosenblit & Gros, 2011).

More recently, we have witnessed the rapid development and popularity of wireless and mobile technologies. The concept of m-learning came when e-learning was combined with wireless technology. The approach of m-learning is attractive due to the fact that the devices are portable and affordable, enhance learner collaboration, engagement and creative thinking, encourage discovery learning and provide flexible access to course resources to the "Net Generation" learners (Mirri & Salomoni, 2011; Rossing et al., 2012; Sharma et al., 2015; Woodcock et al., 2012; Yu, 2012).

The most common device that can be used for mLearning today is mobile phones preferably the smart phones. The students not only use their mobile phones for making calls but gathering access to the university information, course resources, navigating through locations, communicating through various forums such as social networking sites, emails and online forums (Iqbal et al., 2017; Reddy et al., 2017; Sharma et al., 2019). An Educause survey conducted in 2014 showed that out of the 95% students who owned mobile phone, 77% indicated that they had used smart phones for accessing course syllabus, LMS, checking grades and for capturing data during field trips (Rodriguez, 2015). The access and usage of mobile phones have increased over the years that is a tenfold increase today compared to the usage in 2009 (Iqbal et al., 2017) because the price of mobile phones have decreased. A wide range of mobile phones are available for customers to choose from as per their budget and the Internet infrastructure has improved therefore access to resources is available from anywhere at any time (Reddy et al., 2017; Sharma et al., 2019). In addition, these mobile phones have the capability to run complex software, store huge amount of data, run wide range of apps (support for office productivity, web browsing, media production, social media, communication and entertainment), conveniently and directly connect to the Internet through protocols including Wi-Fi, 3G/4G (Hussin et al., 2012; Woodcock et al., 2012). Today, mobile phones have taken the place of computers as there is a lot that can be done by this small hand held device such as getting the daily news, virtual shopping, booking a flight for your vacation, sending work emails, getting approval of a business deal and uploading your assignment (Iqbal et al., 2017; Reddy et al., 2017; Reddy et al., 2021a).

Due to the aforementioned capabilities of mobile phones, the students nowadays prefer to use mobile phones for their learning purposes. A study conducting by Iqbal et al. (2017) showed that 84% of the students agreed that mobile phones are useful mediums for imparting knowledge and 65% agreed that mobile phones allows a more flexible method of learning. Traxler (2010) states that learning with mobile phones allows the owner to become an active producer of the content therefore allows learners to explore their thinking capabilities. He also mentions that mobile phones can be used by facilitators to engage learners by providing a variety of course materials, learning resources and information about the assessments.

Since the varied use of mobile phones amongst today's students is becoming common, it can be used to offer amazing capabilities to the students and facilitators as shown by various researchers. The teaching and learning processes can be transformed and mobilised, learners better engaged through their personal space, and the content delivery re-engineered for more effective learning and better outcomes. The prevalence of the ownership and usage of mobile phones has shown an exponential growth amongst the young generation and the student-aged people in the Pacific due to the falling prices of mobile devices, data plans

and mobile calls (Sharma et al., 2015; Sharma et al., 2019). Therefore, higher education institutes are now placing greater emphasis on using the smart phones as the new learning tools. To begin with, The University of the South Pacific (USP) has developed in house mobile applications such as the USP Mobile App, USP Campus App, In-Country Science App and the USP Moodle App, which can be downloaded through play store for android users (Sharma et al., 2018). To introduce the use of mobile phones for upfront learning and teaching at the university, we need to know student readiness and perception of using smartphones for learning, hence this study was conducted to evaluate these two important attributes amongst the students in the Pacific.

2 Background

In the Pacific region, there are 22 island countries and territories spread over 33 million square kilometers of the Pacific Ocean, which also contains a significant portion of the terrestrial and marine biodiversity (Corcoran & Koshy, 2010). As illustrated in Fig. 1, these countries and territories face the issues of smallness and geographic isolation that has, inter alia, made the delivery of equitable high quality education by HEI in the Pacific a big challenge. The challenge came in the way of, but not limited to, equitable student support, timely delivery of course and program materials, ICT infrastructure, high student enrolments required in order to mount courses face-to-face on local campuses, travel logistics, decision making and governance, lack of local teaching and support staff (Corcoran & Koshy, 2010; Lingam & Lingam, 2013; Sharma et al., 2018).
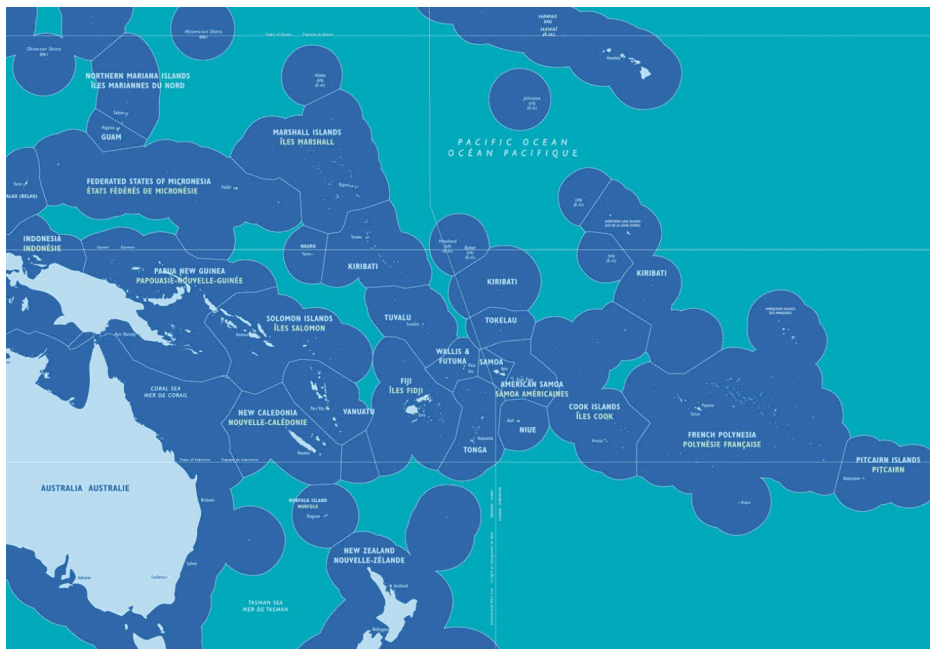

Fig. 1 The 22 Developing Nations of the Pacific (SPC 2016)

However, in recent times, an improved access to technology in the Pacific such as mobile and broadband (International Telecommunication Union 2016; PRIF 2015) is leading to multiple social and economic benefits such as entrepreneurship, innovation, higher quality of services and products, and projecting a more sustainable and equitable higher education for the Pacific populace. The University of the South Pacific (USP), which is the leading higher education provider in the Pacific, has modified facilitation of its courses and programs by incorporating the ICT and m-learning services to improve its flexible and distance learning processes, and provide interactive, engaging and equitable high quality learning to its students (Sharma et al., 2015; Sharma et al., 2019). Moreover, Reddy and Sharma (2016) and Sharma et al. (2015) state that the use of m-learning services (edutainment, SMS notification, course finder and exam timetable) that USP provides is seen to be one of the best mediums that has enabled the university to facilitate a more collaborative, transformative and reflective learning environment in the recent years.

There are a number of tertiary institutions such as national universities and training institutions in the Pacific region, with the only regional institution providing tertiary education being The University of the South Pacific (USP), setup in 1968 and jointly owned and governed by 12 nations of the Pacific. The high school graduates in the Pacific have the option of:

Universities The University of the South Pacific, Fiji National University, The University of Fiji, National University of Samoa, University of PNG, University of Technology PNG, University of New Caledonia, University of French Polynesia, University of Guam, or,

National Institutes Technical College of Fiji, Solomon Islands College of Higher Education, The Tonga Institute of Higher Education, Tonga Teachers College, Vanuatu Institute of Technology, Vanuatu Institute of Teacher Education, American Samoa Community College, Palau Community College, College of Micronesia - FSM, College of Marshall Islands, Kiribati Institute of Technology, Kiribati Teachers College, Northern Marianas College.

3 Rationale

Mobile devices, in particular the mobile phone and tablets, are increasingly integrated into education and the new pedagogies nowadays. A growing number of schools, colleges and universities have introduced mobile phone and tablets in their education system with small pilots and trials, which are subsequently scaled and scaffolded into institution-wide adoption (Geer, 2012; Sharma et al., 2017; Tsinakos, 2014, Reddy et al., 2021a). On the other hand, many institutions have directly adopted these devices based on the success stories of others, and without prior consideration of their student diversity and socio-economic status, budgets, ICT infrastructure, faculty attitude and competencies, and to a greater extend the student preparedness and perception towards the mobile devices (Lavery, 2012; Reddy & Sharma 2017; Shopova, 2012). The developing countries fall in the latter category to a large extent (Imtian et al. 2012; MobiMOOC 2011).

In the developed countries, due to the strong social economic background and financial stability of the country, multi-million dollar projects on mobile learning are funded

by the governments, academic institutions and non-governmental organizations to esca-late student access to educational resources and enhance quality learning. For example the Mobile Learning Network (MoLeNET) program in UK which was supported with more than $25 million (MobiMOOC, 2011), and the Bring Your Own Device (BYOD) program in US whereby the students are provided with mobile phones or allowed to bring their own to be used for learning (Tsinakos, 2014). Comparatively, in developing countries the potential for m-learning is lower. Figure 2 shows each region share of the world's global Internet and mobile connection.

The Pacific makes up for less than 1% of the global Internet usage as well as the mobile connection. However, these developing countries are progressively involved in different mobile learning projects due to the flexibility, cost, convenience and popularity of the mobile devices amongst the younger generation (Hussin et al., 2012; Sharma et al., 2017; Sharma et al., 2019; Tsinakos, 2014; Woodcock et al., 2012, Reddy et al., 2020).

In the Pacific, the use of mobile phones and subscription to Internet has increased dras-tically due to the falling prices of the devices, the lowering costs of the broadband and growing familiarity and popularity of ICT tools and technologies (Sharma et al., 2019). The younger generation in the Pacific today have incorporated the use of mobile devices in every facet of their daily lives. Table 1 shows the Mobile Cellular Subscriptions data per 100 people for Pacific island countries. A number of mobile projects have emerged in the Pacific region, such as in Vanuatu the resource strained medical staffs use mobile phones to reach doctors and specialists in event of emergency through mobile calls. Also, in Vanuatu, SMS notification service is being used for natural disasters and account balance updates (TheWorld Bank, 2013). In Fiji, mobile phones are used as a m-Health service whereby healthy eating is promoting via mobile phones using a mobile app – "My Kana" (The Fiji Times, 2017). In Fiji, mobile phones are also used to send and receive money and make pay-ments. The World Health Organization (WHO) is using mobile technology as part of a post-disaster Early Warning Alert and Response System (EWARS) following Tropical Cyclone Winston in Fiji. WHO supported the Ministry of Health and Medical Services (MoHMS) in establishing 35 early warning surveillance sites across Fiji to monitor for infectious dis-ease outbreaks (WHO, 2016). The mobile technology collects the information from all 35 surveillance sites, rapidly analyses the data to detect unusual increases in disease, and sends alerts to medical officers and public health staff to warn of potential disease outbreaks. The MoHMS has rapid response teams to quickly investigate alerts generated by the early warning system. These projects have garnered good success in recent times. The HEI in the Pacific are also investing in this technological revolution to enhance educational delivery

Fig. 2 Region's Share of the World's Global Internet and Mobile Connection Distribution as of January, 2017. (SlideShare, 2017)
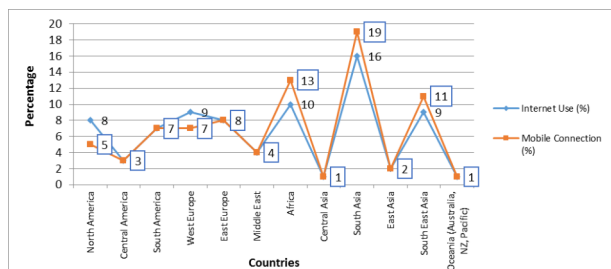
Table 1 Mobile Cellular Subscriptions Data per 100 People of the Pacific Island Countries

Country	Subscriptions per capita
Fiji	103
Papua New Guinea	49
Kiribati	51
Vanuatu	71
Tuvalu	76
Tonga	75
Solomon Island	70
Samoa	69

and tailor the learning environment to meet the needs of the individual learners (Murphy et al., 2016), with some examples already mentioned in the previous section.

However, while the HEI and regional governments in collaboration with NGOs, donor agencies and the mobile service providers are already integrating mobile devices to education, there is a dearth of empirical studies in the Pacific on what the students want from mobile learning, in which ways they are comfortable using the mobile devices for education, and how they perceive this new learning tool. There is a lack of data on the readiness of the Pacific students to mobile learning in schools and tertiary institutions. It is still not known if there is enough done in schools to facilitate learning with the use of mobile devices in the Pacific. These issues and concerns have provided a strong motivation to researchers of this paper to provide some answers and recommendations, which are useful to those involved in m-learning in the Pacific. Reddy et al. (2016) had surveyed a smaller cohort in Pacific on similar attributes, while this research extends the survey to a much bigger sample in the Pacific and provides more conclusive results and recommendations.

3.1 Problem Statement

The seminal aim of this descriptive research is to determine the readiness and perception of students in the Pacific towards the use of mobile phone in higher education. The research will also provide insights into the types of mobile learning the students are exposed to, and their mobile learning preferences. The findings invariably serve as an important prerequisite to future integration, implementation and effective use of mobile devices in higher education in the Pacific. Given the above aims, the following research questions guide this research:

1. What is the mobile phone ownership pattern among students in the Pacific? Is there any statistically significant association between the types of mobile phones owned by the participants and their education level?
2. What mobile phone services are used by students in the Pacific? Is there any statistically significant association between the level of education and the mobile services used by students?
3. What is the level of ICT and mobile phone competency and comfortability for male and female students in the Pacific? Is there any statistically significant difference between the mean of ICT competency and ICT comfortability between the male and female students in the Pacific?

4. What is the mobile phone usage pattern among students in the Pacific? What is the students' perception towards mobile phone usage for educational purposes?

4 Methodology

The descriptive research was conducted using an online survey to determine the readiness and perception of students towards effective use of mobile phone for higher education in the Pacific. The survey, created using Google form, was deployed to gather information from tertiary and high school students of 22 developing nations of the Pacific (excluding Australia and New Zealand as they are classified as developed nations (SPC 2016)). A total of 18 (6 demographic and 12 research) questions were included in the online survey, made of short answer, multiple selection, Likert scale and yes/no type of questions. The survey questions, adapted from Hussin et al. (2012), were categorized into *ownership of mobiles, mobile apps and services, ICT competency and usage in learning*, and customized to the Pacific context. We also note the following:

- The questionnaire items were assumed valid since they were adapted from the instrument designed in Hussin et al. (2012) which had passed the validity test.
- The validated questionnaire items also passed the face validity test in this research since the sequence of the questions were easy to follow, the layout was easy to read, clear and understandable.
- The Likert scale questions were tested for an internal consistency using the Cronbach's alpha reliability test. This was done to see how closely related the set of items were as a group. A high reliability value: Cronbach's Alpha=0.835 indicated that the questions were reliable.
- The research survey information together with the link of the online survey (http://goo.gl/forms/mFwWcWNCmj) were disseminated to the senior students in the region using communication channels such as USP student email distribution, Moodle forum postings, Moodle messaging, Pacific Islands Chapter of the Internet Society (PICISOC) discussion list and the Faculty Facebook.

The survey was open for a period of 10 months from January to October 2019 to high school, tertiary and vocational students from the 22 developing nations of the Pacific excluding Australia and New Zealand (SPC, 2016). Participants were allowed to participate in the survey only once, and their responses were automatically stored in a Google sheet file in Google drive. This was done to ensure the security of collected data. To increase participation, login credentials was not required since it allowed the participants to directly answer the survey questions without the need for the time-consuming phase of creating a google account and login action.

A total of 5221 participants responded to the online questionnaire during the 10 month survey. After data cleaning and validation, appropriate statistical tools such using IBM SPSS software and Microsoft Excel were deployed to analyze the data collected. Subsequently, frequency tables, pie charts, bar graphs, cross- tabulations and Chi-square tests were some of the techniques used to carry out the descriptive and inferential analysis.

5 Findings

5.1 Demographics

This section considers results from the data collected on participating countries and device ownership.

Table 2 provides a breakdown of participants in percentage per regional country. The number of participants is consistent with the proportion of people in the Pacific. From the data collected, Fiji has the largest number of participants. This correlates well to the statistics provided by (International Telecommunication Union, 2016) that in Fiji by the end of the year 2016, the mobile broadband subscription per 100 capita was estimated to be 48.2%, percentage of households with Internet was 33.6%, and the percentage of individuals using Internet was 46.5%. These are relatively higher compared to those of other Pacific countries. As such the students have easy access to Facebook and Internet (the 2 advertising medium for the online survey). Also, considering the device ownership in the Pacific of mobile phone, the Androids are more popular due to the fact these phones are cheaper and affordable compared to the iPhones. In addition, securing the apps for Androids is much easier and cheaper compared to the iPhones in the Pacific.

Figure 3 presents the demographic profile of the survey participants. It shows that the survey sample consisted of more female participants (3064, 58.1%) compared to the male participants (2152, 41.3%). Interestingly, a majority 57.1% of the participants fall in the 18–21 age group with almost the same female to male ratio. A strong 79.4% of the participants were tertiary students.

Table 2 Number of Student Participants and their Device Ownership in Percentage per Pacific Island country

Country	Participant Percentage	Basic	An-droid 3G	An-droid 4G	iPhone 3G	iPhone 4G	Windows	Oth-ers
Cook Islands	0.3	10	45	25	5	10	5	0
Federated States of Micronesia	0.3	20	15	50	10	5	0	0
Fiji	71.5	14.3	41.7	33.1	4.2	4.3	1.9	0.5
French Polynesia	0.1	20	40	40	0	0	0	0
Guam	0.1	40	0	60	0	0	0	0
Kiribati	2.0	21.6	33.6	36.2	5.2	0.9	1.7	0.9
Marshall Islands	0.9	21.7	28.3	30.4	2.2	15.2	0	2.2
Nauru	0.5	7.1	57.1	14.3	10.7	10.7	0	0
New Caledonia	0.1	25	50	25	0	0	0	0
Niue	0.1	0	33.3	33.3	33.3	0	0	0
PNG	0.4	26.3	47.4	15.8	10.5	0	0	0
Samoa	2.1	16.1	39.3	33.9	3.6	4.5	1.8	0.9
Solomon Islands	7.5	22.2	45.1	25.5	2.7	2.7	1.7	0.2
Tokelau	0.3	33.3	16.7	44.4	5.6	0	0	0
Tonga	3.9	21.2	39.4	26	3.4	5.8	2.4	1.9
Tuvalu	1.6	13.2	46.2	26.4	7.7	2.2	3.3	1.1
Vanuatu	8.3	19.1	49.3	22.4	3.3	4.1	1.1	0.7

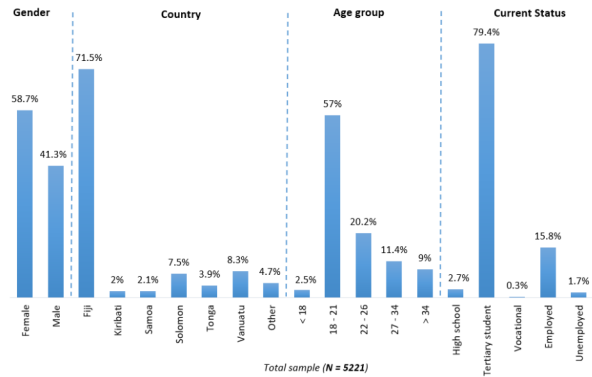**Fig. 3** The demographic profile of the survey participants

Table 3 shows the types of devices owned by the respondents sorted against their level of education. While the Android was more common compared to the other versions, a chi-square test was carried out with the following hypothesis to see if there was an association between the types of devices owned and the level of education of the participants.

H_0: Statistically no significant association between type of device owned and level of education.

H_1: Statistically significant association between the types of devices owned and the level of education.

According to Table 4, since the p-value=0.402 (with $\chi^2 = 6.765$, df=6) is greater than $\alpha=0.05$ (5% level of significance), data does not have enough evidence to reject null hypothesis. Therefore, there is statistically no significant association between the types of devices owned by the participants and their education level at 5% level of significance.

5.2 Student Readiness

This section considers survey results on student readiness to the use of mobile phones for higher learning.

Table 3 Device ownership with respect to level of education

Device Type	High School	Vocational	Tertiary
Basic	18.2	21.1	14.3
Android	73.6	63.2	75.6
iPhone	8.1	10.5	8.1
Windows	0	5.3	2.0

Table 4 Results for chi-square test for association between type of device and level of association

	Association between Type of Device and Level of Education
chi-square (χ^2)	6.765
df	6
Asymp. Significance (2 sided)	0.402

5.2.1 Mobile phone services:

Table 5 shows a multiple response analysis in regards to the popularity of mobile phone services used by the participants. While the response is largely varied, the student participants mainly used their mobile phones for, arranged from most to least popular: music videos, social networking, photography, emails and communication (use of apps such as Skype, Facebook Messenger and Viber). The participants had also use their mobile phones to access theirs lectures and complete course activities. Furthermore, a cross tabulation was used to investigate if there was an association between the mobile phone services used with different level of education.

Table 6 shows that majority of the participants that used the varied services were tertiary students (approx. 96%). The results also show that the tertiary participants did have a significant level of exposure or experience in using the mobile phone for learning purposes; however, to have a fully functional and pronounced m-learning service in the region, the use of mobile phones need to be successfully integrated into teaching and learning pedagogies and processes.

Table 5 Mobile Phone Services used by Student Participants

Services	Number	Percentage
Text or calling	3058	9.8
Social networking	4245	13.6
Photography	4150	13.3
Communicating	3420	11.0
Music videos	4442	14.3
Emails	3815	12.3
News alerts	2569	8.3
Coursework	2346	7.5
Lectures	2852	9.2
Others	215	0.7

Table 6 Mobile phone services used by student participants with respect to their education level

Services	Respondent Status (%)		
	High School	Vocational	Tertiary
Text or calling	3.9	0.3	95.8
Social networking	3.0	0.4	96.6
Photography	2.9	0.3	96.7
Communicating	3.1	0.3	96.6
Music Videos	3.0	0.3	96.7
Emails	3.0	0.3	96.6
News Alert	3.1	0.3	96.6
Coursework	2.7	0.3	96.9
Lectures	1.7	0.3	98
Others	4.5	0.6	94.9

A chi-square test was used to investigate if there was a statistically significant association between level of education and the mobile phone services used. The hypothesis was setup as follows:

H_0: Statistically no significant association between the level of education and the mobile services used.

H_1: Statistically significant association between the level of education and the mobile services used.

Since the p-value=0.0001 (with χ^2 = 102.34, df=20) is less than α=0.05 (5% level of significance), the null hypothesis is rejected. It can be concluded that there is a statistically significant association between education level and mobile learning service used. Basically, this means that tertiary level students used more of the mobile learning services.

Table 7 shows levels of ICT and mobile device competency and comfortability for male and female students in the Pacific. There is not much difference in the mean level in comfortability of using ICT and mobile devices between the male and female students in the Pacific. However, there is a little difference in the mean of genders in the ICT competency, where the female participants were more competent in using the ICT devices compared to their male counterpart.

A mean difference test was used to investigate if there was a statistically significant difference in the mean of ICT competency and ICT comfortability between the male and female students in the Pacific. The hypothesis was setup as follows:

H_0: Statistically there is no difference in the mean of ICT competency and ICT comfortability between the male and female students in the Pacific.

H_1: Statistically there is difference in the mean of ICT competency and ICT comfortability between the male and female students in the Pacific.

Results in Table 8 indicate that for both ICT competency and ICT comfortability, there is a statistically significant difference between male and female students in the Pacific. The females have a small advantage in ICT and mobile device Competency score (on average 0.224), while males have a slight advantage in ICT and mobile device comfortability (on average 0.091). The males have higher comfortability as they tend to use the mobile for

Table 7 The mean and median for ICT and mobile device competency and comfortability for male and female students in the Pacific

			Mean	Median
ICT and mobile device Competency	Gender	Female	3.06	4.00
		Male	2.84	3.00
ICT and mobile device Comfortability	Gender	Female	4.33	4.00
		Male	4.42	5.00

Table 8 Mean Difference test results for ICT and mobile device competency and comfortability difference between the male and female students in the Pacific

	P-value	Mean difference	95% Confidence Interval
ICT and mobile device Competency	0.000	0.224	0.161–0.283
ICT and mobile device Comfortability	0.000	0.091	0.50 −0.130

variety of reasons such social networking, gaming, work purpose and communication while on the other hand women are more competent in using the mobiles due to the fact that they spend more time in using one.

5.2.2 Mobile phones for academic purposes:

The survey further revealed that from the multiple responses situation, 2063/5221 tertiary participants, 7/5521 vocational participants and 58/5521 high school participants had used their mobile devices to access their course work. Also, 2561/5221 tertiary participants, 8/5521 vocational participants and 44/5521 high school participants had used their devices to access their lectures (video records or printed notes). These indicate that the use of mobile technology for academic usage is prevalent at a large scale at tertiary level; however, this technological tool is gradually making its way into the secondary level of education in the Pacific for academic purposes. Figure 4 shows the use of mobiles for different services by students in the Pacific.

5.3 Student Perception

This section considers results on student perception towards the use of mobile phones for learning in the Pacific.

5.3.1 Mobile phones for use in learning

The second major aim of the research survey was to investigate the perception of students towards the use of mobile phone for future learning in the Pacific. Two descriptors were used for this section:

1. The use of mobile phones for academic use in the future in the Pacific.
2. The use of mobile phones for online learning in future in the Pacific.

It was observed that 94.8% of the respondents indicated that they would use mobile phones for online learning in the future, while around 90% indicated using mobile phones for academic use in the future. A chi-square goodness of fit test was used to ascertain if there was

Fig. 4 Mobile phone services used for learning by student participants
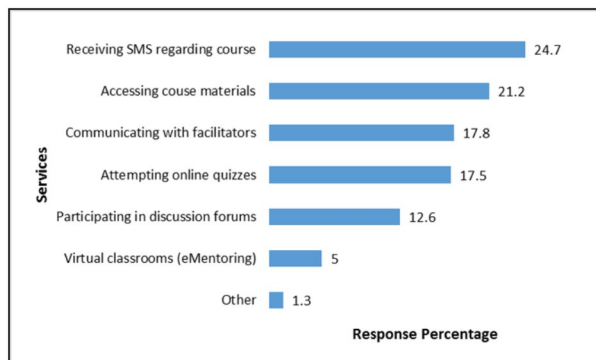
a preference of the use of mobile phone for online learning and academic usage as shown in Table 9. The hypothesis was setup as follows:

H_0: Students perceive that mobile phones are not beneficial for academic use and online learning in the future in the Pacific.

H_1: Students perceive that mobile phones are beneficial for academic use and online learning in the future in the Pacific.

Since the p-value=0.000 (with χ^2 = 2548.927, df=1) is less than α=0.05 (5% level of significance) for mobile phones for online learning and p-value=0.000 (with χ^2 = 1640.795, df=1) is less than α=0.05 (5% level of significance) for mobile phone for academic usage, we can reject the null hypothesis and say that there is enough evidence in the data collected that shows that mobile phones are beneficial for academic use and online learning in the future in the Pacific.

5.3.2 Mobile phones as a learning tool

Table 10 displays the various reasons why the Pacific student participants felt that the mobile devices could be used for future education. The most common response from the list given was that the device made learning convenient followed by easy access to learning materials.

The results show that the participants perceive the mobile phones to be a good learning tool and can be used for academic purposes in future in the Pacific. The participants have also given various reasons and advantages of the mobile devices to be considered as a good learning tool such as; making learning convenient and providing easy access to learning materials. One of the more useful responses from Table 10 is that a majority of the student

Table 9 The Chi-Square test result for using mobile phones for learning

	Mobile phones for online learning	Mobile phones for academic use
chi-square (χ^2)	2548.927	1640.795
df	1	1
Asymp. Sig.	0.000	0.000

Table 10 Participant responses to advantage of using the mobile devices for learning

	Age Group					Total
	<18	18–21	22–26	27–34	>= 34	
Makes learning convenient	107	2425	882	501	369	4284
	2.5%	56.6%	20.6%	11.7%	8.6%	
Mobile device is user friendly	63	1563	624	347	245	2842
	2.2%	55.0%	22.0%	12.2%	8.6%	
Learning 24/7	87	2230	823	474	359	3973
	2.2%	56.1%	20.7%	11.9%	9.0%	
Easy access to learning materials	92	2317	829	469	354	4061
	2.3%	57.1%	20.4%	11.5%	8.7%	
New innovation to education	76	1780	662	385	283	3186
	2.4%	55.9%	20.8%	12.1%	8.9%	

participants from the 18–21 age group consider mobile phone to be a new innovation in education. This means that the new generation of learners are well aware of the technological impact on education in this century.

In contrast, Table 11 shows that the participants mentioned some disadvantages of the use of mobile phone for learning. The results show that the participants had issues with using their mobile phones such as poor internet connection, unfamiliarity with the features of mobile phone, and they also stated that for studies, using mobile phones would be a distraction due to the presence of social networking and gaming apps in their devices. Some participants stated that they were uncomfortable using their mobile devices for learning due to the fact that the devices had small screen and they would still prefer their laptops for learning purposes.

6 Conclusions

The trends in ICT are still evolving and transforming education with the escalating demand and support for learning materials to be available to learners anytime, anywhere and usually through unstructured and personal learning spaces. Access to real time or recorded lectures, videos and multimedia content, online sharing and virtual communication and coaching are increasingly attractive to students in their learning journey. The web and mobile based services and applications, especially ones integrated with games such as edutainment fancy the learners. The arterial focus of edutainment is to make learning an exciting and interactive experience for the learners in their own personal space. On the whole, there is a pedagogical shift towards technology-enabled learning.

The digital technology to facilitate transformative and smart learning, and provide student learning support is unarguably the mobile devices. The mobiles devices are becoming increasingly powerful and capable of supporting many types of applications and services, invariably promoting student-centered learning, nourishing the student agency, and strategically designed to mobilize societal changes. Mobile learning is defined as learning with the use of mobile devices with an emphasis on the mobility. However, there is limited baseline surveys to capture student perception and attitude of the use of mobile devices in higher education learning, especially in the Pacific.

Table 11 Participant responses to disadvantage of using the mobile devices for learning

	Age Group					Total
	<18	18–21	22–26	27–34	>= 34	
Unfamiliar	1	12	3	3	2	21
	4.8%	57.1%	14.3%	14.3%	9.5%	
Distraction	0	29	5	3	4	41
	0.0%	70.7%	12.2%	7.3%	9.8%	
No Internet	1	30	8	3	7	49
	2.0%	61.2%	16.3%	6.1%	14.3%	
Uncomfortable	2	42	13	8	10	75
	2.7%	56.0%	17.3%	10.7%	13.3%	
Laptops	3	107	34	11	18	173
	1.7%	61.8%	19.7%	6.4%	10.4%	

This paper presents the findings of student readiness and perception of Pacific students to the use of mobile phones for higher learning. It has been statistically established from the survey that the Pacific students are ready to use mobile phones for learning in higher education.

Also, a significantly high percentage of the Pacific students perceived that mobile devices are a good learning and communication tool, make learning more engaging, and facilitate self- paced and self-directed learning. It was also established that the Pacific students viewed m-learning as an effective innovative tool for education. On the other hand, there were students who stated that the mobile devices are a distraction to their academic work especially with respect to the choice of apps installed. Furthermore, the intermittent connections and the difficulty in getting cheap data to access the course resources are still problems strongly prevalent in the Pacific, especially for those students who are from lower socio-economic backgrounds. These point in the direction of two primary goals of the Sustainable Development Goals (SDGs) – quality education and no poverty. There is an opportunity for various stakeholders in Pacific to address these goals by leveraging on ICT tools and technologies such as mobile phones and hence m-learning.

Finally, it is evident that the students in the Pacific have positive attitude towards the idea of integrating mobile phones for academic purpose and they perceive that these devices can be good learning tools. This means that educational institutes should now invest in creating awareness and training sessions for students on the use of mobile phones for academic purposes especially during emergencies and crisis such as the Covid-19 pandemic. The students need to be better prepared to utilize mobile phones to learn, create and share knowledge, and secure existing and future support services. For future work, an investigation on the readiness and perception of facilitators for using mobile phones for academic purpose will be carried out.

Declarations

Conflicts of interest The authors have no relevant financial or non-financial interests to disclose. No funding was received for conducting this study.

Ethics approval Ethics approval was given by the University Research Office (USPRO) for this research.

• **Consent to participate/publication** Informed consent was obtained from all individual participants included in the study including the consent to publish the data.

References

Ahmadi, S., Keshavarzi, A., & Foroutan, A. (2011). The Application of Information and Communication Technologies (ICT) and its Relationship with Improvement in Teaching and Learning.Elsiever:Social and behaviourable Sciences,475–480

Bachmair, B., & Pachler, N. (2015). Ideas *in Mobile Learning. Journal of Interactive Media in Education* Retrieved March 28, 2017, from http://www-jime.open.ac.uk/articles/https://doi.org/10.5334/jime.ay/#B10

Corcoran, P., & Koshy, C. (2010) The Pacific way: sustainability in higher education in the South Pacific Island nations. *International Journal of Sustainability in Higher Education*, 11(2), 130–140. https://doi.org/10.1108/14676371011031856

eCyclebest (2015). *Smartphones as Tools for Education: Getting Smart With Smartphones*. Retrieved September 11, 2016, from https://www.ecyclebest.com/resources/smartphones-as-tools-for-education

Geer, R. (2012). *Technology changing teaching.* Retrieved December 30, 2017, from http://www.lutheran.edu.au/assets/Uploads/pr/web/Publications%20and%20policies/Online%20publications/SchooLink/SCHOOLINKVol181.pdf

Gong, Z., & Wallace, J. D. (2012). A comparative analysis of iPad and other mLearning technologies: exploring students' view of adoption, potentials, and challenges.Journal of Literacy and Technology,2–29

GSMA (2015). The Mobile Economy Pacific Islands 2015

Haag, J. (2011). From eLearning to mLearning:The Effectiveness of Mobile Course Delivery. *Interservice/Industry Training, Simulation and Eductaion Conference*, pp. 3–13

Hussin, S., Manap, M., Amir, Z., & Krish, P. (2012). Mobile Learning Readiness among Malaysian Students at Higher Learning Institutes. *Asian Social Science*, 8(12), 276–283

Imtian, U., Chang, V., & Issa, T. (2012). Characteristics of Mobile Learning Enviornments in Developing Countries. *The International Journal of Learning*, 1–6. Retrieved from http://espace.library.curtin.edu.au/

International Telecommunication Union (2016, September). *The state of broadband 2015, Annual Report.* Retrieved April 29, 2017, from http://www.broadbandcommission.org

Iqbal, H., &Ashraf, H. (2017). Impact of behavioral factors towards the adoption of mobile learning among higher education students in public and private universities: A pitch. *Accounting and Management Information Systems*, 16(3), 406–412

Kumar, B., & Mohite, P. (2017). Usability Study of Mobile Learning Application in Higher Education Context: An Example from Fiji National University. In A. Murphy, H. Farley, L. Dyson, & H. Jones (Eds.), *Mobile Learning in Higher Education in the Asia-Pacific Region* (pp. 607–622). Springer

Lavery, H. (2012, June 12). *Why it matters to Higher Education*. Retrieved from http://www.educause.edu/ero/article/breaking-down-barriers-tablet-technology-teaching

Lingam, G. I., & Lingam, N. (2013). Making learning and teaching a richer experience: A challenge for rural Fijian primary schools. *Educational Research and Reviews*, 8(21), 2160–2168.

Margaret, L. (2005). Towards a definition of the integration of ICT in the classrooms. *Proceedings AARE '05 Education Research*, New South Wales, pp. 1–19

Melhuish, K., & Fallon, G. (2010). *Looking to the future: MLearning with the iPad.* Retrieved May 8, 2017, from https://core.ac.uk/download/files/677/29198811.pdf

Mirri, S., & Salomoni, P. (2011). *Adaptation technologies in Mobile Learning*. Retrieved June 28, 2017, from http://www.cs.unibo.it/~mirri/paper/adaptationtechnologiesinmobilelearning.pdf

MobiMOOC (2011). *Examples of MLearning projects compiled by participants*. Retrieved March 14, 2017, from http://mobimooc.wikispaces.com

Murphy, A., Jones, H., & Farley, H. (2016). Mobile learning in the Asia-Pacific region: Exploring challenges hindering the sustainable design of mobile learning initiatives.Ascilite,1–9

Nkechinyere, A. (2011). Supporting Learning in the Digital Age: E-learning Strategies for NOUN (National Open University of Nigeria). Retrieved January 8, 2017, from http://files.eric.ed.gov/fulltext/ED529910.pdf

O'Malley, C., Vavoula, G., Glew, J. P., Taylor, J., & Sharples, M. (2005). *Guidelines for Learning/Teaching/Tutoring in a Mobile Environment.* Retrieved July 21, 2017, from http://www.mobilearn.org/download/results/public_deliverables/MOBIlearn_D4.1_Final.pdf

Oye, N., Salleh, M., & Iahad, N. (2011). Challenges of E-Learning in Nigerian University Education based on the Experiences of Developed Countries. *International Journal of Managing Information Technology*, 3(2), 1–10

Reddy, E., Reddy, P., & Sharma, B. (2016). Student Readiness and Perception to the Use of Smart Phones for Higher Education in the Pacific, In Proceedings of 3rd Asia-Pacific World Congress on Computer Science and Engineering, IEEE, Nadi, Fiji, 2016, pp. 258–264

Reddy, E., & Sharma, B. (2018). Mobile Learning Perception and Attitude of Secondary School Students in the Pacific Islands. In Proceedings of 2018 *Pacific Asia Conference of Information System* pp. 319

Reddy, E., Sharma, B., Reddy, P., & Dakuidreketi, M. (2017). Mobile Learning Readiness and ICT Competency: A Case Study of Senior Secondary School Students in the Pacific Islands, In Proceedings of 4th *Asia-Pacific World Congress on Computer Science and Engineering*, IEEE, Nadi, Fiji, 2017, pp. 137–143

Reddy, P., & Sharma, B. (2015). Effectiveness of Tablet Learning in online courses at the University of the South Pacific. In Proceedings of 2nd *Asia-Pacific World Congress on Computer Science and Engineering*, IEEE, Nadi, Fiji, 2015, pp. 1–11

Reddy, P., Sharma, B., & Chaudhary, K. (2020). Measuring the digital competency of freshmen at a higher education institute. *PACIS 2020 Proceedings*, (pp. 1–13). Retrieved from https://aisel.aisnet.org/pacis2020/6

Reddy, P., Chaudhary, K., Sharma, B., & Chand, D. (2021a). Contextualized Game-Based Intervention for Digital Literacy for the Pacific Islands. *Education and Information Technologies*, 26, 5535–5562. doi: https://doi.org/10.1007/s10639-021-10534-y

Reddy, P., Reddy, E., Chand, V., Paea, S., & Prasad, A. (2021b). Assistive technologies: Savior of Mathematics in higher education. *Frontiers in Applied Mathematics and Statistics*, 6, 1–9. doi: https://doi.org/10.3389/fams.2020.619725

Rodriguez, W. (2015, September 28). *Advantage and Disadvantage of smartphones*. Retrieved September 11, 2016, from http://commons.hostos.cuny.edu/edtech/2015/09/28/advantages-and-disadvantages-of-smartphones-in-higher-education-by-wilfredo-rodriguez/

Rosenblit, S., & Gros, B. (2011). E-Learning: Confusing Terminology, Research Gaps and Inherent Challenges.International Journal of eLearning and Distance Education,1–8

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,1–26

Sharma, B., Jokhan, A., Finiasi, R., & Kumar, R. (2015). Use of Short Message Service for Learning and Student Support in the Pacific Region.Handbook of Mobile Teaching and Learning,1–18

Sharma, B., Kumar, R., Rao, V., Finiasi, R., Chand, S., Singh, V., & Naicker, R. (2017). A Mobile Learning Journey in Pacific Education. In A. Murphy, H. Farley, L. Dyson, & H. Jones (Eds.), *Mobile Learning in Higher Education in the Asia-Pacific Region. Education in the Asia-Pacific Region: Issues, Concerns and Prospects* (40 vol.). Singapore: Springer

Sharma, B., Lauano, F., Narayan, S., Anzeg, A., Kumar, B., & Raj, J. (2018). Science teachers accelerated programme model: a joint partnership in the Pacific region. *Asia-Pacific Journal of Teacher Education*, 46(1), 38–60

Sharma, B., Reddy, P., Reddy, E., Narayan, S., Singh, V., Kumar, R. … Prasad, R. (2019). Use of mobile devices for learning and student support in the Pacific region. *Handbook of Mobile Teaching and Learning*. Singapore: Springer

Shopova, T. (2012). E-Learning in Higher Educational Environment. *International Conference- The Future of Education*, (pp. 1–5). Bulgaria

SlideShare (2017). *Digital in 2017: Australia, New Zealand and The Pacific*. Retrieved from https://www.slideshare.net/wearesocialsg/digital-in-2017-australia-new-zealand-the-pacific

SPC (2016). *Members of the Pacific Community*. Retrieved from South Pacific Commission: http://www.spc.int/en/about-spc/members.html

StatCounter(2016).*Mobileandtabletinternetusageexceedsdesktopforfirsttimeworldwide.*Retrievedfromhttp://gs.statcounter.com/press/mobile-and-tablet-internet-usage-exceeds-desktop-for-first-time-worldwide

The Fiji Times (2017, August 17). *My Kana mobile App*. Retrieved from The Fiji Times Online: http://www.fijitimes.com/story.aspx?id=412876

TheWorldBank (2013, November 18). *Confessions of a mobile phone skeptic in the Pacific*. Retrieved from http://blogs.worldbank.org/eastasiapacific/confessions-mobile-phone-skeptic-pacific

Traxler, J. (2010). Students and mobile devices.ALT-J, Research in Learning Technology,149–160

Tsinakos, A. (2014). State of mobile learning around the world. In A. Tsinakos, & M. Alley (Eds.), *Global mobile learning implementations and trends* (pp. 4–44). Beijing,China: TV University Press

UNESCO (2012). Turning on mobile learning

WHO (2016, March 16). *Using Mobile Technology for Post-disaster Enhanced Surveillance in Fiji*. Retrieved from http://www.wpro.who.int/southpacific/mediacentre/releases/2016/mobiletech_surveillance/en/

Woodcock, B., Middleton, A., & Nortcliffe, A. (2012). Considering the Smartphone Learner: An investigation into student interest in the use of personal technology to enhance their Learning. *Student Engagement and Experience Journal*, 1(1), 1–15

Yu, F. (2012). Mobile/Smart Phone Use in Higher Education. *Southwest Decision Sciences Institute Conference*, Houston, Texas, USA.: Southwest Decision Sciences Institute. pp. 831–839

Authors and Affiliations

Emmenual V. Reddy[1] · Pritika Reddy[2] · Bibhya Sharma[1] · Karuna Reddy[1,3] · Mohammed G. M. Khan[1]

✉ Emmenual V. Reddy
reddy_e@usp.ac.fj

Pritika Reddy
pritika.reddy@fnu.ac.fj

Bibhya Sharma
bibhya.sharma@usp.ac.fj

Karuna Reddy
Karuna.Reddy@usp.ac.fj

Mohammed G. M. Khan
khan_mg@usp.ac.fj

[1]   School of Information Technology, Engineering, Mathematics and Physics, The University of
     the South Pacific, Suva, Fiji

[2]   Fiji National University, Suva, Fiji

[3]   Australian National University, Canberra, Australia