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Assessing Freshman ICT Literacy- A Case Study of UPNG Open College

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Abstract

Every academic year the University Papua New Guinea (UPNG) receives a large number of freshman applications. However, its admission figures are limited based on intake quota imposed by the university due to its limited accommodation and facilities capacity on campus. As a result, many eligible students are offered admissions through Open and Distance Learning (ODL) mode.

One major challenge faced by UPNG Open College freshman is their adaptation to ODL mode. Having gone through the conventional education system for twelve years and transitioning to a self-centered and disassociated teaching institution in ODL mode is a great challenge to many. The fact that ODL mode recognizes the “democratization of knowledge where teacher or institution’s role is simply to preside over the democratization of learning” Gilbert (2011). The standard practice of playing that presiding role by many ODL institutions is through the deployment of various ICT enabled services and devices such as Learning Management Systems (LMS) s, web portals, email, mobile phones, etc. Thus making ICT integration a key component of the ODL institutional infrastructure.

Therefore, this paper sought to establish whether the first year students coming into the undergraduate level of study have acquired the basic ICT skills within their prior two years of schooling under the Papua New Guinea’s Education Department’s Upper Secondary school curriculum. A total of two hundred and eighteen first year students which is 22.5% of the total University of PNG intake for 2019 academic year, were asked to rate their confidence levels in basic ICT skills such as use of Microsoft Office application software, use of social media, owning and operating a PC, having an email account and use of internet. The results reveal that ICT syllabuses in the curriculum is set towards a goal for ICT career path than an essential skills needed by all students entering tertiary studies.

Introduction

Back in 1995, during World Conference on Computers in Education VI with the overarching theme “Liberating the Learner”, it was predicted that “education was serving a society in transition which require other student competencies apart from the traditional literacy and numeracy skills. Students will only be able to develop these new competencies in a changed educational setting in which information technology plays an important role” Tinsley and J.Van Weert (1995). At that time, internet was still developing and mainframe computers were the state of the art PC. PCs were bulky, heavy in weight and suited for confined air conditioned room in the school or at office workstations.

Today, information and technology communications (ICT) have become integrated in all spheres of people’s lives Shopova (2014) Allan Martin labelled this ICT integration as e-permeated society where digital literacy becomes a key enabling factor to participation in education, work and social life (Martin, 2006). The skills to do well professionally have converged with the skills needed to be an effective citizen. “There is no competitive advantage in knowing more than the person next to you because knowledge has become a commodity available to all with the swipe of a finger via the Internet” (Wagner Tonny & Dintersmith). According to the World Economic Forum’s Future of Jobs report, the top rated technological driver of change in economies around is the Mobile Internet and cloud technology, enabling more efficient delivery of services and opportunities to increase workforce productivity. Second on the rank is Advances in computing power and Big Data (World Economic Forum, 2016).

Defining ICT Literacy

The term “Digital Literacy” as quoted by (Shopova, 2014) was coined by Paul Gilster in 1997 in his book Digital Literacy which focused on the ability to understand, appreciate and use the multiple formats of information the computer can provide. Back then, it was “about people’ skills and predisposition to the use of computers and communication technologies”. The term took a broader theme in meaning with the introduction of the internet,

communications technology such as email, video conferencing, computer networks and the World Wide Web. (Oliver & Towers, 2000).

The Educational Testing Services (ETS) a US based NGO convened a team of international experts to study the growing importance of existing and emerging Information and Communication Technologies (ICTs) and their relationship to literacy, and to develop a framework for defining ICT literacy in 2001. According to the report the panel defined ICT literacy as;

“ICT literacy is using digital technology, communications tools, and/or networks to access, manage, integrate, evaluate, and create information in order to function in a knowledge society.”

- *“The Access - knowing about and knowing how to collect and/or retrieve information*
- *Manage - applying an existing organizational or classification scheme, Integrate - interpreting and representing information. It involves summarizing, comparing and contrasting.*
- *Evaluate - making judgments about the quality, relevance, usefulness, or efficiency of information.*
- *Create - generating information by adapting, applying, designing, inventing, or authoring information.”*

In justifying the definition, the panel stated that the definition of Information technology (IT) which is associated with display, processing and storage of electronic information and not necessarily the transmission of information. The ICT “represents the set of activities and technologies that falls in the union of IT and communication technologies”, while “literacy” refers to “other terms such as competency, fluency or ability” and the notion that ICT literacy takes the place in society just like basic numeracy and reading skills making it a fundamental and essential requirement (Educational Testing Services, 2002).

(Hague & Payton, 2011) also defined what constitutes digital literacy *“consists of the skills, knowledge and understanding that enable critical, creative, discerning and safe practices with digital technologies. It is about cultural and social awareness and understanding, as well as functional skills. It is also about knowing when digital technologies are appropriate and helpful to the task, and when they are not”*

According to (Irvin, 2007) ICT literacy is *“ a 21st century form of literacy, in which researching and communicating information via digital environments are as important as reading and writing were in earlier centuries”*.

One of the challenges for educators is make learning relevant to the students’ needs including the use of technologies that the students already knows, is to anchor their learning to something similar. ICT skills can be acquired formally through work or school or informally at home, from friends or self-taught. Imparting basic IT skills to students is essential in order for them to perform in academia, workforce and everyday activities. Basic IT Skills perspective is more empirical, rather than philosophical, conceptual base and focus on the basic practical skills needed to use a computer hardware, software, and network (Ezziane, 2007).

(Murray, 2008) emphasizes the need for educators to use information problem-solving Big6 skills-task definition, information seeking strategy, location and access, use of information, synthesis and evaluation.

(Oliver, 2002) predicted that ICT’s impact on educational practices will grow and ICT will become a strong agent for change among many educational practices. ICT will a strong impact on:

- What is learned
- How it is learned
- When and where learning takes place
- Who is learning and who is teaching

Today, current studies and literature on ICT literacy of students suggests two fronts. First, is student’s ability to learn in an interconnected system of learning that is facilitated by ICT tools and internet. How the students should apply his/her cognitive skills to know where to access information (websites, portals, resource depositories, online libraries etc), filter those information from what is relevant and unbiased verses irrelevant and biased, acknowledge the sources, manage and organize those different formats and forms of digital information resources, and construct meaning in the

individual's learning process towards a desired outcome (National Research Council, 2012). (Garrison D.R & Terry, 2003) described it as “turning the e-information into human knowledge”. Secondly, they need to learn how to use the “tools of the trade”. The ICT technologies that are available such as the laptop PCs, smart phones, and digital gadgets and etc. that can assist them to be productive in their tasks, enable them to access to the vast resources available to them via the internet or institutional networks and to communicate and collaborate with others.

Students in Papua New Guinea (country categorized as one of the least developed countries (LDCs) in the world) continues to face the division in between these two fronts. Many are aware of what internet is, how resourceful it can be for their learning but had very limited or no practical experiences in using the internet during their period as students prior to studies in tertiary institutions. Therefore, most of the technology enabled learning experiences doesn't really connect with them in order to appreciate and adopt in their learning. This this highlighted by UNESCO, the “Potential for ICTs for learning is also challenged by challenges in limitations. Mobile phones and PCs use offer high value for learning, especially when an “internet connection is available (UNESCO, 2014). (Garrison D.R & Terry, 2003) broadly described e-learning as networked, online-learning that takes place in a formal context and use a range of multimedia technologies. At the core of e-learning transformation is the Internet”.

In Papua New Guinea, tertiary student's prior exposure to ICT technologies, mainly mobile phones and PCs depends on the family income bracket (low income, middle class, upper class), areas where they come from (either rural or urban) and whether their school has infrastructure like student computer labs or not.

ICT and Secondary Education Curriculum in Papua New Guinea.

Papua New Guinea had two levels of secondary education in the National Education Department. Lower Secondary Level consists of Grade/Year 9 and 10 of schooling while Upper Secondary School consists of Grade/Year 11 and 12. Prior to 1995, upper secondary years were completed at only four schools which were known as National High Schools. Students from all over the country congregate at any of the four schools to complete the two years of study and then sat National Grade 12 Examination which is the qualifying examination for tertiary studies at colleges and universities. Currently, upper secondary school years are completed in all 21 provinces as well as the four National High Schools. The secondary schools in the provinces are allowed to take Grade 9 up to Grade 12 while the National High School admits only Grade 11 and Grade 12 as before. The four National High Schools are administered by the National Education Department while the provincial secondary schools are administered by the respective Provincial governments (PNG Department of Education, 2017).

Having the realized the need to develop ICT skills at the Secondary Schooling years, the Papua New Guinea Department of Education has two ICT course modules (often termed as “subjects” in the Upper Secondary (Grade 11 and 12) Student Syllabus. These are titled Information Communication Technologies and Computer Studies. The former is focused on more boarder and theoretical, introductory ICT topics as the hardware, information systems, internet and etc. while the later focuses on more skills oriented topics such operating a PC, using Microsoft Office Applications such as Excel, PowerPoint and Word.

The secondary school study modules are categorized under five board categories as follows in table 1.

Subject Category	Study Modules or Subjects
Language	Applied English Language and Literature
Mathematics	General Mathematics Advance Mathematics
Science	Applied Science, Biology, Chemistry, Geology, Physics, Applied Natural Management (Agriculture, Forestry, Fisheries and Applied Natural Management-combination of all three)
Humanities	Economics, Geography, History, Personal Development, Physical Education, Legal Studies, Music, Theatre Arts, Visual Arts and Accounting
Technical and Business	Business Studies, Design and Technology (PS Technologies, Textile & Food Technology), Tourism Studies, Information Technologies and Computer Studies

Table 1. PNG Education Department Secondary School Subject Categories

Secondary School Study Module Composition

All students in Upper Secondary (Grade 11 and 12) are required to take 6 study modules together with either Personal Development or Religious Education.

1. One Language Subject
2. One Mathematics subject
3. Any subject from (science/humanities/technical and Business) subjects
4. Any subject from (science/humanities/technical and Business) subjects
5. Any subject from (science/humanities/technical and Business) subjects
6. Personal Development or Religious Education

It is obvious from syllabus structure that students are given the study module options to choose which suits their career path at the secondary level. The two ICT modules are not termed as “required” subjects like the Language and Mathematics subjects, Personal Development and Religious Education. This is contrary to the existing literature which supports ICT as an important transferable skills in the 21st century (National Research Council, 2012). Students who opted not to take these modules will have to find other means to develop the skills because regardless of what program they applied to study at the tertiary institutions, they are expected have some basic ICT skills during their first year of study (Ezziane, 2007).

This research address two key questions. Firstly, do the secondary schools have computer labs and the supporting resources to effectively deliver the two ICT study modules in syllabus to students who have opted to study them? Secondly, do the students have developed at least the basic ICT skills required as reference point to draw upon as a resource to help them apply in their learning and assist the to explore new ICT related skills.

Materials and Methods

A self-administered survey questionnaire was administered to 218 first year students. The sample population represented 22.5% of the total 965 first year students admitted to study at the University of Papua New Guinea from the secondary schools in 2019. The questionnaire was administered during the Applied Finite Mathematics lecture period. This mathematics course is regarded as “enrichment” course meaning that is a course taken by majority first students either as a core or an optional in their different discipline of studies across the three academic schools. The course is administered by the School of Natural and Physical Sciences (SNPS) the Mathematics and Computer Studies strand.

The questionnaire was divided into four sections. Section A-candidate or student profile. The students were asked to indicate their gender, and age category in three sets of category, 15-20 years, 21-25 years, 26-30 years and 30 plus years. In section B-school profile, students were asked to indicate their secondary school, district, province, type (whether it was a public or private institution), whether the school had computer lab facilities. In the same section, whether the student has taken the two ICT modules and to indicate a rating out of ten on theory and practical lessons, computer equipment’s and teaching aids and teacher’s computer skills. Rating above 5 was indicated as good or very good and below means poor. Section C-social media, students were asked to indicate whether they have a mobile phone, social media account, web based email account, and use the mobile phone to access internet or not. Finally, in section D-computer use and & access, the students had to indicate whether they have a PC and operate it. Also in the section, they had to rate their confidence level out of ten in using Microsoft Office applications such as excel, word, power point and to create simple publication materials. Also included were their rating on basic PC maintenance such as software installation, file management and backup and etc. as well as accessing the internet to search and download information.

Results and Discussion.

Student Profile

59% of the respondents were in the 15-20-year age bracket. 30% 21-25 years old, followed by 3% for 26-30 year olds and 1% for 30 years and above as shown in table 1. In relation to gender, 47% were female and 53% of them were male as shown in table 1 and 2.

Age range	Percentage %	No of respondents
15-20	59%	129
21-25	38%	84
26-30	2%	3
30 +	1%	2
Total	100%	218

Table 1. Respondents' age category distribution

Gender	Percentage %	No of respondents
Male	53%	116
Female	47%	102
Total	100%	218

Table 2. Respondents gender distribution

Secondary Schools

The students came from 40 public and 22 private (private and church agency administered) secondary schools in 16 provinces around the country as shown in table 3. 29 of the public schools had student computer labs and 11 had no computer labs. 15 private schools had computer labs and 7 don't as shown in table 4.

55% of the students did not take the two ICT modules in secondary school. Of that, 37% of them did not take the two subjects even though their school had computer labs. 18% are from schools that had computer labs as shown in table 5. This indicates the career path direction of the syllabus. The secondary schools may have the facilities like computer labs and internet connection but students will not take up the courses if their career path is not within the areas of ICT and the two modules remains as optional subjects. 100% of those who took the ICT modules were from schools that had computer labs. This indicates that students are willing to take the two subjects if the school has the facilities to administer the required outcome.

Province	No# of Secondary Schools
NCD	14
EHP	7
Morobe	5
WHP	5
ESP	5
SIMBU	4
ENB	4
SHP	3
Milne Bay	3
WNB	2
Central	2
Enga	2
Jiwaka	2

AROB	2
WSP	1
Manus	1
Total	62

Table 3. Secondary schools in the provinces

School Type	Computer labs				Total
	Has Lab		Don't Have Labs		
	No# of Schools	Percentage %	No# of Schools	Percentage %	
Government	29	72%	11	28%	40
Private	15	68%	7	32%	22
Total	44	100%	18	100%	62

Table 5. Secondary School computer labs

	No# of Students	Percentage%
Didn't take the 2 ICT Subjects	120	55%
Schools with without computer labs	39	18%
Schools with computer labs	81	37%
Did the 2 ICT Subjects	98	45%
Schools with Labs	98	45%

Table 6. School computer labs and student's enrollment in the two ICT modules

Of the total of 98 students who took the two subjects, majority have rated the theory and practical lessons, equipment and teachers computer skills as good or very good as shown in table7.

Areas Rated	Poor		Good/Very Good	
	Students	Percentage %	Students	Percentage %
Theory	29	30%	69	70%
Practical Lessons	27	28%	71	72%
Equipment	30	30%	66	70%
Teacher's computer Skills	24	24%	72	73%

Table 7. Student's rating of deliver of the two ICT subjects.

Access to Basic ICT Devices and Internet Services

Table 8 shows the access to basic ICT devices which are the mobile phones, PC, internet access through mobile phones, web based email account and use of social media. It is clear that mobile phone is the most accessible device used to access internet and social media sites like Facebook. 30% of the students don't have any PC at all. High number of them having email account was because of the requirement by Department of Higher Education Science and Technology (DHERST) the government agency responsible for selecting students tertiary institutions to register and apply for programs of choice through an online student selection program.

Access items	No		Yes	
	Students	Percentage %	Students	Percentage %
Have a mobile phone	2	0.90%	214	99%
Access Internet through Mobil Phone	4	1.90%	212	98%
Use Social Media sites like Facebook	15	6%	203	94%
Has a web based email account	4	2%	212	98%

Has personal computer	64	30%	152	70%
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Table 8. Student access to basic ICT Items.

Use of Microsoft Office Applications and PC

Students who have taken the two ICT modules have rated themselves as good or very good in the basic skills to use Microsoft Application software and operate a computer. Even though students that have studied the two ICT modules have rated their skills as poor as shown in table 9. For those students who have not taken the two ICT modules, distribution is opposite from those who have taken the subjects. Bigger percentage rating themselves as low in these skills as indicated in table 10.

Skills Rated	Good/Very Good		Poor	
	Students	Percentage %	Students	Percentage %
Use Microsoft Word to create documents	79	81%	18	19%
Use of Excel to manipulate data and create graphs etc	68	70%	29	30%
Access Internet to search for information	74	76%	23	24%
Communicate Using Social Media	76	78%	21	22%
Basic desktop publishing	63	65%	34	35%
Use of Microsoft Power Point	67	69%	30	31%
Operate a PC	86	89%	10	11%
PC Maintenance	60	62%	37	38%

Table 9. Table. Rating of those who did the ICT modules

Skills Rated	Good/Very Good		Poor	
	Students	Percentage %	Students	Percentage %
Use Microsoft Word to create documents	70	59%	49	41%
Use of Excel to manipulate data and create graphs etc.	49	42%	69	58%
Access Internet to search for information	68	57%	51	43%
Communicate Using Social Media	64	54%	54	45%
Basic desktop publishing	41	35%	77	65%
Use of Microsoft Power Point	53	45%	66	55%
PC Maintenance	48	40%	71	60%
Operate a Personal Computer	89	74%	31	26%

Table 10. Table. Rating of those who did not take the ICT modules

Conclusions

The results of the study establish that Papua New Guinea Department of education has categorized ICT skills modules as optional modules in the country's Upper Secondary School syllabus. As result most students miss out from learning the most basic transferable ICT skills like the use of Microsoft Office Applications and operating a computer. Even some of the students who have taken the two (2) modules have rated themselves as poor in these skills sets. Therefore, there is a need for tertiary institutions to reassess these basic skills gaps particularly in the first year students and provide the necessary support classes to assist them. With limited or no basic ICT skills reference point in life, any

ICT or technology enabled learning systems like Moodle and other e-learning initiatives will create a totally new learning curve for the first year students.

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