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ABSTRACT

This paper presents the findings of the survey of the prevalence of student computer use in UPNG, conducted by the Linguistics and Modern Languages Strand (LML), School of Humanities and Social Sciences (SHSS), University of Papua New Guinea (UPNG) in October - November 2024. Our survey aimed to assess UPNG students' access to online learning and explore ways of improving it in line with PNG Digitalization Policy 2020. Specifically, we aimed to provide current data on UPNG undergraduate students' pc/smartphone ownership, measure the extent of students' usage of Learning Management Systems (LMSs) in the form of online learning platforms such as Google Classroom and Moodle, and to estimate student preferences regarding these two learning platforms.

A pre-tested Google Form Questionnaire was used to elicit responses from students in all 5 Schools of UPNG. All UPNG students, registered in Semester 2 2024 (N = 5032), were eligible to participate in this institution-based cross-sectional quantitative study. The calculated sample size at 95% confidence was 357. A pre-tested Google Form Questionnaire Survey elicited 409 responses. Data analysis, using GFormAnalytics and MS Excel DataPack software revealed that 29.6% of all UPNG students do not own a pc, while 8.5 % do not even have a smartphone. The students' use of online learning platforms (Google Classroom / Moodle) showed that 68.5 % of students use both Moodle and Google Classroom, 15.6 % use only Google Classroom, 12.2% use Moodle only, while 3.6 % do not use any online learning platform. Regarding student preferences, 52.5 % liked both platforms, 28.3 % preferred using Google Classroom, 15.7 % preferred Moodle, and 3.6 % do not use / like either of them. Despite some progress in recent years, these findings expose a number of persistent inadequacies in the currently prevailing UPNG learning environment and indicate the need for systematic monitoring and analysis of UPNG students' ICT needs and access to online learning tools.

Keywords: Digitalization, student computer/ digital device ownership, Internet access, Learning Management Systems (LMSs), online learning platforms, Technology-Enabled Learning (TEL), Google Classroom (GC), Moodle

INTRODUCTION

The vitality - even viability - of all human societies is predicated on their knowledge of the world and on their ability to proactively adapt to change. Our distant ancestors' biological memory, though remarkably good, had limitations in accumulating knowledge and transmitting it across generations. Writing transformed the biological or ***internal*** form of memory development into a qualitatively new, historical or ***external*** form. Writing gave us effective control over our biological memory by enabling us to code or 'externalize' it [1; 2]:

> *Everything that civilized humanity remembers and knows at present, all the accumulated experience in books, monuments and manuscripts – all this colossal*

> *expansion of the human memory, without which there could be no historical and cultural development, is due precisely to external human memorization based on symbols* (Vygotsky 1930).

Like the writing systems in the past, new digital communication technologies have now marked another *qualitative* change in the development of human civilization by enabling instant sharing of knowledge globally and in real time. Governments around the world have recognized the potential of Information and Communications Technology (ICT) as the driving force of modern economy and are scrambling to move with the times to ensure sustainable national development. New policies have been implemented and AI management systems introduced to run modern knowledge-based economies. In 2020, the Government of Papua New Guinea (GoPNG), inspired by the stories of successful implementation of ICT solutions in "Estonia, South Korea, the United States, Australia, and New Zealand", also developed the **PNG Digital Transformation Policy 2020** [3] whose two stated goals are:

- "**Goal 1**: To establish and improve a nationally coordinated management and promotion of secure electronic government services, particularly G2G, G2C, and G2B through federation with standardisation principles and to enable and trigger the structured establishment and consequently promulgate PNG's digital economy.
- **Goal 2**: To build national infrastructure, including software and applications ecosystem required to facilitate digital government and other relevant ICT facilitated service delivery for the benefit of the citizens"
  [https://www.ict.gov.pg/Policies/Digital%20Transformation%20Policy/PNG%20Digital%20Transformation%20Policy_21122020_updated.pdf]

The main strategies for achieving these goals in education, one of the core government services, are outlined on p. 22 of PNG Digital Transformation policy 2020:

- "revamping the entire educational system to integrate ICT into all aspects of the curricula and making sure the students are digitally literate as well as physically literate; and
- promoting e-learning" [3].

Education is the main driver of sustainable national development – it produces and cultivates the most important of all resources: Human Resources, without which no national development is possible. All academic institutions in PNG, including UPNG, are undergoing digital transformation in line with the PNG Digital Transformation Policy 2020 [3]. This process requires a lot of planning and monitoring to measure its effectiveness in meeting government goals. Hence, a survey of the prevalence of student computer ownership and internet use at

UPNG was deemed essential in setting a useful metric of where we stand in relation to the stated government goal of integrating ICT into all aspects of our curricula.

Study Aims and Objectives

We aimed to explore the factors which may prevent UPNG students from effectively participating in the modern student-centered blended learning process. Computer ownership is one of those factors that decidedly impact on students' ability to participate in online learning and directly affect their academic outputs. We hope this survey will contribute to systematic monitoring of UPNG students' ability to engage in online learning and help in planning possible interventions to enhance the UPNG learning environment.

Specifically, we aimed to collect quantitative data on current students' ability to access knowledge online through establishing the current prevalence of

(a) computer/digital device ownership among currently registered UPNG students and
(b) student participation in online learning platforms (Moodle/GC).

Our Research Questions were:

1. What is the prevalence of pc ownership among the current UPNG students?
2. What is the prevalence of smart phone ownership among UPNG students?
3. What is the prevalence of Moodle / GC use by UPNG students?
4. What are our students' current preferences in using the LMSs available to them?

LITERATURE REVIEW

COVID-19 pandemic put a tremendous stress on education systems around the world, and PNG was no exception: extended lockdowns disrupted the learning process of "an estimated 2.4 million students in PNG" [4]. Some schools and universities attempted to "ensure continuity of education for their students through remote learning online"; unfortunately, "Access to learning through digital technologies is limited in PNG with an estimated 80% of schools not having access to electricity" [4]. However, tertiary education in PNG is now heavily dependent on the use of digital materials, i.e., texts, AVs, PPTs, etc.

In the US and other technologically advanced countries which also include India, China, the Philippines, Singapore, and Indonesia, a lot of recent research focused on the demographics and significance of student device ownership [5; 6; 7; 8]. The University of California-Davis has conducted annual student pc ownership surveys since Winter 1997. The graph below (Fig. 1) illustrates the trends in computer ownership at UCDavis over the years:

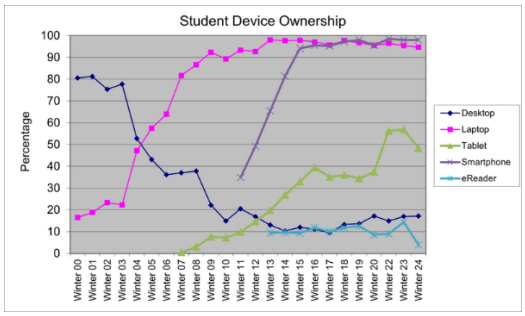


Fig. 1. Student device Ownership trends @ UC Davies

All these and earlier surveys are available online @ https://computerrooms.ucdavis.edu/pubs/survey/student-w2024.html#other

The latest UC Davis Student Survey in Winter 2024 revealed the prevalence of student pc ownership "close to universal, with 94.7% owning laptops and 17.2% owning desktops"; smartphone ownership was 98.0% [9].

Numerous studies of the spread and social impact of ICT have also been undertaken in PNG; among them, two important publications stand out, both emphasizing the critical role of digital skills users need to benefit from the use of digital devices: "The digital divide in Papua New Guinea: Implications for journalism education" by Sagrista, M. & Matbob, P. and "Digital Skills at Divine Word University, Papua New Guinea" by Iwona Kolodziejczyk, Philip Gibbs, Cecilia Nembou & Maria Rodina Sagrista [10; 11].

J.B. Rangou and J. Wohiemani published a comprehensive "Baseline Study of Technology-Enabled Learning at the University of Papua New Guinea" in 2019 [12]. This study also provides baseline records of student device ownership five years ago – and some of the findings can be compared with our results, even though the student population surveyed (N=3370) included 1.6% (54/3370) of students from UPNG Open College (OC) campuses [12:27]. The findings of this "Baseline Study of Technology-Enabled Learning at the University of Papua New Guinea" revealed that about 90% and 86% of respondents owned laptops and smartphones, respectively. Another 27% and 39% of students owned desktops and tablets, respectively. These 2019 figures are impressive; it will be interesting to see if these developmental trends still hold in 2024.

Another important finding of this research was that "Most of the students indicated that they lack advanced ICT skills. This is a potential challenge to mainstreaming TEL at UPNG, so students will need to be provided with training to use technology effectively" [12].

However, despite the high prevalence of student personal computer (pc) ownership in 2019, the report also noted that less than 10% of students surveyed used their laptops and < 4% of respondents used their desktop pcs to access the Internet. This was possibly due to limited Internet access/network coverage on campuses and the very high cost of purchasing data at that time. The findings of this survey may provide a tentative indication of where we stand today and of the general trends in TEL development at UPNG since 2019.

METHODOLOGY:

This was an institution-based cross-sectional quantitative study. A pre-tested Google Form Questionnaire was used to elicit responses from students in all 5 Schools of UPNG. All UPNG students, registered in Semester 2 2024 (N = 5032), were eligible to participate. Data analysis was performed using MS Excel DataPack software and Google Form analytics (https://gformanalytics.com).

Sample Size calculation

The finite population sample size was calculated using the simple formula for sample size calculation:

$n = [z^2 * \hat{p} * (1 - \hat{p})] / e^2$

Where:

z = 1.96 (Based on a 5% margin of error. Data are assumed two-tailed (i.e., a margin of error of 2.5% on each end of a normal distribution curve)

$\hat{p}$= 50% or 0.50 (population proportion of 50% was used, because it provided the largest confidence value)

e = 5% or 0.05 (Same value used to get the z-score estimate but provided as a decimal/ percentage.

At confidence level of 95% ($p<0.5$), the sample size of 357 was obtained for the target finite population of 5032 UPNG registered students in Semester 2, 2024. The figure (n=357) was confirmed, using the online sample size calculator for finite populations @ https://www.calculator.net/sample-size-calculator.html

A pre-tested Google Form **Survey Questionnaire** (Please see sample in Appendix) was used to collect data. Apart from details of their Gender, School, and Year of Study (YOS), the students were asked to answer 4 Yes/No questions:

1. Do you own a computer?
2. Do you own a smartphone?
3. Do you use any of these learning platforms?
    a. Google Classroom
    b. Moodle
    c. Both of them
    d. None of them
4. Which of these learning programs do you find easier to use?
    a. Google Classroom
    b. Moodle
    c. Both of them
    d. None of them

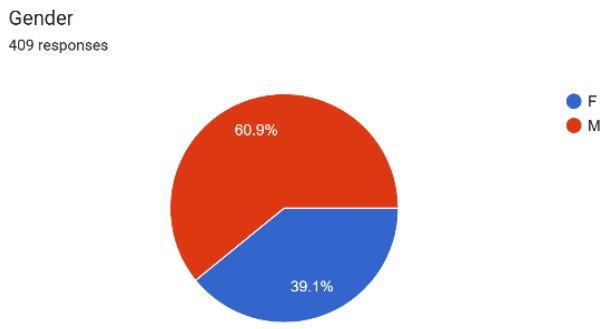
409 filled questionnaires were received, exceeding the sample size required for 95% confidence level by 1.15%.

Data analysis:

This is a purely descriptive statistical analysis of indicators, quantifying the prevalence of device ownership and Moodle/GC use/preferences among the currently registered UPNG students. GF analytics were used for data analysis, and GF Charts were used for data visualization to display this survey results.

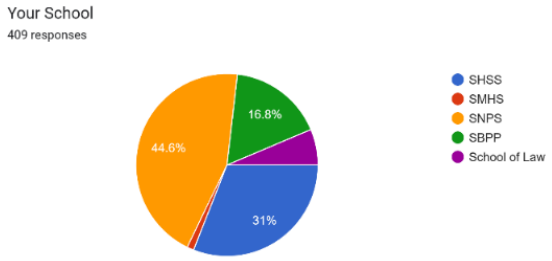
Sample Description

Gender distribution of the 409 male and female survey responders was 60.9% (249/409) and 39.1% (160/409), respectively.



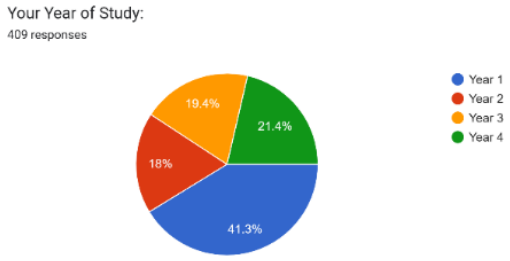
This distribution roughly corresponds to our 2015 findings [13].

Participation by School: SNPS, SHSS, SBPP, SOL and SMHS student participation in this 2024 survey was 44.6% (193/409), 31% (127/409), 16.8% (69/409), 6.3% (26/409) and 1.2% (5/409), respectively.



Student participation in this survey was entirely voluntary; this explains the low response from SMHS, amounting to just 1.2% (5/409). The decision was taken to remove the 589 SMHS students from the total number (5032) of UPNG students registered in Semester 2 2024 (5032 – 589 = 4443) and to recalculate the sample size representative of the 4443 student population in Waigani. The recalculated sample size was 354 ($p<0.5$). This is fairly close to our original sample size (357) and, since the number of responses received exceeded the sample size value of 354 by an even larger margin, the findings presented below are deemed to be representative of the entire UPNG registered student population of 5032.

Participation by Year of Study (YOS): Year 1 students' participation was the highest at 41.3% (170/409), with Year 4, Year 3 and Year 2 at 21.4% (88/409), 19.4% (80/409) and 18% (74/409), respectively:



Findings and Discussion

Our findings revealed that almost a third (29.6%) of all UPNG students in 2024 do not own a pc,[1] while 8.5% do not even have a smartphone. This finding indicates that these students do

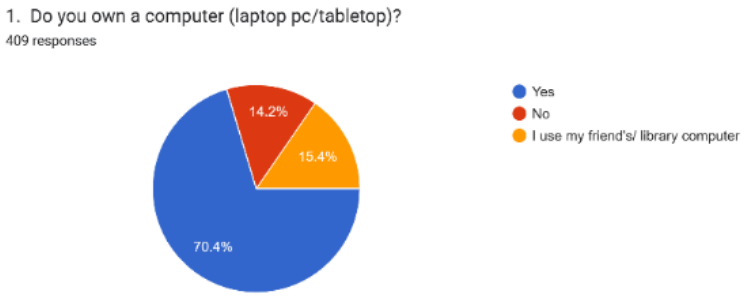
[1] The decline in student pc ownership from 90% in 2019 to 70.4% this year may be due to the considerable increase in student numbers / lower socio-economic status (SES) of current students.

not have the digital learning tools to enable their effective participation in the currently used blended learning curricula.

The students' use of online learning platforms (GC and Moodle) showed that 68.5% (302/409) of students use both Moodle and GC, 15.6% (69/409) use GC exclusively, 12.2% (54/409) use only Moodle, while 3.6% (16/409) do not use any online LMS available. Regarding student preferences, 52.5% (221/409) of the respondents found both LMSs equally user-friendly, 28.3% (119/409) and 15.7% (66/409) preferred exclusive use of either Google Classroom or Moodle, respectively. The remaining 3.6% of respondents (15/409) do not have the digital tools to access the Internet and, consequently, cannot like or dislike any LMS. Details of students' responses to the 4 survey questions, with GF Charts to facilitate data visualization, are presented below:

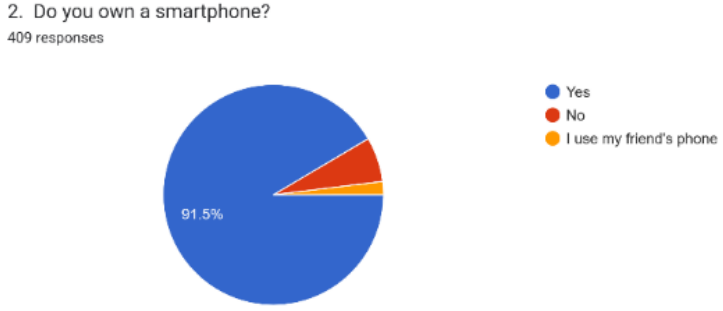
Question 1. Do you own a computer?

Only 70.4% (302/409) of respondents own a pc (laptop or tabletop), with 15.4% (55/409) sharing a friend's device, while 14.2% (61/409) reported they do not have a pc.

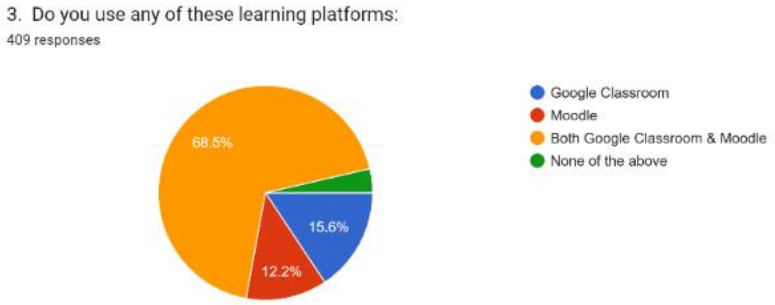


Question 2. Do you own a smartphone?

Almost all (377/409) or 91.5% of UPNG undergraduate students own a smartphone (though often of poor quality) but the total of 8.5% (35/409) do not. Out of these disadvantaged 8.5%, 1.9% (8/409) rely on a friend's help, while 6.6% (27/409) effectively struggle to participate in online learning:



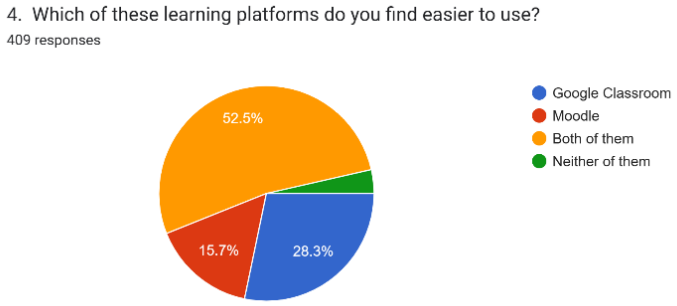
Question 3. On LMS use



A good majority – 68.5% (302/409) of UPNG students use both LMSs available to them (GC and Moodle). 15.6% (69/409) use Google Classroom exclusively, while 12.2% (54/409) use Moodle only. However, 3.6% (16/409) of UPNG students do not have access to online learning platforms.

Question 4. On students' preferences

Over half 52.5% (221/409) of UPNG students like both GC and Moodle; however, 28.3% (119/409) find GC easier to use, while 15.7% (54/409) prefer Moodle. Those who do not have the digital devices to give them access to online learning, make up the remaining 3.6% (15/409).



Our findings indicate a rapid increase in the numbers of students (currently 70.6%) who now use computers, compared to only 9.97% in 2019 [12:30]. There has also been an increase in the ownership and use of smartphones (currently 91.5%, compared to 89.66% in 2019 [12:29].

Neither Moodle nor GC online learning platforms were being used at UPNG before the 2020 COVID shutdowns; however, our findings indicate that these LMS platforms are now widely used by UPNG undergraduate students, which is a great progress. Only 3.6% of students in 2024 are unable to use the LMSs available because they apparently have no digital tools (pc/smartphone) and, therefore, no tech skills to participate in blended learning.

Despite enormous funding challenges and the lowest tuition fees in the country, the UPNG has made great steps in providing the LMS platforms needed for online learning. Challenges, however, still remain; provision of platforms for online learning is just one side of the story. Access to them and students' active participation in blended learning programs requires readiness from the student community (in terms of both device ownership and tech skills), availability of expert ICT support for both faculty and students in different campuses, digitalization of remote provinces other than NCD, etc. For example, the ICT UPNG could not extend the LMS platform access to some of the other provincial centers of UPNG OC just because there are no reliable internet services in those locations. These logistical and technological challenges can only be addressed and, hopefully, resolved through the combined and concerted effort by both Government and Academic Institutions. To grasp the dream of Vision 2050, we need systematic planning and monitoring of developmental trends in PNG education.

Conclusions

Despite considerable progress in recent years, our findings expose some lingering issues in the currently prevailing UPNG learning environment (i.e., limited Internet access on campus, insufficient network speeds, less than optimal prevalence of digital device ownership among students, etc.). This survey results indicate the need for systematic planning and monitoring of UPNG students' ability to participate in Technology-Enabled Learning (TEL). Student tech skills (which is also an issue in their ability to learn online) is largely predicated on their ownership of digital devices, primarily of pcs. Given the digital tools, young people need only nominal ICT assistance to learn how to use them. Currently, almost a third of UPNG undergraduate students do not have the basic digital tools to participate in online learning. Because UPNG students are responsible for purchasing the digital devices they are required to use in their studies, their socio-economic status necessarily impacts the type and quality of their devices (if, indeed, they can afford to buy them). The current prevalence of 70% pc and 95% smart phone ownership, respectively, do not reflect the ***quality*** of these devices (which, based on empirical observation, is often woefully low). Despite these challenges, tremendous progress has been made in the past five years in the provision of ICT services and in overall development of TEL at the University of Papua New Guinea. It is hoped that this survey will stimulate more detailed studies to track the various trends in student device ownership/ Internet and LMS access at UPNG. Systematic tracking of the rapidly changing facts on the

ground will enable effective planning, monitoring and control of the digitalization processes in UPNG. This, in turn, will undoubtedly enhance the students' learning environment, making the UPNG truly the premier university of the South Pacific. Ultimately, all this development is part of the national path charted by the GoPNG Digital Transformation policy 2020.

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Appendix: Sample Questionnaire used in our Survey 2024

Do UPNG students have the tools for online learning?

This survey, conducted by the Linguistics strand, SHSS, aims to assess the UPNG students' prevailing learning environment and explore ways of improving it.
Specifically, this study aims to measure:
1. **The availability of tech 'learning tools'** (i.e., computers/smartphones) to UPNG undergraduate students, and
2. **The extent of Moodle/Google Classroom usage and student preferences** in 2024.
Please answer this short anonymous questionnaire to help UPNG find optimal solutions and enhance your learning environment.

Email *

Valid email

This form is collecting emails. Change settings

Gender *

- F
- M

Your School *

- SHSS
- SMHS
- SNPS
- SBPP
- School of Law

Your Year of Study: *

- Year 1
- Year 2
- Year 3
- Year 4

1. Do you own a computer (laptop pc/tabletop)? *

- Yes
- No
- I use my friend's/ library computer

2. Do you own a smartphone? *

- Yes
- No
- I use my friend's phone

3. Do you use any of these learning platforms: *

- Google Classroom
- Moodle
- Both Google Classroom & Moodle
- None of the above

4. Which of these learning platforms do you find easier to use? *

- Google Classroom
- Moodle
- Both of them
- Neither of them

TENKYU TRU FOR YOUR PARTICIPATION IN THIS IMPORTANT STUDY!

https://docs.google.com/forms/d/1L-gTYS2Re-8qAVNYQyyvdslERxrZr0MSdbxHxh51H7I/edit