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ABSTRACT

This paper is a follow-up to the 2024 Survey of the University of Papua New Guinea (UPNG) students' computer ownership and internet use by the Linguistics and Modern Languages (LML) Strand, School of Humanities and Social Sciences (SHSS) [1]. It investigates student competences, practices and attitudes to Technology Enabled Learning (TEL) and explores the potential correlations between students' demographics and their digital competences. The survey revealed that over half (51%) of all students in Waigani campus started their formal schooling in remote villages, while another 27% came from provincial towns, where they had relatively fewer educational opportunities, compared to the 22% of UPNG students who schooled in Port Moresby. As English is the Language of Instruction (LOI) at all levels of formal education in Papua New Guinea, this ultimately means that students who learned English and literacy well after the age of 10 are less prepared for university studies than those who had acquired English skills before the age of 6 (recommended age for the start of formal schooling).

SPSS Version 28 for MS Windows software was used to conduct statistical analysis of the survey results. It revealed a statistically significant ($p < .001$) correlation between UPNG students' demographics (their socioeconomic status/educational backgrounds) and their digital skills. We argue that urgent and concerted government interventions – in terms of raising general literacy levels, Early Childhood Education (ECE), teacher training, and adequate investments in Education and Health) – are necessary for success in today's knowledge-based-economy world.

Key words: Learning Management Systems (LMSs), Moodle, Google Classroom, digital skills, smart phone/ computer ownership, Age of Onset of Learning English (AOE), Age at Literacy (AGELIT), Early Learning Language (ELL), Internet, Equitable Access

I. INTRODUCTION

Internet Communication Technology (ICT) has transformed the way people around the world live, learn, work and communicate. The evolving role of technology in education specifically has been the focus of systematic study by governments and international organizations, such as UNESCO [2]. The background paper for the 2024 Global Education Monitoring (GEM) UNESCO report, titled "*Technology in education in Papua New Guinea and the Pacific*", examined the role of educational technology in the region, its potential benefits like improving teaching quality and access to resources, and the challenges it faces, such as the digital divide and the need for sustainability [2]. In the Introduction, the authors note that

“The role of technology in education and its ability to reach diverse learners, level the playing field for remote populations, and promote student engagement has become increasingly prominent in the years post-COVID. To achieve Sustainable Development Goal (SDG) 4, which aims to ensure “inclusive and equitable quality education” and promote “lifelong learning for all by 2030”, the opportunities and challenges of education technology (edtech) need to be explored and harnessed in the Pacific region” [2].

The report highlights a number of key challenges for Papua New Guinea (PNG) and the Pacific region, including:

1. Limited and costly infrastructure, especially internet connectivity;
2. Teacher training gaps, as many teachers lack adequate support, skills, or access to infrastructure to implement new technologies effectively; and
3. Equitable access to devices, the internet, and digital learning resources which is essential in bridging the “digital divide”.

To ensure equitable access, “monitoring and addressing inequities in online learning participation” are necessary in order “to prevent further exacerbating educational disparities” [2; Section 4, p. 19].

At university level, increased reliance on Internet access and online course content delivery has expanded the range of competencies, required of students. In addition to being proficient in English (the main learning tool for all students in PNG), they are expected to be skilled in using a new set of learning tools – computers, smart phones and tablets, Internet browsers, software apps/programs and online learning management platforms (LMSs). Despite the rapid spread of Technology-Enabled Learning (TEL) in the UPNG, many students appear to be unable to benefit from it, based on empirical observation. Why? What are the challenges that prevent them from fully benefiting from TEL?

This study, apart from providing extensive baseline data for future monitoring of TEL development at UPNG, addresses the questions above, building upon the insights gained from our earlier “Age Factor in early language education” research [3 – 10].

II. RESEARCH QUESTIONS, AIMS & OBJECTIVES

The many questions that helped crystallize the Aims and Objectives of this research were:

1. Does the quality of the digital tools students own affect their learning online?
2. What is the level and intensity of students’ online engagement, measured by the number of courses they took on Moodle / Google Classroom platforms in 2025?
3. How does the extent and duration of digital tech use affect the students’ online studies?
4. What are the challenges that students face in online learning?
5. Does the students’ Early Language Education history - Age of Onset of learning English (AO), Age at Literacy (AGELIT), Early Learning Language (ELL), Socio-Economic Status

(SES), etc. - affect their digital skills and, thus, their ability to participate successfully in TEL/online learning?

Our overarching goal was to evaluate the effectiveness of blended learning curriculum as it is practiced currently at UPNG by exploring students' competencies, practices and attitudes to TEL. Apart from quantifying these parameters, we also explored some potential *causes* of the observed issues and challenges in TEL implementation at UPNG.

Specifically, our objectives were of three types:

1. Descriptive: To describe students' practices and attitudes to TEL/blended learning curriculum at UPNG
2. Exploratory: To investigate the impact of students' demographics on their digital skills / levels of participation in TEL.
3. Relational: To explore the correlation between students' socioeconomic status (SES) and their access to online educational resources.

II. MATERIALS AND METHODS

To achieve these objectives, we needed verifiable data on students' gender, class standing and Socio-Economic Status (SES), determined largely by the prevalence and quality of the digital devices they own and their early language education history (*where, when* and *how* they learned English and literacy).

An online questionnaire was designed, using Google Forms, to collect data on:

1. Students' gender, origin, on/off campus residential status, early language education history, quality of digital devices owned.
2. Students' digital skills (self-assessed)
3. Purposes and Frequency of students' smartphone use (self-reported)
4. The number of courses offered on GC / Moodle LMSs in Semesters 1 and 2, 2025
5. The challenges (self-reported) students face in terms of their:
 - a. Ability to access course materials /reading online
 - b. Concerns re: Internet use (i.e., purchasing data, network speeds, etc.)

This Google Form Questionnaire was tested in Semester 1, 2025, and subsequently fine-tuned to better reveal the relationships between the various student demographics and students' current digital competencies, practices and attitudes to TEL at UPNG.

II. 1. Sample Size calculation:

To calculate the required sample size, we obtained the following undergraduate student population figures for Waigani campus from the UPNG Information and Communication Technology (ICT) Division: A total of 4450 registered students, made up of 1267 in the School of Business and Public Policy (SBPP), 1491 in the School of Humanities and Social Sciences (SHSS), 874 in the School of Natural and Physical Sciences, and 818 in the School of Law (SOL).

Using the standard formula: $n = N / (1 + Ne^2)$, where 'n' is the sample size, 'N' is the population size, and 'e' is the 5% margin of error (expressed as 0.05), the calculated representative sample size obtained was **367**. Thus, a minimum of 367 responses to our survey questionnaire would be required to validate this survey findings at 95% confidence level.

The Sample Size calculator for finite populations @ <https://www.calculator.net/sample-size-calculator.html> produced an even lower sample size figure of **354** (<https://www.calculator.net/sample-size-calculator.html?type=1&ci=95&ci=5&pp=50&ps=4450&x=Calculate>).

Statistical Package for Social Sciences (SPSS) version 28 for Windows and MS Excel data pack software were used for statistical analysis of the data collected. Apart from descriptive statistics, correlations (parametric and nonparametric), Mann-Whitney U test, Kruskal-Wallis test and Ordinary Logistic regression analysis were used to assess bivariate associations between the students' competencies in online study and independent variables (i.e., Student's Origin, AO, Alit, etc.).

Ethical clearance and permission for this study were sought and obtained from the ethics committee in the SHSS UPNG.

With assistance from the Registrar's Office, the final version of the Survey Questionnaire (See Appendix I below) was disseminated via email to all undergraduate UPNG students in Waigani campus in August-September 2025.

A total of **444** students responded to all 32 survey questions. Their responses were downloaded, saved in Excel spreadsheets, coded (See Appendix II for the Data file) and then analyzed.

III. RESULTS

III.1. Percent distribution according to the demographics

Table 1 A. Demographics
1. Gender distribution across the four UPNG Schools in Waigani indicates relative disadvantage female students (41%) have in relation to male students (59%); Gender Parity Index (GPI) = 0.69.
2. Percent distribution of the 444 questionnaires received, according to Schools: SNPS 24%, SBPP 22%, SHSS 46% and SOL 8%.
3. Year of Study (YOS): Proportional representation of students from the First, Second, Third and Fourth years of study in our sample (n = 444) were 29%, 31%, 19% and 21%, respectively.
4. Respondents' Residential Status: Majority (67%) of Waigani students live off-campus, having to commute to attend face-to-face classes. They also cannot benefit from the Free WiFi that UPNG provides on campus. Only one-third (33%) of registered students live on-campus.

<p>5. Respondents' Origin (where they did their Grade 1 schooling):</p> <p>Over half (51%) of all students in Waigani campus come from remote villages, where they started formal schooling. Another 27% come from provincial towns, and only 22% are from POM, where they were more likely to learn English.</p>	<p style="text-align: center;">ORIGIN</p> <table border="1"> <caption>ORIGIN</caption> <thead> <tr> <th>Origin</th> <th>Count</th> <th>Percentage</th> </tr> </thead> <tbody> <tr> <td>Village</td> <td>227</td> <td>51%</td> </tr> <tr> <td>Town</td> <td>119</td> <td>27%</td> </tr> <tr> <td>POM</td> <td>98</td> <td>22%</td> </tr> </tbody> </table>	Origin	Count	Percentage	Village	227	51%	Town	119	27%	POM	98	22%												
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<p>6. Age at Enrollment into Grade 1:</p> <p>43% of students were enrolled into Grade 1 at the age of 6, as per policy. However, over a third (34%) of all students started schooling 2 to over 5 years late.</p>	<p style="text-align: center;">Age at Enrollment into Grade 1</p> <table border="1"> <caption>Age at Enrollment into Grade 1</caption> <thead> <tr> <th>Age</th> <th>Count</th> </tr> </thead> <tbody> <tr> <td>6</td> <td>190</td> </tr> <tr> <td>7</td> <td>101</td> </tr> <tr> <td>8</td> <td>82</td> </tr> <tr> <td>9</td> <td>33</td> </tr> <tr> <td>10</td> <td>27</td> </tr> <tr> <td>> 10</td> <td>11</td> </tr> </tbody> </table>	Age	Count	6	190	7	101	8	82	9	33	10	27	> 10	11										
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<p>7. Respondents' Age at the Onset of Learning English (AOE)</p> <p>A total of 23% of all students learned English, the Language of Instruction (LOI), before starting school at the age of 6. A total of 77% of all students Learned English after age 6. Over a third of all students (36%) learned English after the age of 10.</p>	<p style="text-align: center;">Age at Onset of learning English</p> <table border="1"> <caption>Age at Onset of learning English</caption> <thead> <tr> <th>Age</th> <th>Count</th> </tr> </thead> <tbody> <tr> <td>3</td> <td>57</td> </tr> <tr> <td>4</td> <td>18</td> </tr> <tr> <td>5</td> <td>28</td> </tr> <tr> <td>6</td> <td>42</td> </tr> <tr> <td>7</td> <td>24</td> </tr> <tr> <td>8</td> <td>30</td> </tr> <tr> <td>9</td> <td>28</td> </tr> <tr> <td>10</td> <td>57</td> </tr> <tr> <td>>10</td> <td>160</td> </tr> </tbody> </table>	Age	Count	3	57	4	18	5	28	6	42	7	24	8	30	9	28	10	57	>10	160				
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10	57																								
>10	160																								
<p>8. Early Learning Language (ELL):</p> <p>English was the ELL for well over half (58%) of all students; Tok Pisin-English was the ELL for almost a third (30%) of all students, making English and TP-English the ELL for almost 90% of all students. Only 5% of students reported Tok Pisin (3%) and Vernacular (2%) as their ELLs, while 7% learned to read and write in Vernacular + English.</p>	<p style="text-align: center;">Early Learning Language (ELL)</p> <table border="1"> <caption>Early Learning Language (ELL)</caption> <thead> <tr> <th>Language</th> <th>Count</th> <th>Percentage</th> </tr> </thead> <tbody> <tr> <td>English</td> <td>257</td> <td>58%</td> </tr> <tr> <td>TP-English</td> <td>131</td> <td>30%</td> </tr> <tr> <td>V-English</td> <td>32</td> <td>7%</td> </tr> <tr> <td>Tok Pisin</td> <td>9</td> <td>2%</td> </tr> <tr> <td>Vernacular</td> <td>15</td> <td>3%</td> </tr> </tbody> </table>	Language	Count	Percentage	English	257	58%	TP-English	131	30%	V-English	32	7%	Tok Pisin	9	2%	Vernacular	15	3%						
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<p>9. Age at Literacy – More than half (56%) of all students learned to read and write only at age 9 and older. Roughly a third of all students (29%) learned to read and write well over the age of 10.</p>	<p style="text-align: center;">Age @ Literacy (AGELIT)</p> <table border="1"> <caption>Age @ Literacy (AGELIT)</caption> <thead> <tr> <th>Age</th> <th>Count</th> <th>Percentage</th> </tr> </thead> <tbody> <tr> <td>5</td> <td>57</td> <td>13%</td> </tr> <tr> <td>6</td> <td>52</td> <td>11%</td> </tr> <tr> <td>7</td> <td>72</td> <td>16%</td> </tr> <tr> <td>8</td> <td>50</td> <td>11%</td> </tr> <tr> <td>9</td> <td>128</td> <td>29%</td> </tr> <tr> <td>10</td> <td>41</td> <td>9%</td> </tr> <tr> <td>>10</td> <td>44</td> <td>10%</td> </tr> </tbody> </table>	Age	Count	Percentage	5	57	13%	6	52	11%	7	72	16%	8	50	11%	9	128	29%	10	41	9%	>10	44	10%
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The demographics presented in Table 1A allow us to make statistically significant ($p < 0.05$) conclusions and generalizations regarding the students' educational backgrounds (AOE & AGELIT) and socioeconomic status (SES). These are presented in Table 1B.

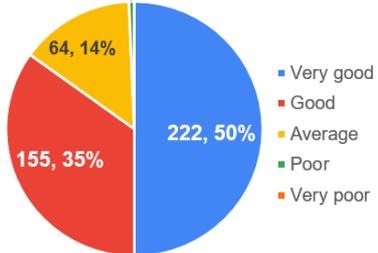
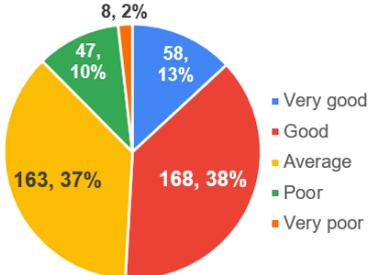
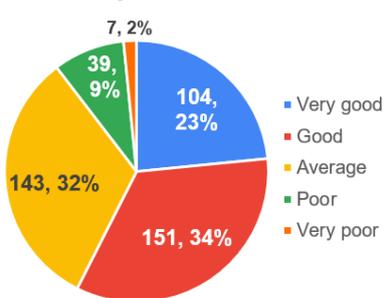
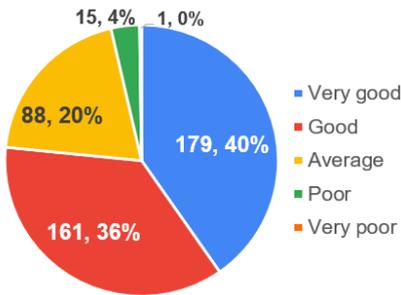
Table 1B. Demographics with Implications													
<p>1. Gender distribution among students in the UPNG Waigani campus reflects a significant preponderance of male over female students (GPI = .69). This GPI shows a slight improvement in relation to GPI of .67 in 2015 and 2018 [1; 6]]. It must be noted though that GPI is considerably higher in PNG National High Schools where GPI is .76, as per the findings of our earlier studies [2; 3]. This may be due to lingering cultural attitudes and socio-economic realities.</p>													
<p>2. Over half (51%) of the students in Waigani campus come from remote villages and over a quarter (27%) - from provincial towns; this means that educational opportunities for the vast majority (78%) of students in Waigani campus have been relatively fewer than for those (22%) who schooled in Port Moresby.</p>													
<p>3. This disparity becomes even more evident if AOE data are grouped into categories:</p> <p style="margin-left: 40px;">Early (3-5 yo) – mostly from Port Moresby, Normal (6-7 yo) – mostly from other towns and Late (8->10 yo) – mostly from remote villages.</p>	<p>AOE groups</p> <table border="1"> <caption>AOE groups data</caption> <thead> <tr> <th>Category</th> <th>Count</th> <th>Percentage</th> </tr> </thead> <tbody> <tr> <td>Early</td> <td>103</td> <td>23%</td> </tr> <tr> <td>Normal</td> <td>66</td> <td>15%</td> </tr> <tr> <td>Late</td> <td>275</td> <td>62%</td> </tr> </tbody> </table>	Category	Count	Percentage	Early	103	23%	Normal	66	15%	Late	275	62%
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<p>4. Similarly, if AGELIT data are grouped into categories:</p> <p style="margin-left: 40px;">Early (5-6 yo), Normal (7-8 yo) and Late (9->10 yo)</p> <p>*AGELIT is a function of AOE, as about 90% of all students were taught in English/ English + Tok Pisin</p>	<p>AGELIT groups</p> <table border="1"> <caption>AGELIT groups data</caption> <thead> <tr> <th>Category</th> <th>Count</th> <th>Percentage</th> </tr> </thead> <tbody> <tr> <td>Early</td> <td>109</td> <td>25%</td> </tr> <tr> <td>Normal</td> <td>85</td> <td>19%</td> </tr> <tr> <td>Late</td> <td>250</td> <td>56%</td> </tr> </tbody> </table>	Category	Count	Percentage	Early	109	25%	Normal	85	19%	Late	250	56%
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These important insights help us understand the current UPNG students’ competences, practices and attitudes to TEL. Our findings regarding students’ digital device ownership largely corroborate the findings reported in 2024 [1].

III. 2. Students’ digital device ownership and competences

Survey findings regarding students’ digital device ownership, usage and competences are presented in Table 2 below.

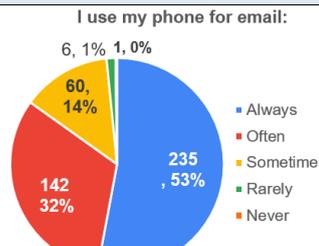
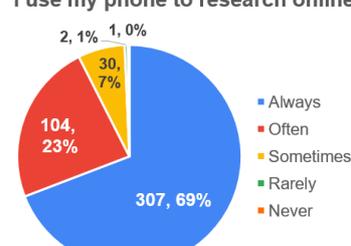
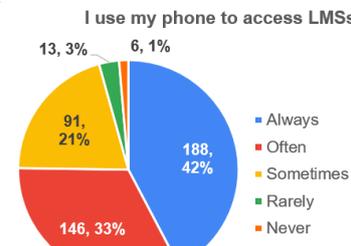
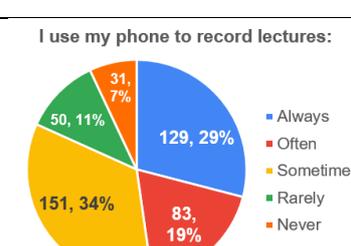
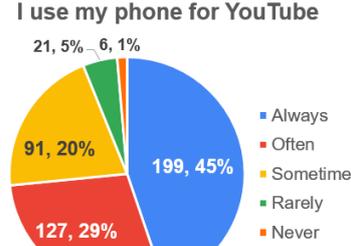
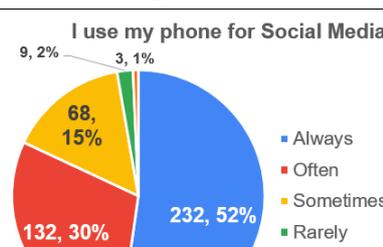
Table 2. UPNG students' digital device ownership and competences																			
<p>1. When did you get your first smartphone?</p> <p>>75% of Waigani students have been using their smart phones for over 3 years, while 13% got their smartphones 3 years ago.</p> <p>New users got their phones 1 to 2 years ago (4% and 6%, respectively).</p> <p>Only 2% of students report having no smart phones.</p>	<p>I got my 1st smart phone x years ago:</p> <table border="1"> <caption>I got my 1st smart phone x years ago</caption> <thead> <tr> <th>Years ago</th> <th>Count</th> <th>Percentage</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>20</td> <td>4%</td> </tr> <tr> <td>2</td> <td>25</td> <td>6%</td> </tr> <tr> <td>3</td> <td>56</td> <td>13%</td> </tr> <tr> <td>>3</td> <td>333</td> <td>75%</td> </tr> <tr> <td>N/A</td> <td>10</td> <td>2%</td> </tr> </tbody> </table>	Years ago	Count	Percentage	1	20	4%	2	25	6%	3	56	13%	>3	333	75%	N/A	10	2%
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<p>2. When did you get your first PC/Laptop / Tablet?</p> <p>Only 41% of students got their PCs more than 3 years ago, suggesting lower levels of digital competence.</p> <p>One-tenth (9%) of all students do not own a pc or laptop/tablet.</p>	<p>I got my 1st pc/laptop/tablet x years ago:</p> <table border="1"> <caption>I got my 1st pc/laptop/tablet x years ago</caption> <thead> <tr> <th>Years ago</th> <th>Count</th> <th>Percentage</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>119</td> <td>27%</td> </tr> <tr> <td>2</td> <td>45</td> <td>10%</td> </tr> <tr> <td>3</td> <td>58</td> <td>13%</td> </tr> <tr> <td>>3</td> <td>183</td> <td>41%</td> </tr> <tr> <td>N/A</td> <td>39</td> <td>9%</td> </tr> </tbody> </table>	Years ago	Count	Percentage	1	119	27%	2	45	10%	3	58	13%	>3	183	41%	N/A	39	9%
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<p>3. Device quality:</p> <p>About a quarter (27%) only own high quality devices;</p> <p>Most students (64%) report owning average/ low PC quality, meaning that they have issues in TEL.</p> <p>One-tenth of all students (9%) do not have a pc, laptop or tablet to use for TEL.</p>	<p>My pc/laptop/tablet quality is:</p> <table border="1"> <caption>My pc/laptop/tablet quality is:</caption> <thead> <tr> <th>Quality</th> <th>Count</th> <th>Percentage</th> </tr> </thead> <tbody> <tr> <td>High</td> <td>121</td> <td>27%</td> </tr> <tr> <td>Average</td> <td>233</td> <td>53%</td> </tr> <tr> <td>Low</td> <td>49</td> <td>11%</td> </tr> <tr> <td>N/A</td> <td>41</td> <td>9%</td> </tr> </tbody> </table>	Quality	Count	Percentage	High	121	27%	Average	233	53%	Low	49	11%	N/A	41	9%			
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<p>4. Phone quality:</p> <p>Smart phones are the most important tool students use, but only 41% have high performance devices.</p> <p>54% of students reported owning phones of average quality, 4% reported owning low quality phones, and 1% have no phones at all.</p>	<p>Quality of my smart phone is:</p> <table border="1"> <caption>Quality of my smart phone is:</caption> <thead> <tr> <th>Quality</th> <th>Count</th> <th>Percentage</th> </tr> </thead> <tbody> <tr> <td>High</td> <td>179</td> <td>41%</td> </tr> <tr> <td>Average</td> <td>241</td> <td>54%</td> </tr> <tr> <td>Low</td> <td>19</td> <td>4%</td> </tr> <tr> <td>N/A</td> <td>5</td> <td>1%</td> </tr> </tbody> </table>	Quality	Count	Percentage	High	179	41%	Average	241	54%	Low	19	4%	N/A	5	1%			
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<p>5. How would you describe your computer skills (software knowledge, online research/typing skills, etc.)?</p> <p>Students generally reported Excellent (21%) or Good (52%) digital skills.</p> <p>However, over a quarter (27%) of all students report having inadequate digital skills.</p>	<p>My digital skills are:</p> <table border="1"> <caption>My digital skills are:</caption> <thead> <tr> <th>Skill Level</th> <th>Count</th> <th>Percentage</th> </tr> </thead> <tbody> <tr> <td>Excellent</td> <td>94</td> <td>21%</td> </tr> <tr> <td>Good</td> <td>232</td> <td>52%</td> </tr> <tr> <td>Fair</td> <td>107</td> <td>24%</td> </tr> <tr> <td>Poor</td> <td>7</td> <td>2%</td> </tr> <tr> <td>Very poor</td> <td>5</td> <td>1%</td> </tr> </tbody> </table>	Skill Level	Count	Percentage	Excellent	94	21%	Good	232	52%	Fair	107	24%	Poor	7	2%	Very poor	5	1%
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Very poor	5	1%																	

<p>6. How good are you in using MS Word?</p> <p>Most students (85%) are very good/good at using MS Word;</p> <p>However, 15% need to upgrade their skills in order to cope with TEL.</p>	<p>My MS Word skills are:</p>  <table border="1"> <thead> <tr> <th>Category</th> <th>Count</th> <th>Percentage</th> </tr> </thead> <tbody> <tr> <td>Very good</td> <td>222</td> <td>50%</td> </tr> <tr> <td>Good</td> <td>155</td> <td>35%</td> </tr> <tr> <td>Average</td> <td>64</td> <td>14%</td> </tr> <tr> <td>Poor</td> <td>3</td> <td>1%</td> </tr> <tr> <td>Very poor</td> <td>0</td> <td>0%</td> </tr> </tbody> </table>	Category	Count	Percentage	Very good	222	50%	Good	155	35%	Average	64	14%	Poor	3	1%	Very poor	0	0%
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<p>7. How good are you in using MS Excel?</p> <p>Almost half (49%) of all students have only average/poor/very poor skills in MS Excel.</p>	<p>My MS Excel skills are:</p>  <table border="1"> <thead> <tr> <th>Category</th> <th>Count</th> <th>Percentage</th> </tr> </thead> <tbody> <tr> <td>Very good</td> <td>58</td> <td>13%</td> </tr> <tr> <td>Good</td> <td>168</td> <td>38%</td> </tr> <tr> <td>Average</td> <td>163</td> <td>37%</td> </tr> <tr> <td>Poor</td> <td>47</td> <td>10%</td> </tr> <tr> <td>Very poor</td> <td>8</td> <td>2%</td> </tr> </tbody> </table>	Category	Count	Percentage	Very good	58	13%	Good	168	38%	Average	163	37%	Poor	47	10%	Very poor	8	2%
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<p>8. How good are you in using PPT?</p> <p>Similarly, almost half of all students (43%) have only average/poor/very poor PPT skills.</p>	<p>My PPT skills are:</p>  <table border="1"> <thead> <tr> <th>Category</th> <th>Count</th> <th>Percentage</th> </tr> </thead> <tbody> <tr> <td>Very good</td> <td>104</td> <td>23%</td> </tr> <tr> <td>Good</td> <td>151</td> <td>34%</td> </tr> <tr> <td>Average</td> <td>143</td> <td>32%</td> </tr> <tr> <td>Poor</td> <td>39</td> <td>9%</td> </tr> <tr> <td>Very poor</td> <td>7</td> <td>2%</td> </tr> </tbody> </table>	Category	Count	Percentage	Very good	104	23%	Good	151	34%	Average	143	32%	Poor	39	9%	Very poor	7	2%
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Very poor	7	2%																	
<p>9. PDF skills</p> <p>This is the only app that ¾ (75%) of all students reported good/very good competence in;</p> <p>Only 24% need to upgrade their skills</p>	<p>My PDF skills are:</p>  <table border="1"> <thead> <tr> <th>Category</th> <th>Count</th> <th>Percentage</th> </tr> </thead> <tbody> <tr> <td>Very good</td> <td>179</td> <td>40%</td> </tr> <tr> <td>Good</td> <td>161</td> <td>36%</td> </tr> <tr> <td>Average</td> <td>88</td> <td>20%</td> </tr> <tr> <td>Poor</td> <td>15</td> <td>4%</td> </tr> <tr> <td>Very poor</td> <td>1</td> <td>0%</td> </tr> </tbody> </table>	Category	Count	Percentage	Very good	179	40%	Good	161	36%	Average	88	20%	Poor	15	4%	Very poor	1	0%
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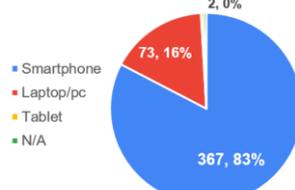
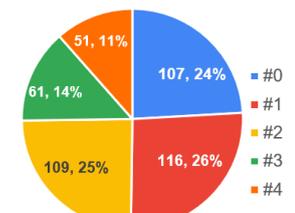
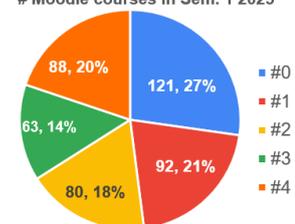
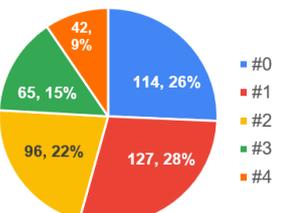
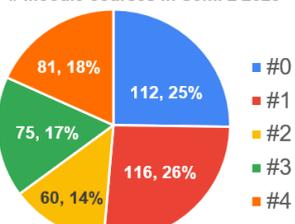
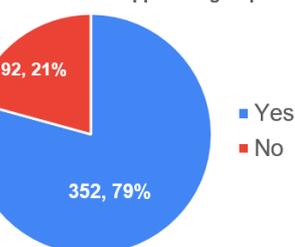
III. 3. Digital tool usage

Section III presents data on students’ smart phone usage and online practices. Table 3 below presents students’ responses to these six questions:

1. How often do you use your smartphone for Email?
2. How often do you use your smartphone for Research online?
3. How often do you use your smartphone to access LMSs?
4. How often do you use your phone to record lectures?
5. How often do you use your phone to watch YouTube videos?
6. How often do you use your phone for social media (FB, etc.)?

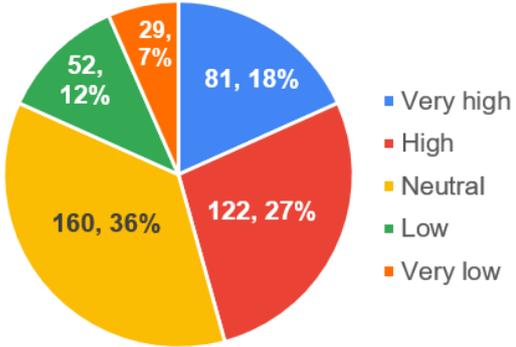
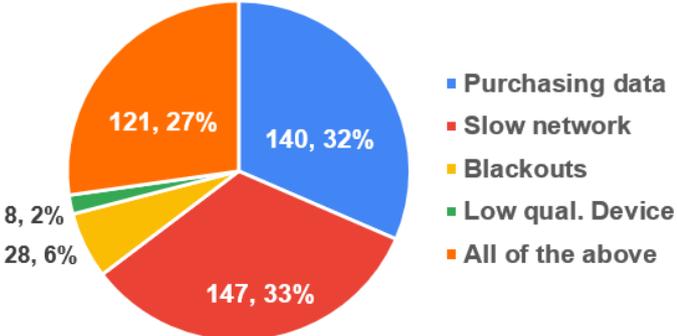
Table 3. Smart phone usage and online practices																			
<p>1. How often do you use your smartphone for Email?</p> <p>All but one student (0%) use smart phones for email (even those who don't own their own phones)</p>	<p>I use my phone for email:</p>  <table border="1"> <caption>Data for Email Usage</caption> <thead> <tr> <th>Frequency</th> <th>Count</th> <th>Percentage</th> </tr> </thead> <tbody> <tr> <td>Always</td> <td>235</td> <td>53%</td> </tr> <tr> <td>Often</td> <td>142</td> <td>32%</td> </tr> <tr> <td>Sometimes</td> <td>60</td> <td>14%</td> </tr> <tr> <td>Rarely</td> <td>6</td> <td>1%</td> </tr> <tr> <td>Never</td> <td>1</td> <td>0%</td> </tr> </tbody> </table>	Frequency	Count	Percentage	Always	235	53%	Often	142	32%	Sometimes	60	14%	Rarely	6	1%	Never	1	0%
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<p>2. How often do you use your smartphone for Research online?</p> <p>Students use their phones for research online Always / Often (69% and 23%, respectively). 7% use it only Sometimes, and about 1% of students don't use them for online research at all or very rarely.</p>	<p>I use my phone to research online:</p>  <table border="1"> <caption>Data for Research Online Usage</caption> <thead> <tr> <th>Frequency</th> <th>Count</th> <th>Percentage</th> </tr> </thead> <tbody> <tr> <td>Always</td> <td>307</td> <td>69%</td> </tr> <tr> <td>Often</td> <td>104</td> <td>23%</td> </tr> <tr> <td>Sometimes</td> <td>30</td> <td>7%</td> </tr> <tr> <td>Rarely</td> <td>2</td> <td>1%</td> </tr> <tr> <td>Never</td> <td>1</td> <td>0%</td> </tr> </tbody> </table>	Frequency	Count	Percentage	Always	307	69%	Often	104	23%	Sometimes	30	7%	Rarely	2	1%	Never	1	0%
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<p>3. How often do you use your smartphone to access LMSs?</p> <p>Students who use their phones to access LMSs Always or Often (42% and 33%, respectively) make up 75% of the total student population. However, 21% access LMSs Sometimes, and 4% do it only Rarely or Never.</p>	<p>I use my phone to access LMSs:</p>  <table border="1"> <caption>Data for LMSs Usage</caption> <thead> <tr> <th>Frequency</th> <th>Count</th> <th>Percentage</th> </tr> </thead> <tbody> <tr> <td>Always</td> <td>188</td> <td>42%</td> </tr> <tr> <td>Often</td> <td>146</td> <td>33%</td> </tr> <tr> <td>Sometimes</td> <td>91</td> <td>21%</td> </tr> <tr> <td>Rarely</td> <td>13</td> <td>3%</td> </tr> <tr> <td>Never</td> <td>6</td> <td>1%</td> </tr> </tbody> </table>	Frequency	Count	Percentage	Always	188	42%	Often	146	33%	Sometimes	91	21%	Rarely	13	3%	Never	6	1%
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<p>4. How often do you use your phone to record lectures?</p> <p>About half of the students record lectures regularly, and 34% - sometimes.</p>	<p>I use my phone to record lectures:</p>  <table border="1"> <caption>Data for Recording Lectures Usage</caption> <thead> <tr> <th>Frequency</th> <th>Count</th> <th>Percentage</th> </tr> </thead> <tbody> <tr> <td>Always</td> <td>129</td> <td>29%</td> </tr> <tr> <td>Often</td> <td>83</td> <td>19%</td> </tr> <tr> <td>Sometimes</td> <td>151</td> <td>34%</td> </tr> <tr> <td>Rarely</td> <td>50</td> <td>11%</td> </tr> <tr> <td>Never</td> <td>31</td> <td>7%</td> </tr> </tbody> </table>	Frequency	Count	Percentage	Always	129	29%	Often	83	19%	Sometimes	151	34%	Rarely	50	11%	Never	31	7%
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<p>5. How often do you use your phone to watch YouTube videos?</p> <p>About 75% of all students use YT regularly, and another 20% - sometimes.</p>	<p>I use my phone for YouTube</p>  <table border="1"> <caption>Data for YouTube Usage</caption> <thead> <tr> <th>Frequency</th> <th>Count</th> <th>Percentage</th> </tr> </thead> <tbody> <tr> <td>Always</td> <td>199</td> <td>45%</td> </tr> <tr> <td>Often</td> <td>127</td> <td>29%</td> </tr> <tr> <td>Sometimes</td> <td>91</td> <td>20%</td> </tr> <tr> <td>Rarely</td> <td>21</td> <td>5%</td> </tr> <tr> <td>Never</td> <td>6</td> <td>1%</td> </tr> </tbody> </table>	Frequency	Count	Percentage	Always	199	45%	Often	127	29%	Sometimes	91	20%	Rarely	21	5%	Never	6	1%
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<p>6. How often do you use your phone for social media (FB, etc.)?</p> <p>A vast majority of students (82%) use their phones for social media (52% - Always, and 30% - Often). Only 3% of students rarely or never use phones for social media – even though about 2% of them reportedly have no phones.</p>	<p>I use my phone for Social Media:</p>  <table border="1"> <caption>Data for Social Media Usage</caption> <thead> <tr> <th>Frequency</th> <th>Count</th> <th>Percentage</th> </tr> </thead> <tbody> <tr> <td>Always</td> <td>232</td> <td>52%</td> </tr> <tr> <td>Often</td> <td>132</td> <td>30%</td> </tr> <tr> <td>Sometimes</td> <td>68</td> <td>15%</td> </tr> <tr> <td>Rarely</td> <td>9</td> <td>2%</td> </tr> <tr> <td>Never</td> <td>3</td> <td>1%</td> </tr> </tbody> </table>	Frequency	Count	Percentage	Always	232	52%	Often	132	30%	Sometimes	68	15%	Rarely	9	2%	Never	3	1%
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III. 4. TEL Courses at UPNG (Google Classroom & Moodle LMSs)

Table 4. Device usage for TEL / LMS in 2025																
<p>1. Which digital device do you typically use to access your Moodle or Google Classroom (GC)?</p> <p>83% of all students use their phones for TEL/LMS access.</p>	<p>I access my LMSs via:</p>  <table border="1"> <caption>I access my LMSs via</caption> <thead> <tr> <th>Device</th> <th>Count</th> <th>Percentage</th> </tr> </thead> <tbody> <tr> <td>Smartphone</td> <td>367</td> <td>83%</td> </tr> <tr> <td>Laptop/pc</td> <td>73</td> <td>16%</td> </tr> <tr> <td>Tablet</td> <td>2</td> <td>2.0%</td> </tr> <tr> <td>N/A</td> <td>0</td> <td>0%</td> </tr> </tbody> </table>	Device	Count	Percentage	Smartphone	367	83%	Laptop/pc	73	16%	Tablet	2	2.0%	N/A	0	0%
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Tablet	2	2.0%														
N/A	0	0%														
<p>2. You took 4 courses in each Semester this year. How many of your courses in Semester 1 were taught in GC?</p> <p>A quarter (24%) of all students took no GC courses in Sem. 1; 26% took only one GC course; 25% took 2 GC courses; 14% took 3, and 11% took all of their 4 courses in GC.</p>	<p># of GC courses I took in Sem. 1 2025:</p>  <table border="1"> <caption># of GC courses I took in Sem. 1 2025</caption> <thead> <tr> <th>Count</th> <th>Percentage</th> </tr> </thead> <tbody> <tr> <td>#0</td> <td>24%</td> </tr> <tr> <td>#1</td> <td>26%</td> </tr> <tr> <td>#2</td> <td>25%</td> </tr> <tr> <td>#3</td> <td>14%</td> </tr> <tr> <td>#4</td> <td>11%</td> </tr> </tbody> </table>	Count	Percentage	#0	24%	#1	26%	#2	25%	#3	14%	#4	11%			
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<p>3. How many of your Sem 1 courses were taught in Moodle?</p> <p>27% of students took no Moodle courses in Semester 1; 21% took only one Moodle course; 18% - two, 14% - three, and 20% reported that all 4 of their Sem. 1 courses were taught in Moodle.</p>	<p># Moodle courses in Sem. 1 2025</p>  <table border="1"> <caption># Moodle courses in Sem. 1 2025</caption> <thead> <tr> <th>Count</th> <th>Percentage</th> </tr> </thead> <tbody> <tr> <td>#0</td> <td>27%</td> </tr> <tr> <td>#1</td> <td>21%</td> </tr> <tr> <td>#2</td> <td>18%</td> </tr> <tr> <td>#3</td> <td>14%</td> </tr> <tr> <td>#4</td> <td>20%</td> </tr> </tbody> </table>	Count	Percentage	#0	27%	#1	21%	#2	18%	#3	14%	#4	20%			
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<p>4. How many of your courses in Sem. 2 were taught in GC?</p> <p>A quarter (26%) of all students took no GC courses in Sem. 2; 28% took only one GC course; 22% took 2 GC courses; 15% took 3, and 9% took all of their 4 courses in GC.</p>	<p># GC courses I took in Sem. 2 2025</p>  <table border="1"> <caption># GC courses I took in Sem. 2 2025</caption> <thead> <tr> <th>Count</th> <th>Percentage</th> </tr> </thead> <tbody> <tr> <td>#0</td> <td>26%</td> </tr> <tr> <td>#1</td> <td>28%</td> </tr> <tr> <td>#2</td> <td>22%</td> </tr> <tr> <td>#3</td> <td>15%</td> </tr> <tr> <td>#4</td> <td>9%</td> </tr> </tbody> </table>	Count	Percentage	#0	26%	#1	28%	#2	22%	#3	15%	#4	9%			
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<p>6. Do you use WhatsApp class groups to communicate with your lecturers?</p> <p>However, a lot of communication between Faculty and Students and students-to-students occurs via WA groups.</p>	<p>Do you use WhatsApp class groups?</p>  <table border="1"> <caption>Do you use WhatsApp class groups?</caption> <thead> <tr> <th>Response</th> <th>Count</th> <th>Percentage</th> </tr> </thead> <tbody> <tr> <td>Yes</td> <td>352</td> <td>79%</td> </tr> <tr> <td>No</td> <td>92</td> <td>21%</td> </tr> </tbody> </table>	Response	Count	Percentage	Yes	352	79%	No	92	21%						
Response	Count	Percentage														
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Finding: Over a quarter of all students in Waigani campus have not taken any TEL courses in 2025.

III. 5. LMSs at UPNG: Students' Satisfaction Levels

Table 5. Student TEL/ LMS satisfaction levels and greatest challenges																			
<p>1. How satisfied are you with online Learning Management System platforms (LMSs) at UPNG? Rate your level of satisfaction from 1 to 5 stars (5 is the highest):</p> <p>Over half of all students have a neutral / low level of satisfaction with LMSs @ UPNG</p>	<p style="text-align: center;">Satisfaction level with LMSs @ UPNG</p>  <table border="1"> <caption>Satisfaction level with LMSs @ UPNG</caption> <thead> <tr> <th>Satisfaction Level</th> <th>Count</th> <th>Percentage</th> </tr> </thead> <tbody> <tr> <td>Very high</td> <td>81</td> <td>18%</td> </tr> <tr> <td>High</td> <td>122</td> <td>27%</td> </tr> <tr> <td>Neutral</td> <td>160</td> <td>36%</td> </tr> <tr> <td>Low</td> <td>52</td> <td>12%</td> </tr> <tr> <td>Very low</td> <td>29</td> <td>7%</td> </tr> </tbody> </table>	Satisfaction Level	Count	Percentage	Very high	81	18%	High	122	27%	Neutral	160	36%	Low	52	12%	Very low	29	7%
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Very low	29	7%																	
<p>2. What are the greatest challenges you face in accessing the Internet?</p> <p>60% of all students identified expensive data and slow networks as their main challenges in TEL.</p>	<p style="text-align: center;">My greatest challenges:</p>  <table border="1"> <caption>My greatest challenges</caption> <thead> <tr> <th>Challenge</th> <th>Count</th> <th>Percentage</th> </tr> </thead> <tbody> <tr> <td>Purchasing data</td> <td>140</td> <td>32%</td> </tr> <tr> <td>Slow network</td> <td>147</td> <td>33%</td> </tr> <tr> <td>Blackouts</td> <td>28</td> <td>6%</td> </tr> <tr> <td>Low qual. Device</td> <td>8</td> <td>2%</td> </tr> <tr> <td>All of the above</td> <td>121</td> <td>27%</td> </tr> </tbody> </table>	Challenge	Count	Percentage	Purchasing data	140	32%	Slow network	147	33%	Blackouts	28	6%	Low qual. Device	8	2%	All of the above	121	27%
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Low qual. Device	8	2%																	
All of the above	121	27%																	

IV. DISCUSSION

The findings above present the demographics of the Waigani campus students surveyed and quantify their competencies, practices and attitudes to TEL as it operated in UPNG at the time of this study. The following deductions can be made from the results obtained:

1. Over half (51%) of Waigani campus students come from remote villages; another 27% schooled in small towns; therefore, well over 75% of all students may have had fewer educational opportunities than those 22% who schooled in Port Moresby.
2. Female students are underrepresented in the University (GPI = .69); this figure shows slight improvement in relation to GPI of .67 in 2015 and 2018 [3; 8]. It must be noted that PNG National High Schools have a relatively higher GPI of .76 [4; 5]. This may be due to lingering cultural attitudes and socio-economic realities.

3. Less than a quarter (23%) of all students were equipped with basic English skills needed to start effective learning in Grade 1.¹
4. Almost two thirds of all students (62%) enrolled into Grade 1 two or three years after the recommended age of 6, some even after the age of 10.
5. Over half (56%) of all students reported delayed Age at Literacy (AGELIT); almost a third of all students (29%) only learned to read and write after the age of 10.
6. The digital tools students own and Internet speeds on/off campus are largely inadequate for online course delivery.
7. Students' digital skills (rather generously self-assessed) should be upgraded.
8. Over a quarter of students do not participate in online classes delivered via Moodle and Google Classroom. Another 20-26% of students took only 1 online course in each semester.
9. Less than half (45%) of all students are satisfied with TEL delivery at UPNG, with 55% having a neutral or negative attitude.
10. High cost of data and slow Internet connectivity are the most serious challenges students face in their efforts to learn online. Lack of high quality digital devices (laptops primarily) is another serious challenge in accessing online information.

Our Aims and Objectives were also **exploratory** and **relational** – and those go beyond simple description; they seek to explain potential relationships between sample variables (such as students' demographics and students' competencies; for example, their digital skills). To investigate these relationships, we framed three hypotheses:

1st H₀ : Origin has no significant effect on students' digital skills.

2nd H₀ : AOE has no significant effect on students' digital skills.

3rd H₀ : AGELIT has no significant effect on students' digital skills.

SPSS Version 28 for Windows software and MS Excel Data Pack were used for statistical analysis.

¹ **N.B.** English is the Language of Instruction (LOI) at all levels of education in Papua New Guinea

Regarding the general findings, our data were found to have a close to fairly normal distribution with negative skewness for Origin, AOE and AGELIT (-.575, -.576 and -.378, respectively) and positive skewness (.538) for the DigiSkills variable:

	N Statistic	Minimum Statistic	Maximum Statistic	Mean Statistic	Std. Deviation Statistic	Skewness Statistic	Std. Error
Origin	444	1	3	2.29	.806	-.575	.116
Age of learning English	444	3	11	8.16	2.945	-.576	.116
Age @ Literacy	444	5	11	8.59	2.176	-.378	.116
Digi Skills cat	444	1	5	2.09	.768	.539	.116
Valid N (listwise)	444						

Descriptives / ANOVAs

Positive skewness (.539) in the DigiSkills variable means that most data is clustered on the left tail (Mean > Median), and negative – in Origin (-.575), AOE (-.576) and in AGELIT (-.378) indicates right tailed data distribution (Mean < Median).

Comparison of means and the ANOVAs run established varying strengths of association between the variables (Table 6):

Variables	Measures of Association	Effect size
Digi Skills : Origin	Eta Squared $\eta^2 = .036$	Small-to-medium effect size
Digi Skills : AOE	Eta Squared $\eta^2 = .079$	Medium effect size
Digi Skills : AGELI	Eta Squared $\eta^2 = .083$	Medium-to-Large effect size

Table 6. Measures of Association between Origin, AOE, AGELIT and DigiSkills variables

Correlations

Since data between -0.5 and 0.5 skewness are considered to be fairly symmetrical, conducting parametric correlations was viewed as appropriate. Pearson Correlation Coefficients between the (Origin, AOE, AGELIT) variables and DigiSkills indicate a weak positive correlation between them ($r=.152$, $r=.268$ and $r=.263$, respectively; $p<.001$).

Table 7 below presents all the parametric correlation coefficients, and Boxplots in Tables 8A, 8B, and 8C (also below) illustrate the various relationships between the variables tested.

		Digi Skills cat	Origin	Age of learning English	Age @ Literacy
Digi Skills cat	Pearson Correlation	1	.152**	.268**	.263**
	Sig. (2-tailed)		.001	<.001	<.001
	N	444	444	444	444
Origin	Pearson Correlation	.152**	1	.490**	.412**
	Sig. (2-tailed)	.001		<.001	<.001
	N	444	444	444	444
Age of learning English	Pearson Correlation	.268**	.490**	1	.666**
	Sig. (2-tailed)	<.001	<.001		<.001
	N	444	444	444	444
Age @ Literacy	Pearson Correlation	.263**	.412**	.666**	1
	Sig. (2-tailed)	<.001	<.001	<.001	
	N	444	444	444	444

** . Correlation is significant at the 0.01 level (2-tailed).

Table 7. Parametric correlations

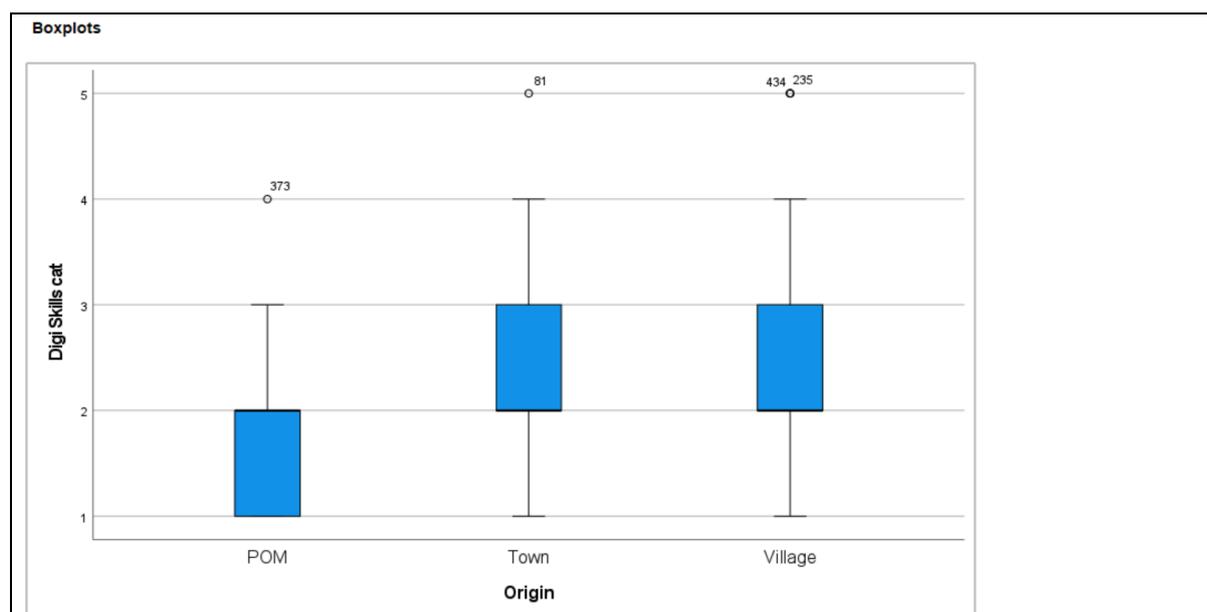
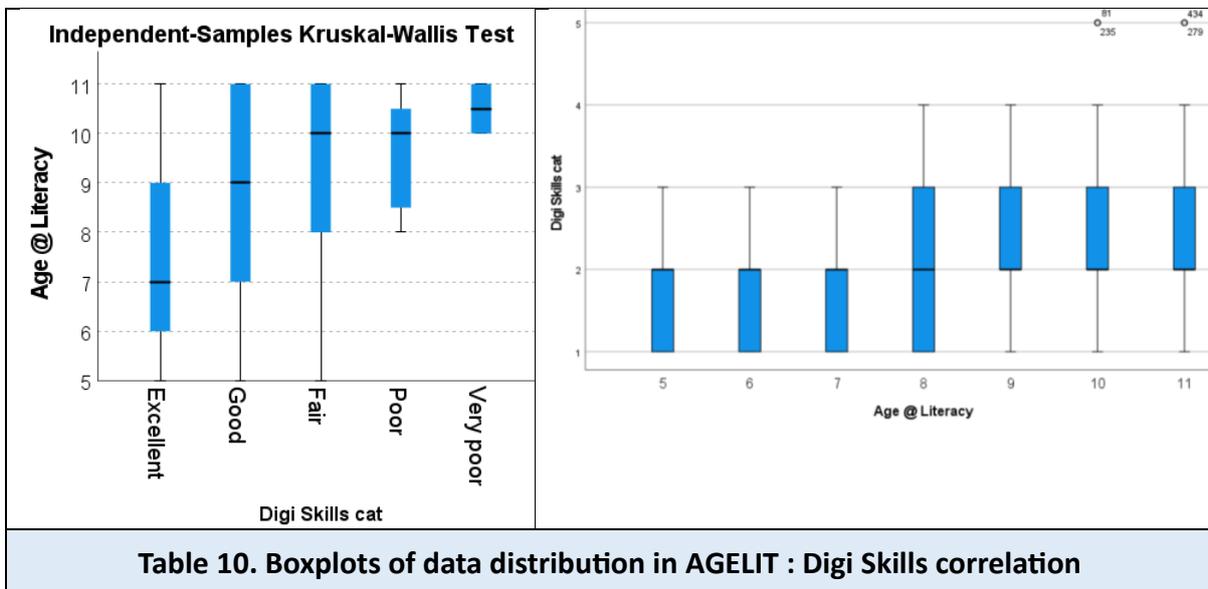
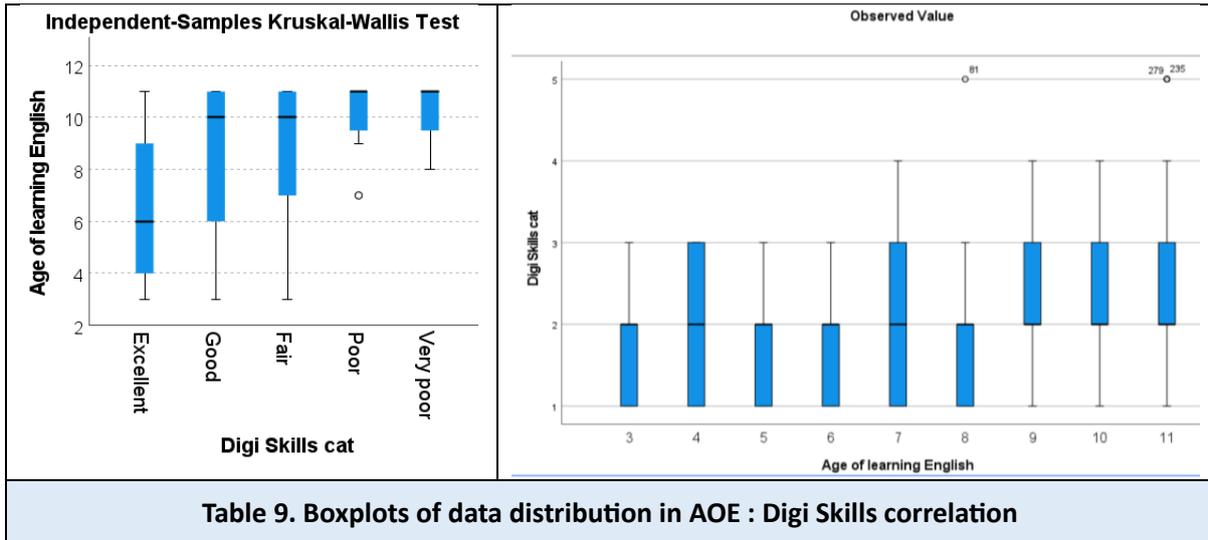


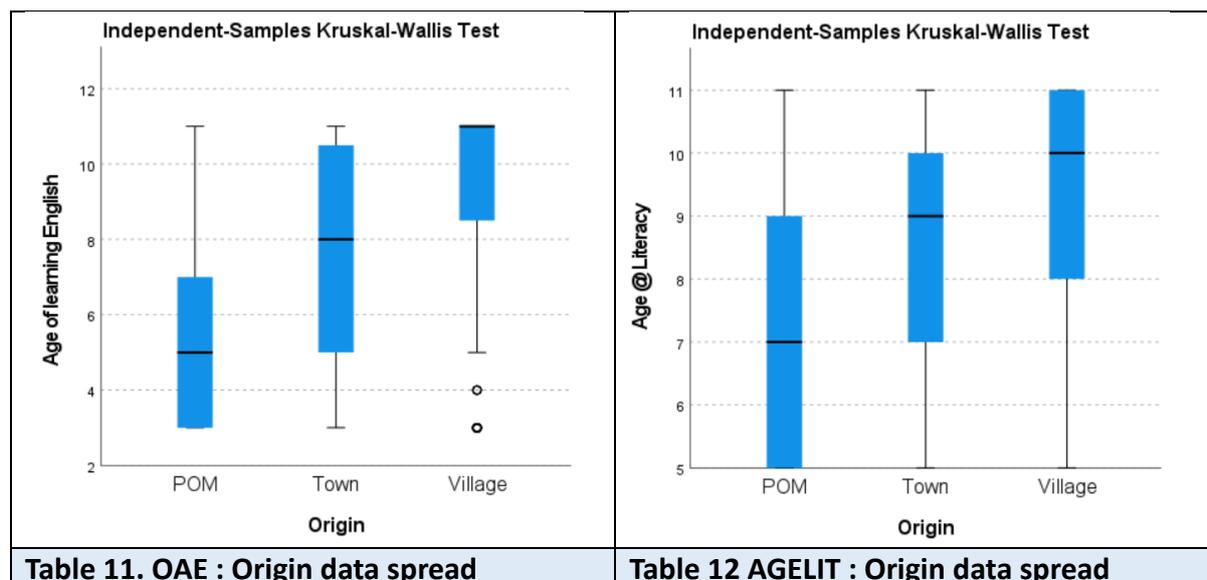
Table 8. Boxplot of data spread in Origin : DataSkills relationship

A vast majority of all students assessed their digital skills as “Good”; this level of digital skills (Level 2) is shared by most students in all groups (Median values are indicated by distinct black lines in the data spread for each category); however, most of “Excellent” (1) assessments occur only in POM and at AOE 8 and below group (Table 9).



Nota Bene: A much stronger correlation is evident between AOE and AGELIT, where we see a high positive correlation ($r=.666, p<.001$). This finding, which corroborates the findings of the LML SHSS UPNG research since 2015 [3-10], has far-reaching implications for students’ general cognitive competence and academic output.

Nonparametric analysis (Custom Field Assignments, Independent-Samples Kruskal-Wallis Test) revealed a clear advantage that children have in learning English (the national LOI in PNG formal education system) in POM as opposed to Town (other than POM) or remote Village. Most Port Moresby children learn English by the age of 5; most children from towns other than POM learn English three years later, by the age of 8; most children in remote villages learn English well after the age of 10 – over 6 years later than children in POM do (Tables 11 and 12):



Thus, Origin undoubtedly affects students’ AOE and their AGELIT. Both these parameters ultimately determine students’ English skills and, therefore, as revealed in our previous studies, their general academic performance. However, do they also affect students’ digital skills? We proceeded to test our remaining two null hypotheses:

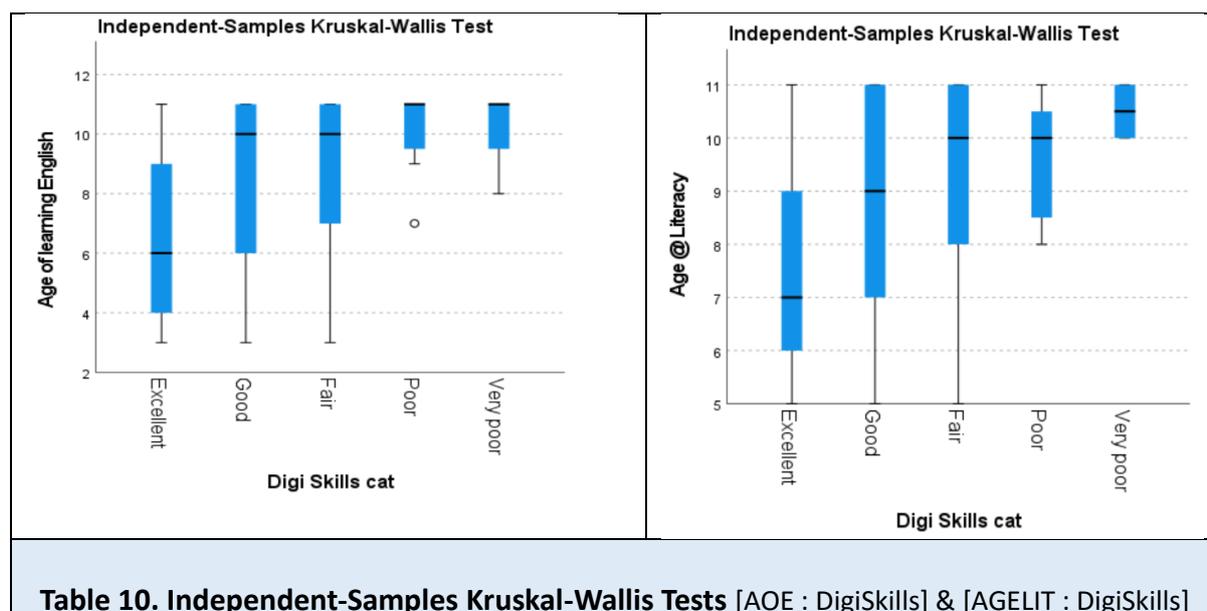
- 2nd H₀ : AO has no significant effect on students’ digital skills.
- 3rd H₀ : AGELIT has no significant effect on students’ digital skills.

Testing of Hypotheses

Using Custom Field Assignments, Independent-samples Kruskal-Wallis Tests were run as part of the Hypothesis Testing procedure. The results are presented in Table 4 below:

Hypothesis Test Summary				
	Null Hypothesis	Test	Sig. ^{a,b}	Decision
1	The distribution of Age of learning English is the same across categories of Digi Skills cat.	Independent-Samples Kruskal-Wallis Test	<.001	Reject the null hypothesis.
2	The distribution of Age @ Literacy is the same across categories of Digi Skills cat.	Independent-Samples Kruskal-Wallis Test	<.001	Reject the null hypothesis.

a. The significance level is .050.
 b. Asymptotic significance is displayed.



The AOE distribution is not the same across all categories of DigiSkills – the Median for “Excellent” is age 6, the Median for “Good” and “Fair” is age 10, and the Median for “Poor”/ “Very poor” is well over age 10. Therefore, we reject our 2nd null hypothesis and accept the alternative hypothesis:

H₁ = AOE has a significant effect on UPNG students’ digital skills.

The AGELIT distribution is not the same across all categories of DigiSkills – the Median for “Excellent” is AGELIT age 7, the Median for “Good” is age 9, the Median for “Fair”/“Poor” is 10, and the Median for “Very poor” is well over age 10. Therefore, we reject our 3rd null hypothesis and accept the alternative hypothesis:

H₁ = AGELIT has a significant effect on UPNG students’ digital skills.

V. CONCLUSIONS

To conclude, this study corroborates the general findings of our 2024 survey [1]. In addition, it describes students’ digital competences, online practices, and attitudes to TEL at UPNG:

- Well over 78% of all students come from remote villages and provincial towns, where lack of educational opportunities put them at a considerable disadvantage compared to those 22% who schooled in Port Moresby.
- Female students are underrepresented in the University (GPI = .69); this GPI is lower than the figure for PNG National High Schools which have a GPI of .76 [2; 3]. This discrepancy may be due to lingering cultural attitudes and socio-economic realities.

- Only 23% of all students were equipped with basic English skills needed to start effective learning in Grade 1.²
- Almost two thirds of all students (62%) enrolled into Grade 1 two or three years after the recommended age of 6, some even after the age of 10.
- Over half (56%) of all students, unsurprisingly, reported delayed Age at Literacy (AGELIT); almost third of all students (29%) only learned to read and write after the age of 10!
- The digital tools students own and Internet speeds on/off campus are largely inadequate for online course delivery.
- Students’ digital skills (rather generously self-assessed) are largely inadequate and should be upgraded.
- Over a quarter of students did not participate in online classes delivered via Moodle and Google Classroom in 2025. Another 20-26% of students took only 1 online course in each semester.
- Less than half (45%) of all students are satisfied with TEL delivery at UPNG, with 55% having a neutral or negative attitude.
- High cost of data and slow Internet connectivity are the most serious challenges students face in their efforts to learn online. Lack of high quality digital devices (laptops primarily) is another serious challenge in accessing online information.

To bridge the digital divide and equip students with essential digital skills, many governments are currently integrating computer programming into school curricula. In China, for example, coding has been incorporated into information technology courses for primary and secondary schools. This strategy aims to enhance students' computational thinking, digital literacy, and problem-solving abilities, preparing them for a technology-driven future [11].

The Government of Papua New Guinea is also on the right track, implementing the 2020 *PNG Digital Transformation Policy* [12] and *National Higher and Technical Education Plan 2021-2030* which envisions “A vibrant higher and technical education system that is innovative in responding to and sustaining national development aspirations in the age of knowledge economy” [13]. However, serious challenges remain: low literacy rates in traditionally oral cultures of Papua New Guinea, and a host of other interconnected issues throughout the early years of schooling lead to high attrition rates down the line, resulting in relatively low academic standards at PNG universities, including UPNG. In addition to the insights from LML AO research between 2015 – 2022 [3-9], this study revealed a significant negative effect of

² **N.B.** English is the Language of Instruction (LOI) at all levels of education in Papua New Guinea

delayed Age of Onset of learning English (AOE) and Age at Literacy (AGELIT) on students' digital skills and academic outputs generally. Without a decisive action to raise general literacy levels, coupled with effective implementation of Bilingual Early Childhood Education (ECE) policy and adequate government investment in Teacher training and ICT infrastructure, the gap between knowledge-based economies and Papua New Guinea is bound to get wider, leaving the vision of a "vibrant higher and technical education system that is innovative in responding to and sustaining national development aspirations in the age of knowledge economy" in the realm of unfulfilled possibilities.

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