

**TECHNOLOGY READINESS AND PERCEPTION AMONG  
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**Abstract:** Technology and digital learning tools can improve learning and engagement among students. This study investigates the extent of technology use and the perception of digital literacy skills and attitudes towards technology among secondary school students in Kuala Lumpur. A survey of 30 students revealed that while most students use technology tools, their digital literacy was low. Key findings indicate that while 85.2% own laptops and 86.6% own mobile phones with Internet access, interactive technologies like digital readers and interactive whiteboards are underutilized. As for technology tools for learning, 91.2% have used online quizzes and tests. However, literacies such as information and data literacy, content creation literacy and communication and collaboration literacy, were low as many students had never used these skills (27.6%, 27.7% and 36.3% respectively). Technology had an impact on learning as 95.1% reported positive experiences with technology. As there was a high level of agreement that technology was useful for learning and for the future, activities for integrating technologies in learning should be considered. Future research should investigate the technology interventions which could improve students' digital literacies and the barriers to implementation. The implication is teacher training for teachers to be equipped with digital pedagogical literacy.

**Keywords:** Technology, information and data literacy, communication and collaboration literacy, digital content creation literacy, digital safety literacy, secondary school, attitude, digital literacy

**INTRODUCTION**

Traditional instruction often fails to engage students or provide immediate feedback, leading some educators to view technology as a distraction (Haleem et al., 2022; Vakaliuk et al., 2021). However, technology can enhance learning and engagement, particularly for the younger generation (Jiao et al., 2024; Haleem et al., 2022; Wu et al., 2024a). This study investigates the extent of technology use in Malaysian secondary schools and students' perceptions of their digital literacy skills and attitudes towards technology. Understanding these aspects can help educators to design strategies to improve digital literacy among students.

**DIGITAL LITERACY**

Digital literacy is needed in the today's global economy (Kent & Giles, 2017). Being technologically literate is no longer a benefit but a requirement in the 21st century (Dinçer, 2018). Hence, there is a need to develop students' digital literacy and integrate technology in schools (Dursun, 2019).

The European Education and Culture Executive Agency Eurydice (2019) categorizes digital literacy as needed for education with the following aspects: (1) information and data literacy, (2) communication and collaboration literacy, (3) digital content creation literacy, (4) problem-solving literacy, and (5) digital safety literacy (European Commission (EC), 2019). In the first aspect of information and data literacy, basic operations deal with data, information, and digital content on three levels. Firstly it covers browsing, searching, and filtering data and information. Secondly, evaluating information and data and thirdly, managing information and data (EC, 2019; Wu et al., 2024b). For this purpose, the basic operations such as using word processing and spreadsheet programs, creating a database and installing software and managing files and folders in the computer are included under basic operations (DeWitt & Siraj, 2010).

Next, for communication and collaboration literacy, there are six digital skills, which are online etiquette, managing digital persona, utilizing digital tools for sharing, engaging in digital citizenship, and collaborating via digital platforms (EC, 2019; Wu et al., 2024b). However, in this study, digital tools for sharing, engaging and collaborating such as websites, blogs, discussion forums and text messaging are included (DeWitt & Siraj, 2010).

Digital content creation literacy refers to the generation of digital content either by developing digital materials, incorporating and refining digital resources (which includes the understanding of the principles of copyright and licenses), and coding (EC, 2019; Wu et al., 2024b). Digital photos, presentations and videos are referred to as digital materials. Problem-solving literacy is the fourth aspect of digital literacy. In solving problems, issues need to be identified and addressed. The requirements and solutions are then recognized before innovatively harnessing technologies to address these issues, before finally determining the need for digital proficiency (EC, 2019; Wu et al., 2024b). For this purpose, the ability to identify and apply digital tools for presenting and identifying ideas is required to enhance this literacy. In the final aspect of digital safety literacy, the skills in safeguarding devices, ensuring the security of personal data and privacy, upholding health and welfare, and preserving the environment are stressed (EC, 2019; Wu et al., 2024b). The responsible use of digital materials is required for literacy in this aspect.

Our students may be digital natives but it is unknown whether they have the digital literacies and are prepared for the future of work. Hence, in this study, students' digital literacy would be determined from their frequency of the usage of technology.

### ONLINE INSTRUCTIONAL STRATEGIES

Digital technology has played a significant role during the COVID-19 pandemic. Institutions had to adopt online teaching (Sangeeta & Tandon, 2021; Turnbull et al., 2021) and use digital tools for synchronous and asynchronous communication (Moorhouse & Wong, 2022). In online teaching, access to learning materials could be provided for the whole class, small groups or individuals (Henderson et al., 2017). Further, tools for communication and collaboration enable interactivity in collaborative activities (Starkey et al., 2021; Ullah & Anwar, 2020).

Technology could engage students and prevent them from being distracted. In addition, technological tools could make learning engaging and enjoyable (Ali, 2020; Haleem et al., 2022; Jones, 2020; Wang et al., 2018), especially when students create digital content for tasks requiring media production, oral presentation and group participation. Digital technologies could also enable problem-solving tasks to be done much more easily (Iñiguez-Berrozpe & Boeren, 2020; Taranto et al., 2022).

In developing students' digital literacy, it is believed that students would be confident users of digital technologies which would improve learning outcomes (Merugu et al., 2023). Learning engagement is a commitment to participation and involvement in learning (Henrie et al., 2015), and has been linked to performance (Qureshi et al., 2023). Students who are more engaged with learning value and actively participate in tasks (Lin et al., 2019).

For example, mobile technology has increased students' skills and extrinsic motivation (Lai et al., 2022). In addition, students who were familiar with technology perceived them usefully and in a positively (Mantello et al., 2023). Students who were positively engaged with technology such as recorded video lectures participated actively in synchronous activities and obtained better grades (Lin et al., 2019). In contrast, students who have low technology readiness are not confident or engaged in using digital technology (Warden et al., 2022).

Hence, it is important to identify the perceptions that learners have towards the use of technology, to determine their readiness. This will help educators target learners who need more support, which could increase their learning engagement and improve learning outcomes (Lin et al., 2019). Although our students are digital natives, it does not mean they naturally have digital literacies. Instead, students' expectations and perceptions of the usefulness of technology can impact their readiness. There have been previous studies on the digital literacies and skills in using technology as well as perceptions towards the impact of technology (DeWitt & Siraj, 2010; DeWitt et al., 2018) but it is pertinent to investigate the current situation to determine students' needs.

### METHODOLOGY

A quantitative survey was conducted through an online questionnaire. An urban public secondary boys' school which has ranked highly by the State Education Department on the use of technology in schools in terms of ICT resources, human capital development, and technology infrastructure was chosen. A total of 30 Form 2 students were randomly sampled and invited to take part in the survey to explore their use of technology tools for learning and engaged learning activities. Memon (2020) noted that the decision on sample size could result from practical considerations such as time and cost due to a geographically dispersed population. In this context, the survey was conducted during the pandemic when lockdowns were in effect. The Form 2 students were given a choice to attend

school and there was also difficulty in contacting the student population. However, given the consideration that large samples were not necessarily more statistically significant and it was more important to have a careful selection of participants (Memon, 2020), the number of participants was maintained. In addition, there were no correlations measured from the data.

The Questionnaire on Students' Use of Technology (QSUT), adapted from a report of the European Union Survey in Schools: ICT and Education (2013) was used and was organized around three constructs: a) use of technology tools at home and other places; b) use of technology tools at schools, and c) technology for learning. The first section focuses on the students' experience in using technology at home and other places. The second section presents students' experience in using technology at schools and engagement in learning activities at school. The third section relates to students' ICT skills and competence to their use of the tools, the impact of technology on learning and attitudes towards computers. In order to measure skills, competence, and impact, a four-point Likert Scale related to the frequency of technology was used with the options: (1) never, (2) rarely, (3) sometimes and (4) always. In measuring attitudes towards computers, a four-point Likert Scale was used to measure agreement with options: (1) strongly disagree, (2) disagree, (3) agree and (4) strongly agree. The instrument was validated by three experts in instructional technology, who had postgraduate qualifications and at least 5 years of teaching experience.

The data collected from the QSUT was analysed. As the data is categorical data and the information can be divided into mutually exclusive groups, cross-tabulation analysis was employed. Frequencies and percentages were used in the cross-tabulation. This is sufficient for the research question which is to investigate students' use of digital technologies in Malaysian secondary schools and students' attitudes towards technology.

## FINDINGS

The findings show students' access to technology devices and tools at school as well as students' digital literacy as gauged using the European Education and Culture Executive Agency Eurydice (2019) digital literacy framework (EC, 2019). In addition, students' perception and attitudes to the use of technologies was investigated.

### *Use of technology devices and applications at home and at school*

There seems to be a high ownership of digital devices reported as follows:

1. Use of Technology at Home: 85.2% own laptops with Internet access. 86.6% own mobile phones with Internet access.
2. Use of Technology at School: 80.4% use laptops, and 79.1% use desktop computers with Internet for learning.
  - a. Digital readers and interactive whiteboards are underutilized (56.8% and 72.3% have never used them, respectively).

The frequency of the use of technology applications at school is shown in Table 1. Software exercises, online quizzes and tests are used most often (91.2%) followed by digital books and textbooks (79.1%) and digital learning games (computer and video games) (73.0%). However, most students have never used computer simulations (61.5%), data logging tools (54.7%) or broadcasting tools (52.0%) at school. Some students use technology tools more frequently than others and there is a possibility that these students could support others who use technology less often to develop their digital skills.

*Table 1*  
*Analysis of frequency of the use of technology applications at school*

Resources and tools	Level of frequency, % (n)				Total
	Never	Rarely	Sometimes	Always	
Digital books and textbooks	20.9 (31)	20.9 (31)	21.6 (32)	36.5 (54)	100 (148)
Exercise software, online quizzes and tests	8.8 (13)	34.5 (51)	35.8 (53)	20.9 (31)	100 (148)
Data logging tools (e.g., temperature rise)	54.7 (81)	21.6 (32)	12.8 (19)	10.8 (16)	100 (148)

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Computer simulations (interactive program simulating real world phenomena in which you can make changes and see the consequences)	61.5 (91)	18.2 (27)	10.1 (15)	10.1 (15)	100 (148)
Digital learning games, computer/video games	27.0 (40)	20.9 (31)	18.9 (28)	33.1 (49)	100 (148)
Total	34.6 (256)	23.3 (172)	19.8 (146)	22.3 (165)	100

### *Digital literacy among students*

The frequency of use of technology in learning for digital literacy is shown in Tables 2 to 5.

Generally, students have low information and data literacy as more than a quarter (27.6%) have never used these skills (see Table 2). Information literacy skills for searching and filtering information seem to be most frequently used as most students are able to search the Internet to collect information (92.6%). However, students were less likely to judge the reliability of the information they collected (80.4%). In addition, many do not download/upload/browse material from their school's website (53.4%). Word processing programs seemed to be more often used (82.4%) as compared to spreadsheet programs (68.9%) and databases (53.4%).

Table 2

### *Analysis of information and data literacy*

Skills/ competence	Level of frequency, % (n)				Total
	Never	Rarely	Sometimes	Always	
<b><i>Information and data Literacy</i></b>					
Produce text using a word processing program	17.6 (26)	31.1 (46)	26.4 (39)	25.0 (37)	100 (148)
Edit online text containing Internet links and images	17.6 (26)	35.8 (53)	29.1 (43)	17.6 (26)	100 (148)
Create a database	46.6 (69)	31.8 (47)	16.2 (24)	5.4 (8)	100 (148)
Edit a questionnaire online	48.0 (71)	29.7 (44)	13.5 (20)	8.8 (13)	100 (148)
Install software on my computer	17.6 (26)	23.0 (34)	23.0 (34)	36.5 (54)	100 (148)
File electronic documents in computer folders and subfolders	25.7 (38)	29.1 (43)	22.3 (33)	23.0 (34)	100 (148)
Use spreadsheet programs	31.1 (46)	37.2 (55)	18.2 (27)	13.5 (20)	100 (148)
Use a spreadsheet to plot a graph	41.2 (61)	36.5 (54)	14.9 (22)	7.4 (11)	100 (148)
Search the Internet to collect information	7.4 (11)	19.6 (29)	31.1 (46)	41.9 (62)	100 (148)
Download/upload/browse material from your school's website	46.6 (69)	24.3 (36)	12.8 (19)	16.2 (24)	100 (148)
Judge the reliability of information found on the Internet	19.6 (29)	33.8 (50)	25.7 (38)	20.9 (31)	100 (148)
Identify online sources of reliable information	12.8 (19)	23.6 (35)	38.5 (57)	25.0 (37)	100 (148)
Total	27.6 (491)	29.6 (526)	22.6 (402)	20.1 (357)	100 (1776)

The frequency of use of technology tools for communication and collaboration literacy is very low as cross-tabulation indicates more than one-third (36.3 %) have never used these tools (see Table 3). Although online chat for schoolwork (82.4%) seems to be most frequently done, other communications such as sending or reading email messages were less frequently used (70.9%). In general, the findings indicate that communication and collaboration literacy was very low.

Table 3  
Analysis of Communication and collaboration literacy

Skills/ competence	Level of frequency, % (n)				Total
	Never	Rarely	Sometimes	Always	
<b>Communication and collaboration</b>					
Chat online for schoolwork	17.6 (26)	15.5 (23)	24.3 (36)	42.6 (63)	100 (148)
Send or read email messages	29.1 (43)	33.8 (50)	22.3 (33)	14.9 (22)	100 (148)
Email a file to someone/another student or teacher	18.2 (27)	28.4 (42)	26.4 (39)	27.0 (40)	100 (148)
Participate in a discussion forum on the Internet	38.5 (57)	27.0 (40)	20.9 (31)	13.5 (20)	100 (148)
Contribute to and/or create blogs or discussion forums for school work	61.5 (91)	17.6 (26)	10.1 (15)	10.8 (16)	100 (148)
Post your work on the school website	48.6 (72)	16.2 (24)	18.9 (28)	16.2 (24)	100 (148)
Create blogs or web sites and maintain them	52.7 (78)	27.7 (41)	11.5 (17)	8.1 (12)	100 (148)
Participate in social networks and use most of their features	24.3 (36)	31.1 (46)	25.7 (38)	18.9 (28)	100 (148)
Total	36.3 (430)	24.7 (292)	20.0 (237)	19.0 (225)	100 (1184)

Students have low digital content creation literacy as more than a quarter (27.7%) have never used these skills (see Table 4). However, students do sometimes edit digital photographs or graphics (81.1%) and some have created multimedia presentations (77.0%).

Table 4  
Analysis of digital content creation literacy

Skills/ competence	Level of frequency, % (n)				Total
	Never	Rarely	Sometimes	Always	
<b>Digital content creation</b>					
Edit digital photographs or other graphic images	18.9 (28)	32.4 (48)	30.4 (45)	18.2 (27)	100 (148)
Broadcasting tools (publish podcast, upload to You Tube, etc.)	52.0 (77)	20.3 (30)	12.2 (18)	15.5 (23)	100 (148)
Multimedia production tools (e.g. PowerPoint, video editing, digital recording)	12.8 (19)	40.5 (60)	29.1 (43)	17.6 (26)	100 (148)
Create a presentation with animations	31.8 (47)	25.0 (37)	19.6 (29)	23.6 (35)	100 (148)
Create a multimedia presentation (text, graphics, video ...)	23.0 (34)	27.7 (41)	24.3 (36)	25.0 (37)	100 (148)
Total	27.7 (205)	29.2 (216)	23.1 (171)	20.0 (148)	100 (740)

Digital safety literacy was higher as only 10.2 % have never considered aspects of digital safety (see Table 5). Students seem more likely to use the Internet safely to respect others' reputations (91.9%) and their own privacy (93.2%), as well as to protect their online reputation (92.6%) and protect against bullying (88.5%). Digital safety is an important area required in order to use the Internet safely especially when using new technologies in the classroom.

Table 5  
Analysis of digital content creation literacy

Skills/ competence	Level of frequency, % (n)				Total
	Never	Rarely	Sometimes	Always	
<b>Digital safety</b>					
Use the Internet safely to protect yourself against bullying	11.5 (17)	14.9 (22)	29.1 (43)	44.6 (66)	100 (148)
Use the Internet safely to protect your online reputation	7.4 (11)	18.2 (27)	29.7 (44)	44.6 (66)	100 (148)
Use the Internet safely to respect the privacy of others	6.8 (10)	14.9 (22)	26.4 (39)	52.0 (77)	100 (148)
Use the Internet safely to respect others' reputation	8.1 (12)	12.2 (18)	26.4 (39)	53.4 (79)	100 (148)
Use information found on the Internet without plagiarising (e.g., copy/paste in homework)	15.5 (23)	24.3 (36)	31.8 (47)	28.4 (42)	100 (148)
Protect yourself against spam and junk mail	12.2 (18)	11.5 (17)	23.0 (34)	53.4 (79)	100 (148)
Total	10.2 (91)	16.0 (142)	27.7 (246)	46.1 (409)	100 (888)

**Impact of technology and attitude towards computers**

Table 6  
Analysis of the impact of technology on learning

Impact of technology	Level of frequency, % (n)				Total
	Never	Rarely	Sometimes	Always	
You concentrate more on what you're learning	4.7 (7)	20.3 (30)	37.8 (56)	37.2 (55)	100 (148)
You try harder in what you're learning	4.7 (7)	15.5 (23)	33.8 (50)	45.9 (68)	100 (148)
You feel more independent in your learning (e.g., go over work again, find out more about things you are interested in)	4.7 (7)	18.9 (28)	27.7 (41)	48.6 (72)	100 (148)
You understand more easily what you're learning	3.4 (5)	22.3 (33)	40.5 (60)	33.8 (50)	100 (148)
You remember more easily what you've learnt	2.7 (4)	30.4 (45)	35.8 (53)	31.1 (46)	100 (148)
ICT enables you to work better with other students on tasks	7.4 (11)	21.6 (32)	30.4 (45)	40.5 (60)	100 (148)
ICT improves the atmosphere in class (e.g., students are more engaged, there is less disruption)	6.8 (10)	25.0 (37)	28.4 (42)	39.9 (59)	100 (148)
Total	4.9 (51)	22.0 (228)	33.5 (347)	39.6 (410)	100 (1036)



The impact of technology on learning seems to be positive (see Table 6). Generally, students perceive that they are more often able to learn better with technology as they remember more easily (97.3%) and understand better (96.6%). In addition, the students perceived that ICT improves the atmosphere in class (93.2%) and enables them to work better with other students on tasks (92.6%). Hence, there seems to be a positive perception of the impact of technology on learning.

There seemed to be a positive attitude towards the use of computers for learning as only 5.4% had never considered it useful for learning and 2.2% had never considered it useful for the future (see Table 7). Generally, most students agreed that learning with computers was fun (89.9%). However, there was some disagreement that they were distracted as they lost track of time when learning with the computer (50.0%). However, there seems to be an agreement that the computer was a necessity in future studies (83.7%) and in the work they would do later (90.6%). Hence, there were positive attitudes among students on the need for computers in learning and for their future. Kaedah ISM melibatkan langkah seperti berikut:

Table 7  
Analysis of the impact of technology on learning

Attitudes towards computers	Percentage of Agreement, % (n)				Total
	Strongly disagree	Disagree	Agree	Strongly agree	
<b>Useful for learning</b>					
It is really important to me to work with a computer for learning	4.7 (7)	10.1 (15)	55.4 (82)	29.7 (44)	100 (148)
Using a computer for learning is really fun	2.0 (3)	8.1 (12)	42.6 (63)	47.3 (70)	100 (148)
I use a computer for learning because I'm very interested in computers	2.7 (4)	18.2 (27)	40.5 (60)	38.5 (57)	100 (148)
I lose track of time when I'm learning with the computer	12.2 (18)	37.8 (56)	36.5 (54)	13.5 (20)	100 (148)
Total	5.4 (32)	18.6 (110)	43.8 (259)	32.3 (191)	100 (592)
<b>Useful in the future</b>					
It's really worth using a computer for learning because it will help me in my future life as an adult	.7 (1)	14.9 (22)	41.2 (61)	43.2 (64)	100 (148)
I use a computer to learn as it will help in the work that I want to do later on	2.0 (3)	7.4 (11)	53.4 (79)	37.2 (55)	100 (148)
I learn things using computers that will help me to get a job	2.0 (3)	18.2 (27)	45.3 (67)	34.5 (51)	100 (148)
Learning with computer is important for me because I need it for what I want to study later on	4.1 (6)	12.2 (18)	37.8 (56)	45.9 (68)	100 (148)
Total	2.2 (13)	13.2 (78)	44.4 (263)	40.2 (238)	100 (592)

## DISCUSSION

The findings suggest that while technology ownership is high among students, the use of interactive technologies in school is limited. Similar to previous studies, the ownership of personal mobile devices among students was high (Alelaimat et al., 2020) and was used for learning (Starkey et al., 2021; Ullah & Anwar, 2020). The usage of interactive tools can make learning more engaging (Ali, 2020; Haleem et al., 2022). Similarly, digital learning games have the potential for high learning engagement (Wang et al., 2018). This highlights a potential area for development in enhancing digital literacy through a more integrated use of interactive tools and game-based learning. Future research could explore interventions to increase the use of these technologies for learning.

The findings also indicate that information and data literacy as well as digital content creation literacy was low. Only word processing for producing text documents and searches for online sources of information was frequently used, while more complex applications such as spreadsheets had low usage. These findings reflected previous research which showed that spreadsheets were infrequently used for learning (DeWitt et al., 2015). In addition, presentations with animations or multimedia and media broadcasting were hardly used. Hence, this is another potential area for development in enhancing digital literacy. Teachers could include activities which include the applications of spreadsheets and databases and the development of multimedia content to broadcast such content. This is because these literacies are important for future careers. The use of spreadsheets, management of databases and content creation are essential skills for management, business and marketing. Future research could explore interventions to increase the use of these applications for learning.

The findings also indicate communication and collaboration literacy was very low. Tools for information dissemination such as blog and website creation were hardly used, while emails and discussion forums were not common. This was also similar in previous studies as emails and discussion forums were rarely used (DeWitt et al., 2015). Hence, there is a potential for development in enhancing digital literacy for communication and collaboration through the introduction of more communication and collaborative tools. Collaborative tools can develop knowledge management processes and encourage the building of new knowledge. These aspects are essential for innovation at work (DeWitt & Koh, 2019). Hence, future research could explore interventions to increase the use of these tools for learning and improve digital literacy.

On the other hand, digital safety literacy seemed to be high as students exhibited a high level of digital citizenship. As digital classrooms could encourage a more inclusive learning environment, there was also the possibility of unethical use of technology (Haleem et al., 2022). Hence, there is a need for development in enhancing digital safety literacy and digital citizenship to constantly emphasize its importance (EC, 2019; Wu et al., 2024b).

The findings also indicate that students find digital technologies to have a positive impact on learning and agree that it is important for their work and in their future lives. This is even more important as digital literacies become more important for work. Hence, it can be seen that digital literacies are important to prepare our students for the future. Digital literacies, which prepare and incorporate life-long learning skills, have the potential to enable our students to adapt to new and emerging technologies such as virtual reality and artificial intelligence.

Although the study has limitations which include the small sample size and focused only on a single school, which may limit generalizability, it provides insights into the situation at the school. In general, digital literacy was low although students had a positive attitude towards using technology. Hence, teachers could integrate technology in the classroom to improve digital literacy. However, teachers may not have the competency or the confidence to use digital tools in the classroom (Wu et al., 2024a). Future research should also focus on the competencies teachers need for integrating technology, which is digital pedagogical literacy. This competency is important in developing digital literacies for the 21st century (EC, 2019) and to develop competent and knowledgeable digital citizens of the future.

## CONCLUSION

This study highlights that while there is a high level of technology ownership among students, there is a gap in the use of interactive educational technologies. Students have low digital literacies as they reported a lack of use of information and data skills, digital content creation literacy, as well as communication and collaboration tools. Enhancing digital literacy requires integrating these skills into the learning activities in the classroom. However, it is not clear whether teachers have digital pedagogical literacy (Wu et al., 2024b) to integrate technology into their teaching. Hence, future research should focus on strategies to overcome barriers to technology adoption in



schools and improve digital literacy. This may have implications on teacher training as the level of teachers' digital literacy and digital pedagogical literacy may need to be improved.

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