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Research article

Assessing Student ICT Knowledge Through Survey and Hands-On Task

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ARTICLE INFO

Article history:
Received 04 02, 2023
Revised 05 01, 2023
Accepted 07 23, 2023
Available online 08 21, 2023

Keywords:
ICT
ICT Knowledge
Computer Application
E-Skills

Please cite this article in IEEE style as:
F. M. Yamin, W.H.W. Ishak, and A. Abdullah, " Assessing Student ICT Knowledge Through Survey and Hands-On Task " *Data Science Insights*, vol. 1, no. 1, pp. 1-7, 2023.

ABSTRACT

To date, knowledge on information and communication technology (ICT) is a vital to all students. ICT knowledge is the skills of using appropriate ICT devices and software to accomplish a task. This knowledge is gain through practices and experience when using the ICT. Besides the academic excellence, ICT knowledge is another most important assets for any graduate before entering the job market. This is because ICT has become one of the key components of any organization's operations. This study aims to assess the level of ICT mastery among final year undergraduate students. This study employed two main methods of questionnaire and practical activities. The questionnaire aimed to assess students' basic knowledge on ICT while the practical activities aimed to assess students' actual skills. The findings from the questionnaire show that students believe that they have adequate knowledge on ICT. However, practical activities show that students' true mastery is still at a moderate level. Therefore, students need to enhance their ICT skills to enhance their value and capabilities in the job market. Students also should take the advantage of exploring and applying their ICT skills during their learning activities such as preparing, completing, and presenting their assignments. These are crucial exercises that can improve their ICT knowledge and skills.

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1. Introduction

Information and Communication Technology (ICT) is one of the most important tools to individuals, organizations, and businesses. In fact, almost all human activities rely on ICT such communication, entertainments, shopping, education, etc. According to the Internet Users Survey 2020 report conducted by the Malaysian Communications and Multimedia Commission (MCMC), Internet users in Malaysia have increased from 87.4% in 2018 to 88.7% in 2020 [1] The study also found that smartphones remain the most popular device used to access the Internet. As reported in 2018, smartphone is one of the most popular devices to access the internet along with other devices [2]. The 2020 report also reveal that the use of internet among children aged 5 to 17 in 2020 (47%) has increase 155% since it was last surveyed in 2016 (18.4%).

In Malaysia, ICT evolves dramatically since the introduction of Multimedia Super Corridor (MSC) in 1995. Since then, massive campaign was steered to increase Malaysian awareness on ICT and promote it usage among organizations and businesses [3]. In conjunction, Malaysian government has also taken several positive actions to increase ICT utilization such as revision of the import tax for ICT product and tax incentives for ICT company operating in Malaysia. As a result, MSCs have shown positive effect on the Malaysian economy [4].

To date, all organizations whether government or private, small or large, local or international, have utilize ICT as one of their main assets. This is because ICT can be used at various levels in the organization. In fact, the use of ICT brings many advantages such as; reduce costs, increase organizational efficiency, improve decision making efficiency and enhance organizational competitiveness [5][6].

The industrial revolution 4.0 put greater pressure on organizations to increase the implementation of ICT in their operations. This is because industry 4.0 emphasizes the use of high technology in operations and production such as Internet of Thing (IoT), artificial intelligence, robots, sensors and so on [7]. Therefore, ICT knowledge is vital in organization as poor ICT knowledge may reduce the effectiveness of ICT usage [8].

The students at the higher learning institutions should be prepared with adequate ICT knowledge and skills before entering the job market [9][10]. They should be able to support industry's ICT needs. For instance, they should become the knowledge worker that be able to operate ICT devices, use and solve related problems using ICT. The self-reporting of ICT knowledge and skills through a questionnaire is a common approach to assess ICT knowledge and skills at low cost. However the approach does not reflect the true students' ICT knowledge. For instance two students with the same actual knowledge and skills level may give different self-assessments depending on their confidence level [11]. Inaccurate self-assessment might hinder the true potential of the students [12].

This paper discusses the assessment of ICT mastery among undergraduate student. The assessment is based on two methods; questionnaire and practical activities. The questionnaire gives an overview of the students' ICT knowledge while in-depth measurement will be obtained through the practical activity. The practical activity is a problem solving task, where students are required to use their ICT knowledge to solve a problem. This approach will give an actual measurement of the students' actual ICT mastery.

The knowledge and ability to use ICT technology effectively is a prerequisite for today's job market [13][14]. Previous research has shown that the use of ICT leads to better academic performance [15][16][17]. These achievements will indirectly increase student prospects in the labor market.

Generally, ICT-related skills are also known as e-skills [18]. E-skills are the ability to use ICT for a variety of purposes including personal, social and business. It covers a wide range of skills in the use of ICT tools such as computer tools and tools, application software, the internet and more.

E-skills can be divided into three categories: ICT user skills, ICT practical skills, and e-leadership skills [14]. ICT practical skills are the ability to apply ICT skills to various tasks such as problem solving, marketing, administration, and planning. ICT user skills are the capabilities associated with the use of ICT applications, systems, tools, and devices. Meanwhile, e-leadership skills refer to the ability of organizational leaders to achieve organizational goals.

2. Research Methods

The respondents of this study are final year undergraduate students. The students were selected randomly from different academic program. Two approaches have been conducted to assess students' e-skills: survey and hands-on task.

The survey was adapted from [19]. The aimed is to measure students present ICT knowledge. The questionnaire uses 5 likert scale measuring four aspects of ICT that are (1) issues and basic operation of a computer, (2) application software, (3) Internet, and (4) ICT equipment. Table I shows the description of the likert scale.

The hands-on task is conducted in a computer lab monitored by a facilitator. Students were given a task to prepare certificates for 10 individuals using Microsoft Word. The example of the certificate is shown in Fig. 1. Students were given one hour to prepare the certificate. Students are also required to find the similar pictures as in the example from the Internet.

Table 1. Description on the Likert Scale

Scale	Code	Description
1	NA	"I am not aware of this application/operation"
2	DU	"I do not use"
3	OU	"I have used this occasionally but need further training"
4	RCU	"I am a regular and confident user of this application"
5	FC	"I am fully competent with this application/operation"

Fig. 1. Example of Certificate

The hands-on task aimed to assess students actual e-skills, where there are expected to use the appropriate ICT tools and software to complete the task. Once done, students were instructed to submit the 10 certificates to the instructor's email. Students work were given marks and grade as shown in Table 2.

Table 2. Marks Range and Grade

Marks	Grade
$x < 34.45$	F
$34.45 <= x < 39.45$	D
$39.45 <= x < 44.45$	D+
$44.45 <= x < 49.45$	C-
$49.45 <= x < 54.45$	C
$54.45 <= x < 59.45$	C+
$59.45 <= x < 64.45$	B-
$64.45 <= x < 69.45$	B
$69.45 <= x < 74.45$	B+
$74.45 <= x < 79.45$	A-
$79.45 <= x < 89.45$	A
$x >= 89.45$	A+

Through this task, student's actual ICT skills can be evaluated as following:
1) Using Microsoft Word appropriately
2) Obtain the similar pictures as in the example given from the Internet using Google search engine
3) Using appropriate software to edit the pictures
4) Manage the materials and related files in the computer efficiently (such as creating folder and sub-folder)
5) Using zip or rar software to compress files before sending it through email.
6) Using email appropriately (with subject and appropriate email content).

3. Results and Discussion

The total number of students involved in this study was 63 and divided into two groups according to the capacity of the computer lab used. Fig. 2 shows the distribution of students involved by gender, as shown in Fig. 2, the majority of respondents were female (83%), while men were only 17%.

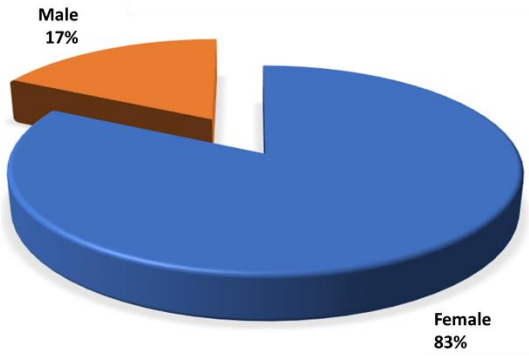

Fig. 2. The Distribution of Students Involved by Gender

3.1. Current Level of Student ICT Knowledge

Descriptive analysis was performed on student feedback to see student feedback on each question posed. Student feedback is made easier by representing the scale of 1 to 5 into 3 classes: low, middle and high. Scales 1 and 2 are classified as low, scale 3 as middle and scale 4 and 5 as high.

Table III shows student feedback on basic computer operations and issues. Feedback shows that students are familiar with most of basic computer operations such as opening application software, finding files, using CDs/DVDs, using folders, changing drivers and printing. However, some students (less than 50%) rarely use peripheral devices. This may be due to students rarely assembling and removing their computer devices. Students were also found to be less concerned about safety and health issues related to the computer usage. As shown in Table 3, less than 40% of students were concerned about computer security and user's health.

Table 3. Basic Computer Operation and Issues

	Low (%)	Middle (%)	High (%)
CO_1: I can locate and run an application program e.g. word.	7.94	22.22	69.84
CO_2: I can search for files on computer system.	0.00	14.29	85.71
CO_3: I can connect the computer and its peripherals.	6.35	39.68	53.97
CO_4: I can access information on CD/DVD.	3.17	19.05	77.78
CO_5: I can organize electronic files into folders.	7.94	15.87	76.19
CO_6: I can move files between drives (e.g. from A: to C).	4.76	7.94	87.30
C0_7: I can print to various networked printers.	0.00	34.92	65.08
C0_8: I am aware of computer security, copyright and the law.	6.35	55.56	38.10
CO_9: I am aware of health and safety issues relating to the computing environment.	14.29	49.21	36.51

Table 4 shows student feedback on application software. In this study respondents were asked to provide feedback on three commonly used application software namely Microsoft Word, Microsoft Excel and Microsoft PowerPoint. As expected, students are well versed in Microsoft Word software. Over 90% of respondents know how to create new documents and know how to use basic functionality in Microsoft Word. Respondents also knew how to use Microsoft PowerPoint software to create a presentation slide. Respondents' feedback shows that over 70% of respondents know how to create a presentation slide and update their colors and text. More than 60% of respondents know to use animations in their presentation slides. Students' proficiency in Microsoft Excel software is relatively low compared to Microsoft Word and PowerPoint software. Feedback shows that less than 50% of respondents know how to use Microsoft Excel well, make predictions and organize and filter data. This finding shows that Microsoft Excel software is difficult and quite technical among students. So not all students can handle it very well. Furthermore, not many students are using Microsoft Excel software in their study, compare to Microsoft Word and Powerpoint.

Table 4. Application Software

	Low (%)	Middle (%)	High (%)
AS_1: I can open a new document in word.	0.00	4.76	95.24
AS_2: I can use simple editing e.g. bold, italics, centering, font size, etc.	0.00	4.76	95.24
AS_3: I can use spreadsheet package very well.	7.94	47.62	44.44
AS_4: I can use spreadsheet to make predictions.	12.70	47.62	39.68
AS_5: I can sort and filter data.	9.52	42.86	47.62
AS_6: I can create a basic presentation package.	3.17	20.63	76.19
AS_7: I can modify colors of text, lines and spaces on a slide.	0.00	12.70	87.30
AS_8: I can introduce animation into slides.	9.52	25.40	65.08

Levels of Internet use among students are shown in Table V. Overall, the findings show that students use the Internet for communication and learning purposes such as searching information and downloading material from the Internet. Technical activities such as the use of meta search engines and web development tools have been found to be less popular among students. Students are also less likely to enter a web site directly through the web address.

Table 5. Internet Usage

	Low (%)	Middle (%)	High (%)
AR_1: I can access an Internet site via its website address.	31.75	46.03	22.22
AR_2: I can download files from the Internet.	0.00	15.87	84.13
AR_3: I can send and receive e-mail messages.	0.00	4.76	95.24
AR_4: I can attach files to outgoing e-mails.	1.59	15.87	82.54
AR_5: I can sort messages and file in created folders.	4.76	17.46	77.78
AR_6: I can save a document in various file formats including HTML.	7.94	39.68	52.38
AR_7: I can save text and images from web pages.	4.76	9.52	85.71
AR_8: I can communicate online with other students on homework /	1.59	7.94	90.48
AR_9: I can use web search engines very well.	3.17	6.35	90.48
AR_10: I can do deep web searching using appropriate meta-search engines very well.	34.92	44.44	20.63
AR_11: I can use web authoring tools.	23.81	44.44	31.75
AR_12: I can chat on the Internet using instant messaging tools (Yahoo, MSN, Skype, etc.).	3.17	19.05	77.78

The use of ICT hardware among students is also quite good. As shown in Table 6, the majority of students (over 50%) know how to use digital cameras for taking pictures, communicating through webcams on the Internet and making photocopies using digital scanners. However, only a few students (30%) know how to operate a Liquid Crystal Display (LCD) or Multimedia projector for multimedia presentation purposes.

Table 6. I ECT quipment

	Low (%)	Middle (%)	High (%)
IE_1: I can use a digital camera to capture images.	3.17	20.63	76.19
IE_2: I can use the web camera to communicate on the Internet.	9.52	25.40	65.08
IE_3: can set up and use Liquid Crystal Display (LCD) or Multimedia Projector.	30.16	38.10	31.75
IE_4: I can use a scanner to copy images.	6.35	36.51	57.14

3.2. Results of hands-on task

Table 7 shows the overall scores obtained by students based on the tasks they completed. Two students did not submit the assignment, two students failed, while the other students passed with a minimum grade of D+. Most students received grades C, C +, B- and B. Six students received grade A and three students received grade A-.

Table 7. Score for the Task

Minimum Score	**Grade**	**Frequency**	**%**
	Not submitted	2	3.17
0	F	2	3.17
34.45	D	0	0.00
39.45	D+	4	6.35
44.45	C-	3	4.76
49.45	C	9	14.29
54.45	C+	8	12.70
59.45	B-	10	15.87
64.45	B	11	17.46
69.45	B+	5	7.94
74.45	A-	3	4.76
79.45	A	6	9.52
89.45	A+	0	0.00
	TOTAL	**63**	**100**

Table 8 shows the students' skill scores for each component of the task assigned to them. The findings show students have basic skills in using Microsoft Word, using search engines, findings and manipulating images. However, students were found to be weak in performing the alignment function in Microsoft Office. Students were also found to be unable to apply mail-merge in this assignment. Most students also do not use software to compress files. Only 32.79% sent compressed work attachments. In terms of email usage, all students have submitted assignments by email. This shows that they have a basic knowledge of email. However, not many students use email correctly such as placing the appropriate subject and writing the content of the email.

Besides Microsoft Office, students were found to be using various software such as Adobe Photoshop, Microsoft Excel, Microsoft Publisher, Microsoft PowerPoint, paint and so on in completing their task.

Table 8. Student Skills Score by Activity

			%
1.	Microsoft Word basic skills		
	a. Using font – select font type, size, color, style	:	87.13
	b. Alignment – apply and setting adjustment	:	31.97
2.	Mail-merge	:	0
3.	Picture – retrieve, manipulate, and apply according to the example given		
	a. Correct/similar pictures	:	92.62
	b. Editing Picture - crop, picture effect	:	44.26
	c. Pictures are manage appropriately	:	60.66
4.	Identical logo	:	96.72
5.	Internet, web browser and searching facility		
	a. Using appropriate search engine	:	100
	b. Relevant keywords	:	100
6.	Compress file	:	32.79
7.	Email		
	a. Using email	:	100
	b. Use appropriate subject as instructed	:	75.41
	c. Email content	:	6.56

4. Conclusion

Students with sufficient ICT skills are expected to be able to utilize various ICT resources and applications to full fill their jobs' requirements [20]. For instance, using appropriate software and tools students can find a wide range of information, filter and perform the necessary analysis [17]. The mastery of ICT skills at the university level will help students to enter and compete in the job market. This is because organizations need staff who can use ICT well.

However as shown from the findings, students seem to be very confident with their ICT knowledge. They seem to have adequate knowledge to perform basic operation of computer and using software to solve problems. This is in line with other studies such as [11][12]. However, the hands-on task shows that their ICT competency were not as expected. The task given only required some basic skills of Microsoft Office. Besides other software such as compress software, email, and web browser are just the supporting tools, which they should have mastered.

These findings can be concluded that students need to equip themselves with more ICT knowledge. ICT knowledge is not just a know-how knowledge. It needs to be practice and explored so that more problems can be solved efficiently. As demonstrate in this study, students may find easier to produce 10 certificates if they can adapt the mail-merge concept in Microsoft Word.

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