

Information and communication technology awareness of Indonesian high school students

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ABSTRACT: Digital competence is a promising skill to be learned in this ICT era. However, teaching such skill is not a trivial task, especially when the students are not ICT-aware. In this article, the authors consider the ICT awareness of high school students in Indonesia. According to this study that involved 113 respondents at the beginning of August 2018, most students are aware of the existence of ICT and they frequently interact with ICT devices or services. Further, they are familiar with at least one ICT application or skill. In conclusion, high school students have a considerable amount of ICT awareness. Digital competence can, therefore be taught to them with ease.

Keywords: ICT awareness, digital competence, computing education, k-12 education

INTRODUCTION

Information and communication technology (ICT) significantly alters our daily life [1]. In the past, for example, one often relied on the postman to communicate with people in remote areas. Nowadays, one can simply use an e-mail service, which is far cheaper and faster. Another significant impact occurs in the learning process. One was used to learning with physical books and attend on-site classes to learn things. Now, one can just simply read softcopy books (which are accessible through the Internet) and learn remotely through educational tools.

The significant impact of ICT draws a lot of attention in both industry and academia. From the industry perspective, the impact of ICT is argued to affect output growth in the economy [2] and skill demand [3]. In academia, on the other hand, ICT is argued to provide learning alternatives (such as self-learning through educational tools [4] or distance learning [5]), even though those alternatives are only beneficial when academia is adaptive to it [6].

Considering the crucial role ICT plays in human life, it starts to be taught to school students. Some related research works are reported to focus on three school actors: students (or learners), teachers and stakeholders (or school leaders). Student-focused research is mainly focused on how to provide more convenient learning mechanisms with ICT. For instance, in the work carried out by Bilyalova ICT was implemented in learning foreign languages [7]. Another two examples are about collecting the student perspective on the use of non-academic ICT for academic performance [8] and combining ICT and gamification in learning [9].

From the teachers' point of view, research work is more focused on how to facilitate and encourage teachers to integrate ICT in their teaching. Revilla Muñoz et al proposed a mechanism to reduce teachers' techno-anxiety by improving their ICT problem-solving skills [10]. Work by Rao et al summarised the differences in ICT usage among teachers (so that ICT usage guideline for teachers can be further extracted) [11]. Other research shows the evaluation of the impact of ICT (which could be used to convince the teachers about the benefits of ICT and to encourage them to apply it in their own teaching) [12-14].

Despite them not being directly related to the teaching process, stakeholders (or school leaders) are still important in integrating ICT at schools. The summary of school leaders' perspective about ICT usage can be seen in work by Blau

and Shamir-Inbal [15]. In addition to facilitating the teaching process, ICT can also be used as a medium to mitigate the gap between high schools and universities [16].

The advance of ICT does not only affect teaching process in schools and universities, but it also forces them to teach their students about digital competence. According to Hatlevik et al, digital competence refers to the skills, knowledge and attitudes that make learners use digital media for participation, work and problem solving in a critical, responsible, and creative manner [17]. However, teaching digital competence is not a trivial task since it depends heavily on students' prior knowledge about ICT. If the students are aware of the existence of such things, it will be easier to teach digital competence. Otherwise, more advanced teaching methods should be incorporated.

This article reports on the ICT awareness of high school students in Indonesia, involving 113 respondents. In general, three research questions are proposed: 1) how aware are the students of ICT?; 2) how frequently do the students interact with ICT?; and 3) how many ICT applications (or skills) have the students been familiarised with? Findings resulting from this study are expected to support teaching digital competence in Indonesia, especially at the undergraduate level (which is the successive level of high school). Further, from the university stakeholder perspective, those findings can also be used for reaching the right market or proposing more suitable academic curricula.

METHODOLOGY

To measure high school students' awareness about ICT, a questionnaire containing nine questions was proposed (see Table 1 for the details). The first two questions (i.e. S1 and S2) are related to how aware the students are of ICT. S1 asks about whether they are aware that ICT is inseparable from daily life; whereas S2 asks whether ICT is an attractive field to be learned (with an assumption that such interest is also affected by student awareness about ICT impact). Those questions should be answered in a 4-point Likert scale, where 1 refers to strongly disagree and 4 refers to strongly agree.

Table 1: Survey questions.

ID	Question
S1	Do you agree that your daily life is inseparable from ICT?
S2	Do you agree that ICT is an attractive field to be learned?
S3	How many hours do you spend (on average) for interacting with computer?
S4	How many hours do you spend (on average) for interacting with smartphone?
S5	How many hours do you spend (on average) for interacting with Internet?
S6	How many hours do you spend (on average) for interacting with computer or smartphone games?
S7	Which social media platforms are you familiar with?
S8	Which ICT skills are you familiar with?
S9	Which programming languages are you familiar with?

The following four questions (i.e. S3 to S6) are about how frequently the students interact with ICT. For each question, it should be answered with a non-negative integer describing how many hours are involved on given interaction. Four ICT devices and services are considered: computer (or laptop), smartphone, Internet and electronic games played from either computer or smartphone. Those devices and services are assigned to S3-S6, respectively.

The last three questions (i.e. S7 to S9) refer to how many ICT applications and skills, which the students have become familiarised with. These questions are formed as multiple-answer questions, where students can provide more than one answer from the options provided (see Table 2 for the options for each question). Further, they can also add their own-defined option or provide no answers, if necessary. S7 is about social media platforms, whereas S8 and S9 are about ICT skills and programming languages, respectively. Here, it is assumed that using more of those aspects will correspond to higher ICT awareness.

Table 2: Predefined options for S7-S9.

Question ID	Options
S7	Facebook, Instagram, Line, Telegram, Twitter, WhatsApp
S8	Computer network, document processing, image editing, programming, video editing, 2D/3D modelling
S9	C#, C++, Java, HTML/JavaScript, Kotlin, Pascal, PHP, Python

The questionnaire was written in digital format through Google form and distributed to high school students at a private school in Indonesia. On the survey form, it was stated that by filling the survey they agreed for their data to be used for research purposes. However, for privacy reasons, it was also stated that their personal information would be anonymised. To make the students aware about the survey, the authors had asked the school to provide them a short period of time at the end of class session at the beginning of August 2018. This short session was used to explain the survey and asked the students to fill the form through their own smartphone. As the result of our survey, 113 responses were collected.

RESULTS AND DISCUSSION

According to Figure 1, S1 and S2 are agreed (or strongly agreed) by more than 85% respondents. In other words, the students are aware that ICT is inseparable from their daily life, and it is an attractive field to be learned. Those findings are strengthened by the fact that only up to 10% of respondents who disagree or strongly disagree with those statements. When compared to each other, S1 is strongly agreed by more respondents than S2. Hence, it can be stated that some students are completely aware that ICT and their daily life are inseparable, but it does not mean that they want to learn it further. Such a finding is natural since some people prefer to become users rather than the developers.

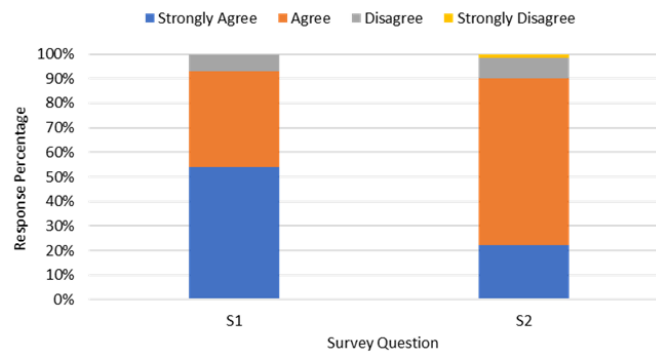


Figure 1: Survey result regarding how aware the students are of ICT (Students views on ICT awareness).

In terms of how frequently the respondents interact with ICT, Figure 2 shows that the Internet (that is stated in S5) is that ICT devices or services are the most frequently interacted with. On average, respondents spend about nine hours a day being connected with it. Such high frequency is then followed by the use of smartphones, for which the average is about six hours (see S4). Computers (in S3) and electronic games (in S6) are the services least frequently interacted with. The respondents spend only about two hours per day to access each of them. It is important to note that the ICT services and devices discussed here may intersect with each other. For example, it is possible that some students interact with laptops and the Internet at the same time.

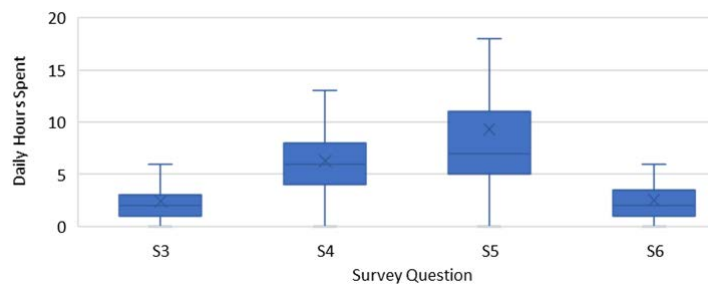


Figure 2: Survey result regarding how frequently the student interact with ICT (Daily hours of interaction with ICT devices and services).

Few respondents answered S3 to S6 survey questions with zero (meaning they have no interaction with given ICT devices and services). According to this survey, the proportion of such respondents are only about 9%, 4%, 4% and 19%, respectively. It is important to note that the largest proportion occurs in S6. In other words, it can be stated that electronic games are not as popular as other ICT devices and services in terms of engaging human interaction. The respondents have become familiarised with several ICT applications and skills. Figure 3 depicts that, on average, they are used with three social media applications, three ICT skills, and one programming language. It is natural that when compared to other ICT applications and skills, programming languages is the one least familiar to users; it is only known by students who want to learn ICT further.

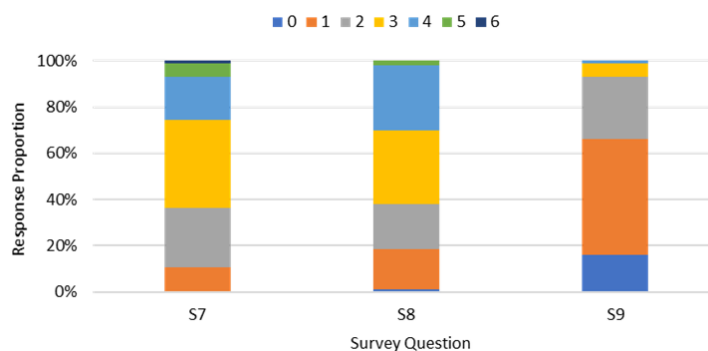


Figure 3: Survey result regarding how many ICT applications and skills, the students have been familiarised with.

Through further observation towards the S7-S9 result, it is interesting to see that all respondents have at least one social media platform, 99% of respondents were familiar with at least one ICT skill, and 84% of respondents know at least one programming language. Most (if not all) high school students have familiarised themselves with ICT applications and skills.

Among the social media applications surveyed, Instagram is the most familiar one among respondents. As shown in Figure 4, it was selected by 94% respondents. Such high popularity is then followed by Line (91%), WhatsApp (58%), Facebook (13%) and Twitter (13%), respectively. It is important to note that other social media applications besides the aforementioned ones were also selected. Some of them are Snapchat, Telegram and Kakao Talk. They are merged as others (18%) in Figure 4. From the university marketing division perspective, this finding can be used to reach prospective students in Indonesia. They can focus their advertisements on Instagram and Line instead of other social media.

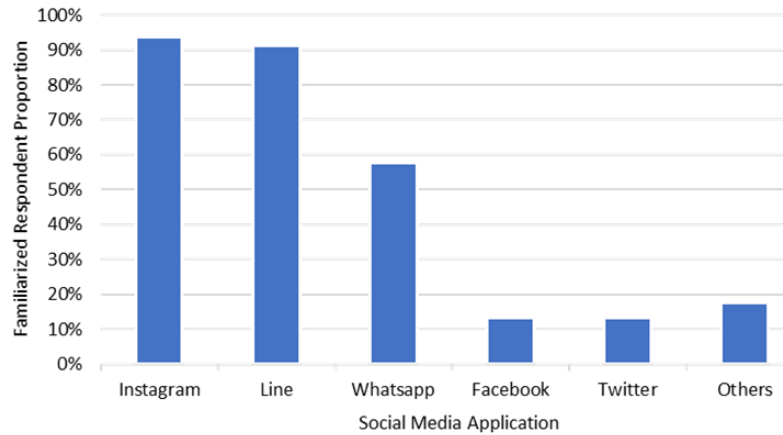


Figure 4: S7 result: familiarised social media applications.

When perceived from familiarised ICT skills, Figure 5 shows that programming is the most familiar one. It has been learned by 84% respondents. Further observation shows that such high popularity is supported by the fact that most schools teach programming as a part of their curricula due to ICT integration at schools.

Document processing (e.g. manipulating Word files, Excel files and presentation slides) is ranked second. It was selected by 82% respondents as one of their familiarised ICT skills. Such skill is then followed by image editing and 2D/3D modelling, respectively. Others refer to ICT skills other than the aforementioned ones. It includes computer networks (such as integrating LAN) or video editing. According to the S8 result, ICT skills other than programming, document processing and image editing should be taught in a more comprehensive way at the university level; prospective students may not be familiar with them.

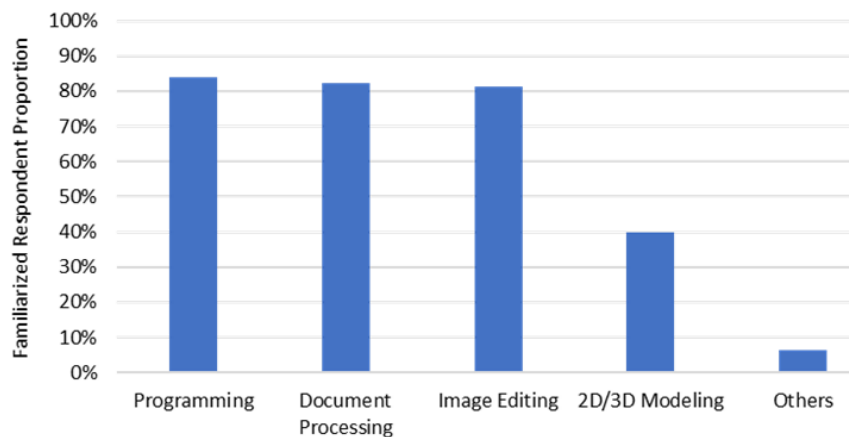


Figure 5: S8 result: familiarised ICT skills.

Figure 6 shows that HTML/JavaScript is the most familiar programming language. Further observation shows that students are familiar with it as it is often taught at schools. HTML/JavaScript is easy to use (compared to other stricter languages, such as Java and C#) yet its result is representative (since it involves a lot of visual components).

According to this finding, if some universities plan to teach their students programming languages, it would be better to teach them from the HTML/JavaScript perspective since they have learned such a language at school. The second most familiarised programming language is Pascal, and then followed by Java. Other languages, such as PHP, Python, C++, and C# are seldom mentioned by respondents. In total, those languages were only selected by 7% respondents.

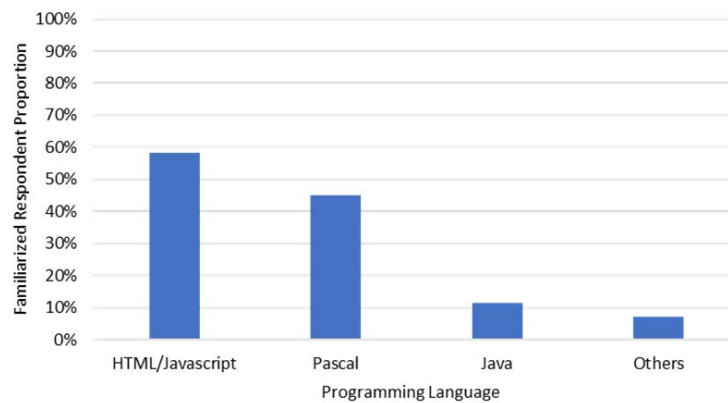


Figure 6: S9 result: familiarised programming languages.

CONCLUSIONS AND FUTURE WORK

In this article, ICT awareness of high school students in Indonesia is observed. Three significant findings can be derived from the results. First, most students are aware of the existence of ICT. Second, the interaction between the students and ICT devices or services is frequent. Third, most students are familiar with at least one ICT application or skill. In short, it can be concluded that high school students have a considerable amount of ICT awareness. They can learn digital competence easily without utilising advanced teaching methods.

It is important to note that the findings are also beneficial to university stakeholders. In the marketing domain, they could put more advertisements on ICT services (such as social media) since most high school students are aware and familiar with ICT. From the academic perspective, they can put more ICT-based learning in their curricula since most prospective students should be adaptive to it.

For future work, it is planned to observe ICT awareness at the primary and secondary education level. Further, it is also planned to evaluate whether such awareness affects academic performance.

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BIOGRAPHIES



Wenny Franciska Senjaya graduated with a Bachelor of Informatics from Maranatha Christian University, Bandung, Indonesia, in 2009. She completed a Master's degree at Bandung Institute of Technology in 2016. She has worked as a full-time lecturer in the Faculty of Information Technology at Maranatha Christian University since 2010. She is currently Secretary of the Informatics Programme at Maranatha Christian University. Her interests include information systems and cryptography. She has published a programming book entitled *Mari Belajar Algoritma Pemrograman Menggunakan C#/JAVA/Python*.



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