# Undergraduate Students' Digital Literacy Skills in The Digital World of Sustainable Development

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**Abstract:** The world of globalization and the high development speed has raised high demands on equitable quality education and lifelong learning to all, which is also known as the objectives of Sustainable Development Goal 4 (SDG 4). Thanks to the rapid expansion of digital technology, educational quality and equity are gradually achieved. In addition, information technology (IT) plays vital roles of electronic instructors, guiders, tools and materials in supporting individuals' lifelong learning. Therefore, it is tremendously crucial that young generations should prepare themselves not only academic competencies but also a variety of skills including digital skills (e-skills) in a digital society that is densely linked and moves at a quick pace. This research emphasizes the significance of being digitally-enabled in the sustainable development world. It aims to find out how undergraduate students view themselves in terms of several facets of digital literacy, such as the capacity to handle digital issues, the processing of data and information, the production of online contents, the usage of communication tools and the ability to create online contents. The findings give an analysis of university students' current digital literacy and their application, whose outcomes can be used to enhance learning, teaching and administrative activities in education in general; and to attain SDG4 in particular.

**Keywords:** undergraduate students, e-skills, digital literacy skills, sustainable development, higher education, digital tools, digital learning

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## Introduction

At the heart of UNESCO's mission is "Education transforms life" for the sustainable development world. While "transform" implies various aspects of education, it also markedly refers to digital transformation in Industry 4.0. Genuinely, in the UNESCO's Sustainable Development Goal 4 (SDG 4) targetting "lifelong learning", SDG4.4.2 emphasizes boosting "the percentage of youth/adults who have achieved at least a minimum level of

proficiency in digital literacy skills". In a world characterized by the omnipresent innovation of technologies and digital transformation, digital literacy and skills have become crucial in generating and sustaining economic growth. Hence, on the policy agenda of most countries including Viet Nam, education focusing on skills, especially Internet access and technology usage, are of great compulsion.

When it comes to the current situation in Vietnam, under the rapid pace of economic growth and the reallocation of jobs away from agriculture in recent years, Vietnam is facing new challenges. As the size of its workforce is turning to be expanding and demanding, her youth population is shrinking and lacks of necessary skills to meet the firms' increasing requirements. Therefore, there is urging need for a more productive and skilled workforce for its further economic modernization in the coming decade and beyond. Despite the impressive literacy and numeracy achievements among Vietnamese workers, many Vietnamese firms report a shortage of workers with adequate skills as a significant obstacle to their activity. The statistics of the Vietnamese Ministry of Information and Communications shows that the number of job openings in the software and IT industry increases by about 30,000 every year. By 2020, the recruitment demand of enterprises would be 1 million IT personnel. With such a fertile IT job market, Vietnam, however, is predicted to be in shortage of some 400,000 IT workers and each year. Although experts claimed that digital technology must be used more often in education to train students on essential digital skills and competencies to adapt to the digital revolution (Herman, 2019), only about 27% of IT workers can meet the requirements, the rest need additional training for a minimum of three months. According to the Ministry of Education and Training, 37.5% of universities and colleges in Vietnam offer ICT majors, and there are about 50,000 IT graduates (over 400,000 IT vacancies) each year. With the high pressures on the demand in quantity and quality of labors, it is questioning whether education in ICT has been in its right track, and whether educators know "what is happening to their students?".

The concept of digital literacy encompasses skills and capabilities that enable learners to accomplish commissions, solve complex challenges, try out new things, and ease and enrich life under technology support (Hatlevik and Christophersen, 2013; Kim, Hong, and Song, 2019). To young adults, digital literacy is vital because all of our daily activities ranging from study, work, and entertainment to communication greatly depend on technology. Apparently, digital literacy is not just about scrolling a website up and down, or posting some pictures and writing comments on social media, it is more about acquiring knowledge of technology, what it can help to solve real-life purposes, and how to use it smartly; therefore, apply and build a strong career out of their lives. However, most young adults are partly aware of what digital literacy skills actually are and how digitally literate they really are. As Rogers (2000) asserted that students' attitudes are primary elements in the successful integration of new technology in education, an insight into their self-assessment on literacy in the concepts and the uses of technology should be well delved into by not only students themselves but also teachers and academicians. While there have been hundreds of studies on digital competence, an empirical study on students' digital literacy in the Vietnamese Southern context is still scarce and needs more investigation. This study aims at identifying university students' self-evaluation of their digital literacy due to two primary reasons. Firstly, undergraduates are those who will be soon new employees in international workplaces and potential global citizens. It is expected that they are well literate in technologies to meet the needs of their career requirements in

the 21st century. Secondly, university students are those who have completed their compulsory 12-year education and are reaching their degrees in some professions. They are, to some extent, expected to acquire the necessary digital skills that have been trained. This study, on the one hand, is able for students to evaluate their e-skill acquisition before any further education and career decisions. On the other hand, the study outcome is taken as proof of the current national curriculum in digital literacy education. It is significant for teachers and educators who directly work with students to know what and how to update and adjust for more efficient education in the future.

## Research Questions

1. What is the general digital literacy skill level of Vietnamese undergraduate students according to Digital Literacy Global Framework (DLGF)?
2. What is the strongest digital literacy skill in the overall Vietnamese sample?
3. What is the weakest digital literacy skill in the overall Vietnamese sample?

## Research objective

- To examine the general level of digital literacy skills according to their self-assessment.
- To identify the strongest literacy skill from the Vietnamese students' self-evaluation.
- To identify the weakest literacy skill from the Vietnamese students' self-evaluation.

## Significance of the study

This study is significant because there has not been a lot of research conducted to identify the current issue of young people's digital literacy progress in the Mekong Delta, Vietnam. As Vietnam has become an active member of UNESCO in the "Sustainable Development" campaign, the pursuit of accomplishing the campaign targets, including education-oriented targets, is of great concern more than ever. Regarding education plans, terminologies like life-long learning, skills, digital, literacy, equity and equality, and sustainable development are key as well as goals. Self-assessment is able to boost an upward cycle of learning (Ross, 2006), the findings, hence, can help teachers, administrators and researchers draw a general picture of the digital literacy skill level of young citizens before any practical actions are carried out. Pertinent to their self-assessment is proven to improve performance through the element of self-efficacy, (Bandura, 1997), self-confidence and effort (Ross, 2006).

## Theoretical background

### Digital literacy skills (ICT skills/ e-skills)

Digital literacy has been defined in various ways since the term was first introduced in the 1990s by Gilster

(1997). Eshet-Alkalai (2004) generalized digital literacy into three dimensions: technical, cognitive and sociological skills, which are used to deal with problems within the environment of a digital society. In 2005, Martin (2006) suggested a more complete definition of digital literacy: individual realization, attitude and usage capacity of digital tools in order to access, manage, integrate, analyze, and synthesize digital information sources. Hatlevik and Christophersen (2013) described *digital competence as* the acquisition and processing of digital information and the ability to produce digital information. It was not until recent years that Law et al. (2018) initiated a more concrete definition of the term digital literacy. According to these scientists, it refers to the use of digital technology, communication tools, gadgets, and networks to access, manage, integrate, evaluate, and create information safely and appropriately for a knowledge society. Clearly, digital literacy is a broad concept embracing different aspects, and its continuous progress ranges from the acquisition of instrumental skills to that of productive and strategic competence and cognitive skills (Calvani, Fini, Ranieri, & Picci, 2012). Digital literacy is identified and analyzed in different concepts, such as internet skills (van Deursen & van Dijk, 2011; Hargittai, 2010), digital literacy (Eshet-Alkalai & Yoram, 2012), digital readiness (Arthur-Nyarko & Moses, 2019), and digital skills (Reedy, Boitshwarelo, Barnes, & Billany, 2015). In this paper, digital literacy or e-skill literacy includes the abilities of (1) generating new digital knowledge, and (2) using various forms of digital media in order to communicate, create and reflect the concepts within daily life situations in the digitally-rich world.

**Digital literacy framework**

Digital competence is even regarded as a key determinant for understanding and interpreting digital learning resources and online learning services (Lopez-Meneses, Sirignano, Vazquez-Cano, & Ramírez-Hurtado, 2020). Hence, plenty of attention is paid to the panorama of digital competence, including employing a digital competence scale (Tzafilkou, K., Perifanou, M. & Economides, 2022), digital competence models (Amaro, Oliveira, & Veloso, 2017; Touron, ´ Deborah Martin, Enrique Navarro, SilviaPradas, & VictoriaInigo, ˜ 2018), digital competence building blocks (Janssen et al., 2013) and applying comprehensive frameworks (Vuk˘cevi´c et al., 2021). Some of the frameworks to assess digital competence include the European Computer Driving License (Leahy and Dolan, 2010), the iCritical Thinking framework of the International ICT Literacy Panel (Verizon et al., 2002), and the Digital Competence Assessment Framework (Calvani et al., 2008). On the other hand, some research has also attempted to evaluate digital competence using qualitative (Çebi, A., & Reisoglu, ˘ ˙ I. (2020) as well as mixed method approaches (Burgos-Videla et al., 2021). In this study, an empirical study was carried out to assess the digital competencies of university graduates based on the Vietnamese Digital Literacy Global Framework (Do et al., 2021) and the Digital Literacy Global Framework (DLGF) (Law et al., 2018). The current version of the DLGF was modified from Digital Competence Assessment Framework 2.0 (DIGCOMP 2.0) (Vuorikari et al., 2016).

*Digital Literacy Global Framework (DLGF) (Law et al., 2018)*

DLGF (shown in Table 1) is developed based on Digcomp 2.0 (Vuorikari et al., 2016), which originated from

DigComp 1.0 by Evangelinos and Holley (2015). The DigComp 2.0 framework suggests a pattern for evaluating the core competencies necessary for all citizens who adapt and actively participate in the digital world. The DigComp 2.0 framework accomplishes the concept of digital literacy both in scope (extension) and content (intensity). It includes 5 areas of competencies: (1) Information and data literacy; (2) Communication and collaboration; (3) Digital content; (4) Safety; and (5) Problem-solving. According to the scholars, the first three areas cover competencies that are applied within specific interactions and uses, whereas the two remainings incline to more specialized activity performed through digital technologies.

Compared to Digcomp 2.0, the updated model is more specific in measuring the digital literacy skills of global citizens because there are two more competence areas added (as can be seen in Table 1), which are Devices and software operations (ranked first) and Career-related competences (ranked last). These two newborn competencies are fundamental to fully scrutinize the field of digital literacy in teaching and learning, as well as best measure its proficiency level. Likewise, underlying is career-related competence when there are incongruities between what is taught and what is applied, what the teachers provide and what the entrepreneurs expect.

DLGF was created from the DLGF project aiming to generalize "a methodology that can serve as the foundation for thematic Indicator 4.4.2 and the development of digital literacy frameworks, curricula, and assessments across different countries and regions" (Law et al., 2018). Therefore, the instrument of the present study is highly based on DLGF. The design of the questionnaire is primarily constructed from the description of each competence area.

Table 1. Description of competences and competence areas in the DLGF

| **Competence area and competences** | **Description** |
|---|---|
| 0. Devices and software operations | To identify and use hardware tools and technologies. To identify data, information and digital content needed to operate somewhere tools and technologies |
| 0.1. Physical operations of digital devices | To identify and use the functions and features of the hardware tools in technologies |
| 0.2. Software operations in digital devices | To know and understand the data information and/or digital content that are needed to operate software tools and technologies. |
| 1. Information and data literacy | To articulate information needs, to locate and retrieve the digital data, information and content. To judge the relevance of source and its content. To store, manage, and organize digital data, information and content |
| 1.1. Browsing, searching and filtering data, information and digital content | To articulate information needs, to search for data, information and content in digital environments, to access them and to navigate between them. To create and update personal search strategies. |

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| 1.2. Evaluating data, information and digital content | To analyse, compare and critically evaluate the credibility and reliability of sources of data, information and digital content. To analyse, interpret and critically evaluate the data, information and digital content. |
| 1.3. Managing data, information and digital content | To organise, store and retrieve data, information and content in digital environments. To organise and process them in a structured environment. |
| 2. Communication and collaboration | To interact, communicate and collaborate through digital technologies while being aware of cultural and generational diversity. To participate in society through public and private digital services and participatory citizenship. To manage one's digital identity and reputation. |
| 2.1. Interacting through digital technologies | To interact through a variety of digital technologies and to understand appropriate digital communication means for a given context. |
| 2.2. Sharing through digital technologies | To share data, information and digital content with others through appropriate digital technologies. To act as an intermediary, to know about referencing and attribution practices. |
| 2.3. Engaging in citizenship through digital technologies | To participate in society through the use of public and private digital services. To seek opportunities for self-empowerment and for participatory citizenship through appropriate digital technologies |
| 2.4. Collaborating through digital technologies | To use digital tools and technologies for collaborative processes and for co-construction and co-creation of resources and knowledge. |
| 2.5. Netiquette | To be aware of behavioural norms and know-how while using digital technologies and interacting in digital environments. To adapt communication strategies to the specific audience and to be aware of cultural and generational diversity in digital environments. |
| 2.6. Managing digital identity | To create and manage one or multiple digital identities, to be able to protect one's own reputation, to deal with the data that one produces through several digital tools, environments and services. |
| 3. Digital content creation | To create and edit digital content. To improve and integrate information and content into an existing body of knowledge while understanding how copyright and licenses are to be applied. To know how to give understandable instructions for a computer system. |
| 3.1. Developing digital content | To create and edit digital content in different formats, to express oneself through digital means. |
| 3.2. Integrating and re-elaborating digital content | To modify, refine, improve and integrate information and content into an existing body of knowledge to create new, original and relevant content and knowledge. |
| 3.3. Copyright and licenses | To understand how copyright and licences apply to data, information and digital content. |
| 3.4. Programming | To plan and develop a sequence of understandable instructions for a |

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| | computing system to solve a given problem or perform a specific task. |
| 4. Safety | To protect devices, content, personal data and privacy in digital environments. To protect physical and psychological health, and to be aware of digital technologies for social well-being and social inclusion. To be aware of the environmental impact of digital technologies and their use. |
| 4.1. Protecting devices | To protect devices and digital content, and to understand risks and threats in digital environments. To know about safety and security measures and to have due regard to reliability and privacy. |
| 4.2. Protecting personal data and privacy | To protect personal data and privacy in digital environments. To understand how to use and share personally identifiable information while being able to protect oneself and others from damages. To understand that digital services use a "Privacy policy to inform how personal data is used. |
| 4.3. Protecting health and wellbeing | To be able to avoid health-risks and threats to physical and psychological well-being while using digital technologies. To be able to protect oneself and others from possible dangers in digital environments (eg. cyber bullying). To be aware of digital technologies for social well-being and social inclusion. |
| 4.4. Protecting the environment | To be aware of the environmental impact of digital technologies and their use. |
| 5. Problem solving | To identify needs and problems and to resolve conceptual problems and problem situations in digital environments. To use digital tools to innovate processes and products. To keep up to date with the digital evolution. |
| 5.1. Solving technical problems | To identify technical problems when operating devices and using digital environments, and to solve them (from trouble-shooting to solving more complex problems). |
| 5.2. Identifying needs and technical responses | To assess needs and to identify, evaluate, select and use digital tools and possible technological responses to solve them. To adjust and customise digital environments to personal needs (e.g. accessibility) |
| 5.3. Creatively using digital technologies | To use digital tools and technologies to create knowledge and to innovate processes and products. To engage individually and collectively in cognitive processing to understand and resolve conceptual problems and problem situations in digital environments. |
| 5.4. Identying digital competence gaps | To understand where one's own digital competence needs to be improved or updated. To be able to support others with their digital competence development. To seek opportunities for self-development and to keep up-to-date with the digital evolution. |
| 5.5. Computational thinking | To process a computable problem into sequential and logical steps as a |

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|---|---|
| | solution for human and computer systems. |
| 6. Career-related competences** | To operate specialised digital technologies and to understand, analyse and evaluate specialised data, information and digital content for a particular field. |
| 6.1 Operating specialised digital technologies for a particular field** | To identify and use specialised digital tools and technologies for a particular field. |
| 6.2 Interpreting and manipulating data, information and digital content for a particular field** | To understand, analyse and evaluate specialised data, information and digital content for a particular field within a digital environment. |

**Self-assessment**

Boud (2009) states that judgment is simply a daily activity at work and in life about where one is, the effectiveness of what one has done, and what one should do in the future. For Boud (2010a), assessment is sustainable when it comes to not only to high education requirements and outcomes, but also to what is primary for lifelong learning.

Research has shown that assessment has a tremendous impact on student learning and development (see e.g. Price et al. 2011), while inappropriate or poor thoughts can diminish the beneficial effects of good teaching practices if these are not captured in assessment approaches (Boud 1995).

Regarding self-assessment, it involves one's own making critical judgments about their achievements and learning outcomes (Boud & Falchikov, 1989). According to the Oxford Dictionary (2022), self-assessment is the process of judging one's own progress, achievements, etc. During the process, an individual reviews what was performed to identify elements that can be improved or exploited to achieve certain predefined. It is inevitably important for students to form the capacity for 'informed judgment' either individually or collectively before any further steps are considered to be taken. Self-assessment is appropriate for adolescents because they are more realistic in their approach to self-assessment of their performance, which, therefore, reflects a higher level of reliability (ibid, in Ross 2006:3).

When it comes to digital literacy skill self-assessment, it is a subjective evaluation of one's own digital competence, skills, relevant decisions made and progress towards some particular purposes. Students' self-awareness of the essence of e-skills and their level of e-skill competence enables them to self-regulate their own learning progress. Moreover, this investigation helps teachers and educators timely assist their children with appropriate policies, curriculum and teaching methodologies. The validity of self-assessment is guaranteed as the authors meant to inform from the beginning in the open letter that the questionnaire is served for the students' own self-regulation and research purposes only. It was also stated that the results would not be used

for testing or grading their performances. The mean and mean range (see Table 2) were utilized to identify the students' level of digital competence skills and sub-skills.

Table 2. Categorization of responses for Digital Literacy self-asessment

| Means | Descriptive Equivalent | Interpretation |
|---|---|---|
| 4.51 – 5.00 | Very High | Digital Literacy is always manifested. |
| 3.51 – 4.50 | High | High Digital Literacy is often manifested. |
| 2.51 – 3.50 | Moderate | Moderate Digital Literacy is sometimes manifested. |
| 1.51 – 2.50 | Low | Low Digital Literacy is seldom manifested. |
| 1.0 – 1.50 | Very low | Very Low Digital Literacy is never manifested |

**Previous studies**

In the year later since DigComp Framework 2.0 was introduced, Al Khateeb (2017) designed a standardized questionnaire on the basis of the framework to investigate in-service English language teachers' digital competence. The outcomes of the current research revealed that the majority of teachers are not adequately digitally competent according to the level and standards required to enable them to be good digital teachers of the twenty-first century. Further digital-related competencies should be promoted to teachers as part of continuous professional development (CPD). Such competencies also need to be incorporated into different teacher education programmes. S Vishnu et al. (2022) also applied the Digital Competence Framework 2.0 of EU Science Hub (DIGCOMP) in their study assessing students' digital competence in a Turkey agriculture university. Their study's result was satisfactory as the students performed at an acceptable level of competence in most aspects of e-skill competence.

In consideration of DL in the Asian context, numerous studies have been conducted. Son, Park, and Park (2017) compared the DL of undergraduates learning English for academic purposes (EAP) and EFL in two universities in Canada and Japan. The study reported that all EAP participants taking part in the study were aware of digital technologies and were familiar with using them. In addition, most EAP students indicated that their level of DL was good or very good, while most EFL participants self-assessed their DL level as acceptable or good. Cote and Milliner (2017) surveyed first-year college students preparing for their study abroad program to find out students' specific DL levels. The results indicated that almost all students in the sample thought they had limited DL and lacked the necessary experience and skills. Kim, Ahn, and Kim (2019) conducted research to assess Korean primary and secondary school students' DL and found that students' DL had progressed. Dashtestani and Hojatpanah (2020) researched the DL levels of Iranian students. The questionnaire results depicted that students' DL is low, and they do not apply a broad range of computer applications and software. The study also indicates that the low DL level results from the Ministry of Education's ill-defined plans as regards improving students' levels of DL. Mega (2020) contributed to the digital literacy research field by *defining the Indonesian students' perception of digital literacy competencies as learning sources. In her study*

*using the descriptive qualitative method, digital literacy areas based on Paul Gilster's theory (1997) such as internet searching, hypertext navigation, content evaluation, and knowledge assembly were under study. The outcome was disappointing when only one over nine students considered him/herself digitally literate.* Zulkarnain et al. (2021) also adopted DigComp Framework 2.0 as the basis and the questionnaire from previous studies to carry out their research. The samples were 389 students studying multiple academic programs in UiTM, Kelantan Branch in Malaysia. The quantitative study concluded that Malaysian students have a "High level" of digital competence. However, respondents were not very competent in two areas out of five main areas of problem solving and digital content creation.

In Vietnam, a large-scale study was carried out by Nguyent et al. (2020) whose participants were up to 1661 English as a foreign language (EFL) learners at Vietnamese universities. According to the study, it is indicated that digital tools have a positive effect on their studies and students are aware of the essence of technologies towards their language learning. However, students' technology skill levels normally range from a low level to an average level, and they do not frequently apply technologies when learning English. Surprisingly, while seniors' attitudes toward using ICT tools are the most positive, their skills are the lowest among the year groups. Bearing that the sample of the study was served for language learning and primarily from Ha Noi (the capital city from the North), Ho Chi Minh (the most bustling and developed city), and Kien Giang (a province from the South) without clarification of students' DL levels of the three regions. This study, aiming to focus on students from the Mekong Delta will provide a more detailed picture of the current phenomenon. Besides that, identifying students' DL readiness for future careers, rather than learning a subject, is considered more vital for senior students.

## Methodology

### Participants

In order to generalize the picture, the study investigates 482 participants who are from 4 distinct universities in the Mekong Delta. They are all senior students because the study aims to investigate their self-evaluation in digital literacy before their graduation and employment. Moreover, students whose majors are technology or computer science related are excluded from the study due to the assumption that those undergraduates can gain an acceptable level of general digital literacy skills. In their curriculum, they have definitely learned basic information technology courses; therefore, their digital literacy should be explored in other studies which require other specialized research instruments.

### Instruments

The instrument used for this study was a questionnaire which was designed under careful review from various sources. This questionnaire was constructed following the UNESCO Digital Literacy Global Framework (Law et al. 2018) and a previous questionnaire by Zhao et al. (2021). Zhao et al. designed their study mainly based on

the research instrument by Martínez et al. (2010) and DGLF 2.0 model, which comprises five main competence areas. This research is, rather only adapted from Zhao et al, extended two other competence areas, which were devices and software operations, and career-related competence (introduced in the updated DLGF). The questionnaire was created in Vietnamese with English translation via Google form. Definitions of digital terms were included in the questionnaire to help students clearly understand the question items. The questionnaire is written in both English and Vietnamese. It comprises two main sections: (I) sociodemographic characteristics of students and, (II) a self-assessment on digital literacy, which includes 50 question items categorized into six subscales, in line with the defined areas in the DLGF. These competence areas are as follows: (2.1) devices and software operations, (2.2) information and data literacy, (2.3.) digital content creation, (2.4) communication and collaboration, (2.5) safety, and problem-solving, and (2.6) career-related competence. The development of digital literacy was assessed on a five-point scale (5 – I'm confident I can do, 4 – I'm somewhat confident I can do, 3 – I'm confident I know, 2 – I'm somewhat confident I know/can do, and 1- Idon't know/cannot do), whereby a higher score indicates more developed digital competences of a student. The reliability of the assessment scale on the student sample was 0.84 expressed by Cronbach's alpha.

**Research procedure**

For the guarantee of reliability and validity, the designed questionnaire went through two reviewing stages. The validation of the instrument was first reviewed by a panel of Information Technology lecturers who analyzed the content validity and an exploratory factor analysis was applied to complete the construct validity. It is to ensure that technical terms were precisely used and the meanings were not changed after the translation. The characteristics and external validity of the questionnaire were examined in discussion with experienced researchers in the fields of research methods, education and linguistics. After that, the questionnaire was revised in line with the recommendations of the experts. In the second stage, the questionnaire was piloted in a group of 30 participants. The Cronbach's Alpha coefficient reached a value of 0.987, representing a very high level of reliability.

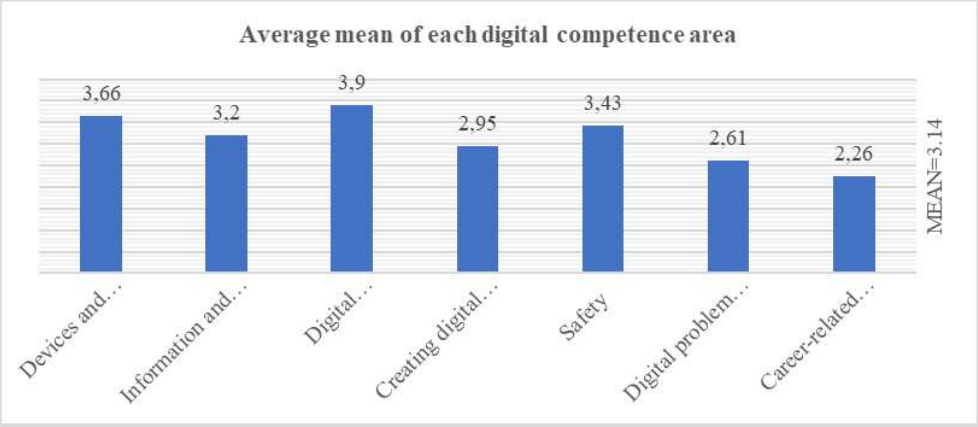
Consent emails were sent to the Deans of the four departments of the four universities in the Mekong Delta. After having got permission, I received the email addresses of lecturers who could help forward the email (including the student consent form and the questionnaires) to their students. The purposes of the study were explained in the email, which clearly stated that the outcomes of the questionnaire would be secured, only used for research purposes, and not for grading or evaluation. The number of participants is not narrowed in the English language Department only because the question items were already translated into Vietnamese. Students were able to share the link with their friends and anyone was welcome to answer the online questionnaire voluntarily.

After one month of the data collection process, 482 responses were digitally collected. The data were processed by using the IBM SPSS Statistics 20 statistical software in order to measure arithmetic mean and percentages. The results were then compared with the Categorization of responses for Digital Literacy self-assessment (Table

1).

## Findings

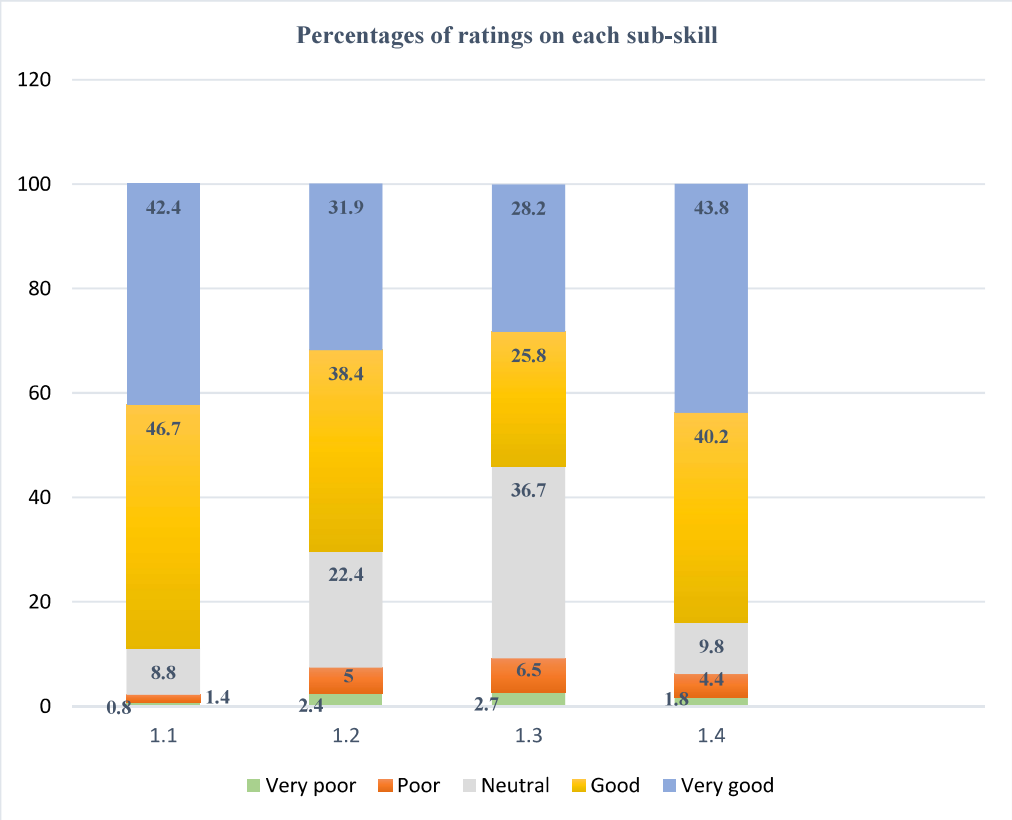
The present study was designed aiming to assess a sample of Vietnamese students in terms of their level of digital competence skills from their own perspectives. In this section, undergraduate students' self-evaluation of their digital competence skills (50 items) will be presented according to the following competency areas: information and data literacy (6 items); communication and collaboration (13 items); digital content creation (6 items); safety (7 items) and problem-solving (7 items). As mentioned above, to avoid bias, participants responded on a Likert-type scale of 1 to 5.




Graph 1. The comparison of average means of the seven digital competence areas

Graph 1 indicates the average values of the 7 digital literacy skills of undergraduates from four universities in the Mekong Delta. Overall, the participants from the four institutions placed themselves at a moderately high level with the total average mean=3.14. It is noticeable that digital communication and collaboration skill has the highest rating, with the mean being up to 3.9 and even higher than devices and software operation skills, with mean=3.66 only. However, students shown apparently much less confidence in productive digital skills such as creating digital content, digital problem solving and career-related competence skills (with the mean being no more than 3.0). Among the three aforementioned skills, career-oriented competence skill is the weakest, whose mean is only 2.26 and lower than the average.

In order to go deeper into the analysis of the results, the average scores of subskills in each competence area are presented in the following tables. Graph 2 provides information on the students' self-assessment of the first competence area. In comparison with other ones, the device and software operation competence area is the most extraordinary field with a mean ranging from 3.7 to 4.3. Among the four sub-skills, the highest score is seen in students' abilities to operate digital devices and basic softwares on a daily basis, reaching up to mean=4.3. The number of respondents who rate negatively in the four sub-skills is low, with no more than 10% each.

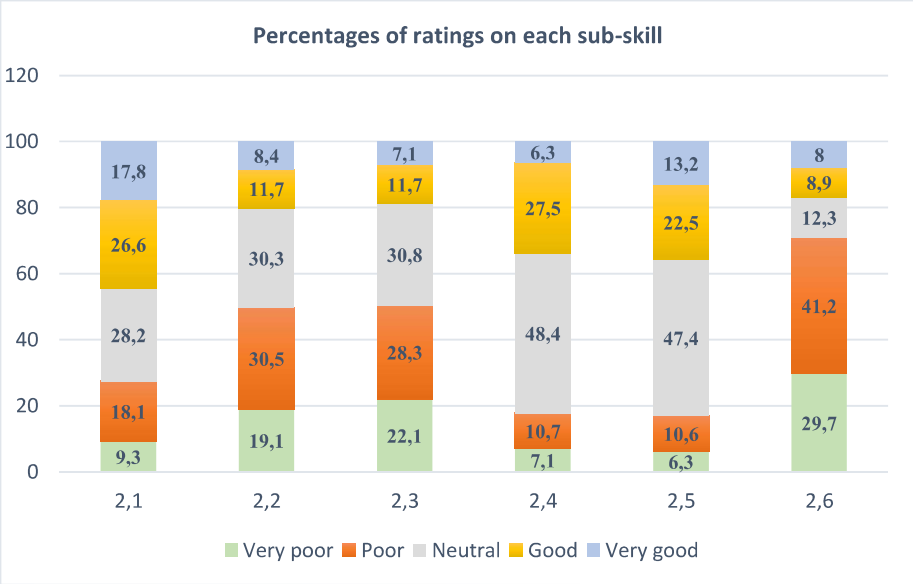



| 1. Device and software operation | Mean |
|---|---|
| 1.1. I know how digital devices physically operate. | 4.3 |
| 1.2. I am able to operate digital devices for my daily purposes. | 3.9 |
| 1.3. I know how basic softwares and applications operate | 3.7 |
| 1.4. I am able to operate basic softwares for my daily purposes. | 4.2 |

Graph 2. University students' self-evaluation of digital competence on Device and software operation

As can be seen in Graph 3, students gain an acceptable ability in information and data literacy, with all of its sub-skills's mean values higher than 2.5. This shows that the individuals from the four institutions are able to use ICT tools to search, organize, evaluate… information, and apply different methods and tools to manage and store information (mean=3.4 each).

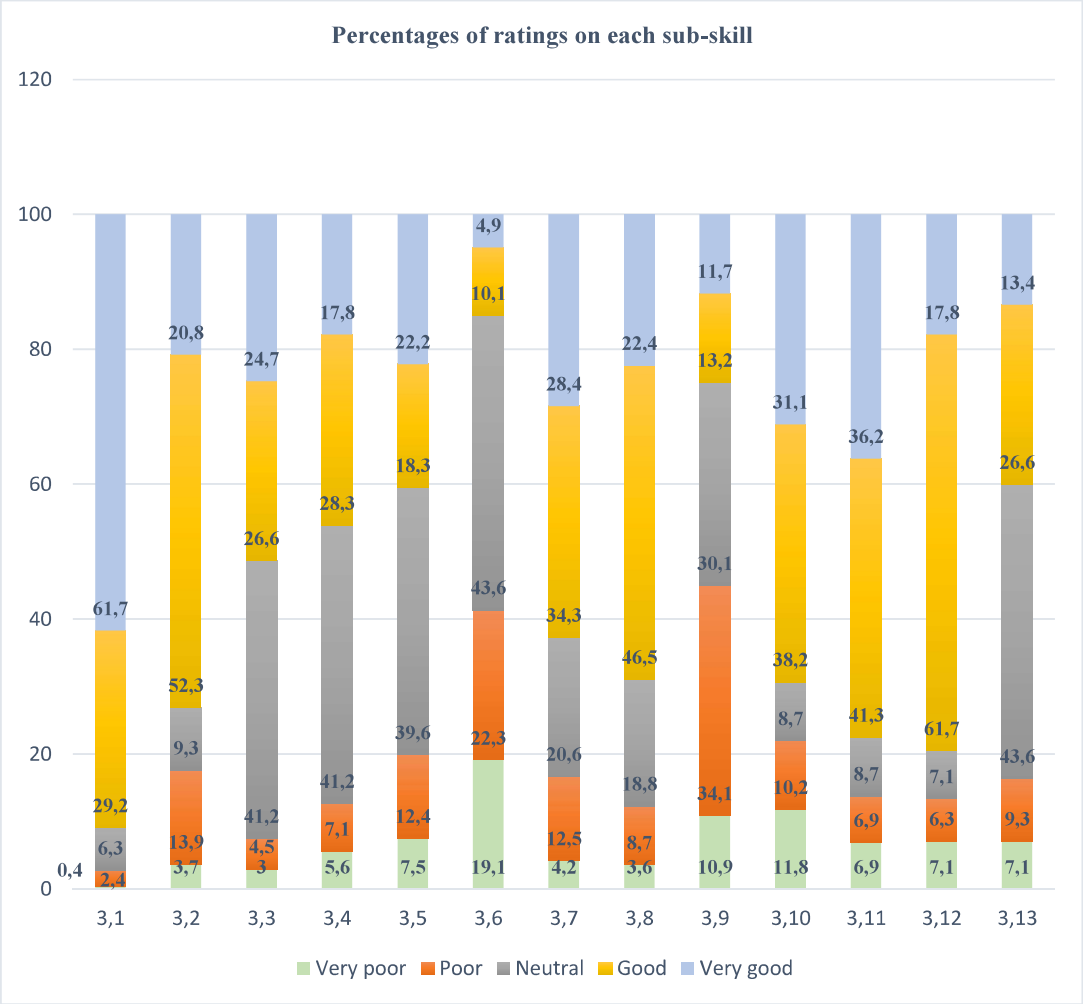
Another positive outcome is seen in students' ability to critically analyze and comment on data sources and digital content well (mean=3.3). Whereas, nearly half of the students feel uncertain about their abilities to analyze and comment critically, verify the information, and apply different methods and tools to manage and store information. It does not mention that up to 41.2% of students rated themselves "weak" in the ability to use their own strategies to organize and retrieve information and data.




| 2. Information and Data Literacy | Mean |
|---|---|
| 2.1. I use ICT tools to search, locate, select, organize, evaluate, process, store, transform, disseminate, cite and communicate information. | 3.4 |
| 2.2. I use specialized search engines and meta-search engines with various mechanisms (Identify keywords, synonyms and related terms, search in more than one language...). | 2.7 |
| 2.3. I understand different sources of information and can build search strategies correctly based on them. | 2.6 |
| 2.4. I analyse and comment critically on information, data sources and digital content, verify the validity and timeliness of the information located. | 3.3 |
| 2.5. I apply different methods and tools to manage and store information, data and digital content for easy retrieval. | 3.4 |
| 2.6. I have my own strategy to organize and retrieve information and data. | 2.3 |

Graph 3. University students' self-evaluation of digital competence on Information and Data Literacy

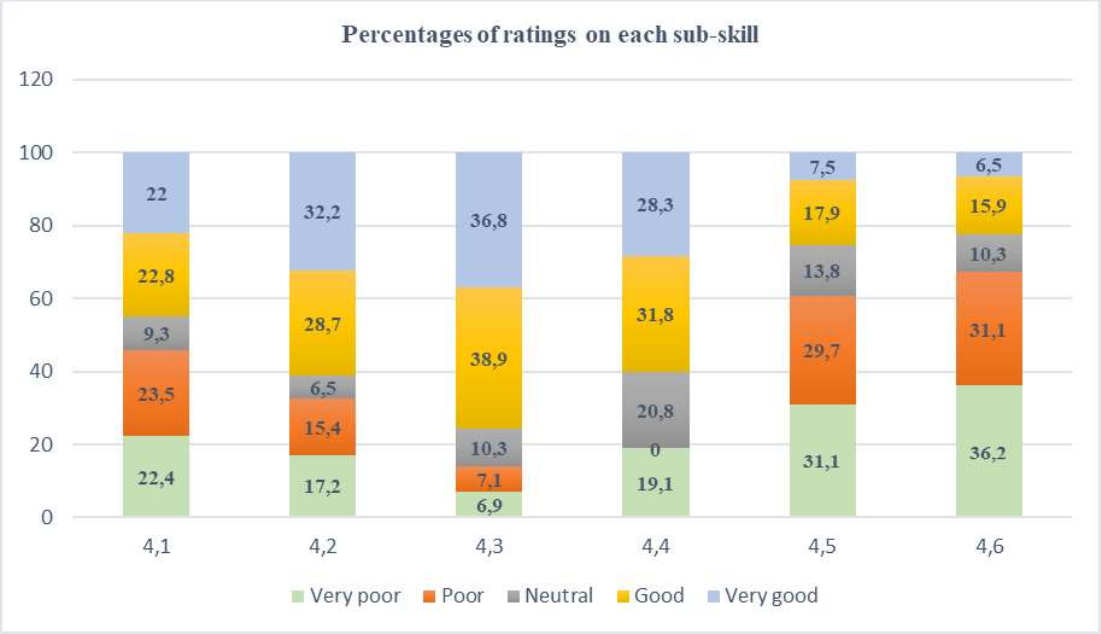
Students unveil their strengths in communication and collaboration competence, with up to 90% being able to communicate and interact through various digital devices and applications (mean=4.7) (see Graph 4,). This is also the highest digital sub-skill among the 44 under the survey. Besides, students are also literate in sharing knowledge and multimedia content via social networks and online communities (up to 73%). However, half of the students do not pay their specific attention to interacting with partners in their familiar educational or professional fields. A similar number of students also do not feel engaged in online citizen participation. In the discussion of teamwork, around 40% of students seem reluctant to apply digital technologies to getting together or solving groupwork tasks. In relation to ethnicity and security issues, nearly 70% of young respondents are aware of virtual world rules and remind families and friends of basic ethnic behaviors although about 50% of them report that they are not sure how they can actually protect their own digital reputation.




| 3. Communication and Collaboration | Mean |
|---|---|
| 3.1. I communicate and interact through a variety of digital devices and applications (SMS, email, cloud, QQ, WeChat, video conferencing). | 4.7 |
| 3.2. I participate in social networks, collaborative platforms and online communities where I share knowledge, multimedia content and information. | 3.9 |
| 3.3. I collaborate through the Internet with other people in my educational or professional field that form my personal learning network (PLN). | 3.8 |
| 3.4. I engage with society through online participation (social, political, cultural, administrative action) and am aware of the potential of technology for citizen participation. | 3.6 |
| 3.5. I use digital technologies and media for teamwork. | 3.4 |
| 3.6. I use technology and collaboration tools to plan, execute and share monitoring of activities and projects. | 2.6 |
| 3.7. I participate in learning activities such as MOOCs through collaborative environments. | 3.7 |

| | |
|---|---|
| 3.8. I am familiar with the rules of conduct online or in the virtual world, such as being friendly, respecting people's privacy and being careful with my language. | 3.8 |
| 3.9. I stay up to date with ethics regarding internet use. | 2.8 |
| 3.10. I take care to remind my family and friends of the basic rules of behaviour on the Internet. | 3.7 |
| 3.11. I know how to create and manage a public, personal and professional profile on social media. | 3.9 |
| 3.12. I am able to manage several digital identities depending on the objective or context. | 3.9 |
| 3.13. I pay attention to what I post online and I know how to protect my digital reputation and/or that of others. | 3.4 |

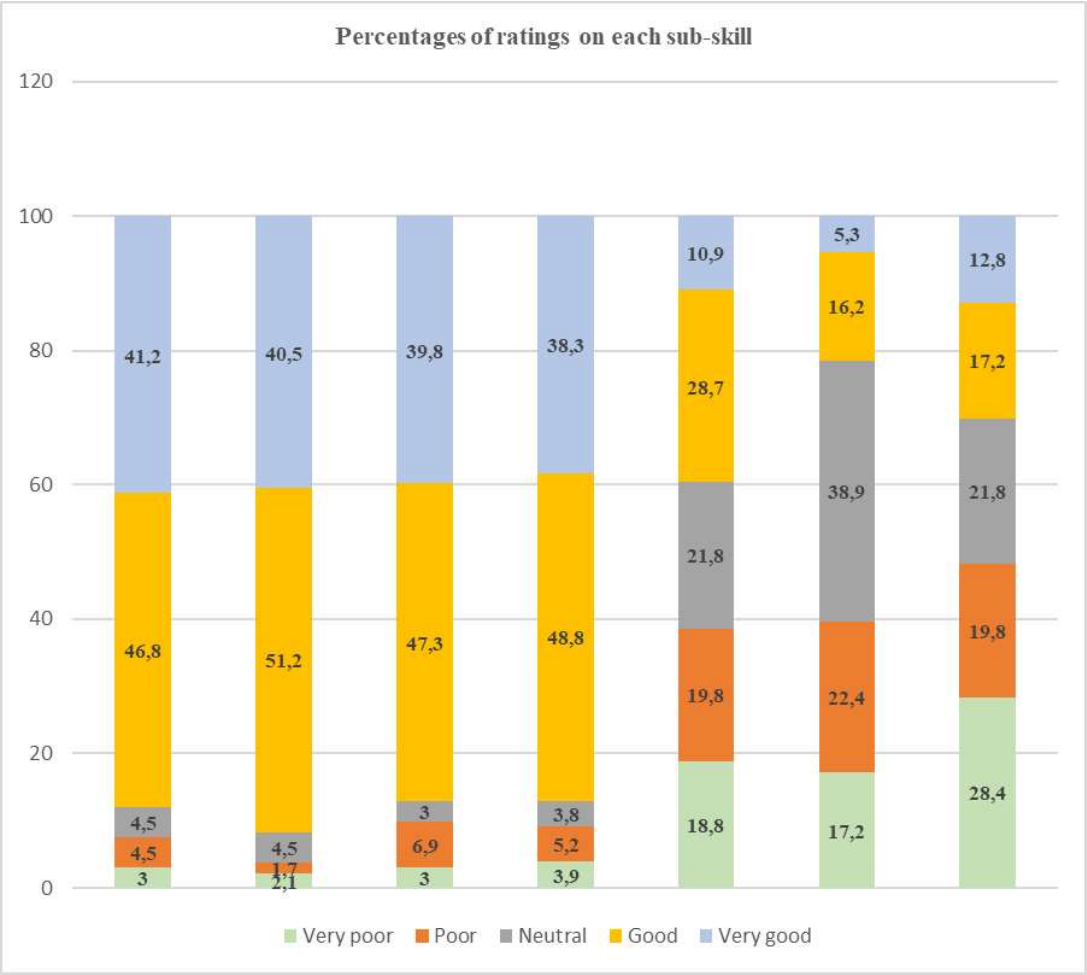
Graph 4. University students' self-evaluation of digital competence on Communication and Collaboration




| 4. Digital Content Creation | Mean |
|---|---|
| 4.1. I use a variety of tools and software to create multimedia content in a variety of formats. | 3.0 |
| 4.2. I am able to use different media and methods to present ideas in a creative way. | 3.4 |
| 4.3. I am able to edit, modify, improve and combine existing resources to create new and relevant content and knowledge. | 3.9 |
| 4.4. I understand the basic knowledge and laws of intellectual property and the licensing of information and digital content when working with ICTs. | 3.2 |
| 4.5. I know the basics of digital processes, understand the principles of programming and what is behind a programme. | 2.4 |
| 4.6. I make modifications to computer programs, applications, configurations and equipment as needed | 2.3 |

Graph 5. University students' self-evaluation of digital competence on Digital Content Creation

Referring to Graph 5, digital content creation is the fourth digital literacy skill that requires students to be productive. The depressing point is that around 46% of the students revealed that they could not apply various tools and software to create multimedia contents. The figures are even higher in terms of understanding the principles of programming (60.8%) and making modifications to computer programs or applications (67.3%). These two aforementioned sub-skills also have very low mean scores, with 2.4 and 2.3 respectively. However, the optimistic finding is discovered when more than half can creatively create contents and present ideas through different media. They also show a good understanding of laws and principles of intellectual property (49.3%).

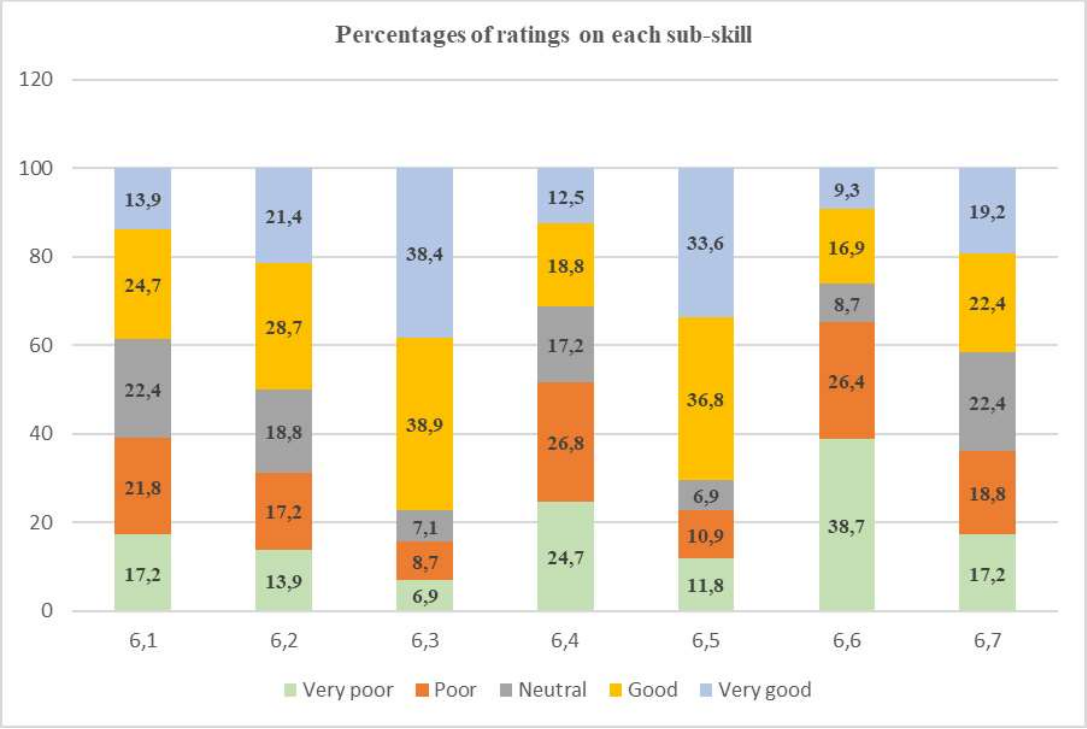



| 5. Safety | Mean |
|---|---|
| 5.1. I understand the risks associated with the use of online tools and devices. | 4.2 |
| 5.2. I protect my equipment and multimedia content. | 4.3 |
| 5.3. I keep data security and protect my personal privacy. | 4.1 |
| 5.4. I understand the health risks associated with the use of related technologies. | 4.3 |
| 5.5. I prevent and avoid physical and mental health threats when using the Internet | 2.9 |

| | |
|---|---|
| and multimedia devices, such as poor sitting posture and cyberbullying. | |
| 5.6. I know the positive and negative aspects associated with the use of technology on the environment. | 2.7 |
| 5.7. I apply basic measures to save energy, recycle devices and protect the environment. | 2.7 |

Graph 6. University students' self-evaluation of digital competence on safety

Another very important digital literacy skill is safety whose sub-skills, as shown in Graph 6, are unevenly rated. The sub-skill 5.1, 5.2, 5.3 and 5.4 own mean values higher than 4.0. In particular, approximately 90% of students are confident in their understanding of personal risks related to the use of technologies and they are also able to protect the privacy of their equipment and multimedia contents. Interestingly, although up to 87% of participants claimed to know the possible physical and mental health risks caused by the use of technologies, not many (only 39%) made attempts to prevent and avoid negative health effects. Moreover, environmental risks are also less concerned by the young generation, with only 18% knowing about environmental problems caused by the technologies and taking action to protect the environment.




| 6. Problem Solving | Mean |
|---|---|
| 6.1. I am familiar with the operation of digital devices and am able to identify possible technical problems. | 3.0 |
| 6.2. I solve daily technical problems. | 3.3 |
| 6.3. I evaluate and select appropriately a tool, device service to perform my tasks and | 3.9 |

| | |
|---|---|
| meet my needs. | |
| 6.4. I keep myself updated on new developments and emerging technology trends, and innovate using digital technology. | 2.7 |
| 6.5. I use various methods such as text, images and audio to make my expression more creative and innovative. | 3.7 |
| 6.6. I actively attend events and workshops on digital creation, and participate in collaborative multimedia and digital projects. | 2.3 |
| 6.7. I understand the needs to improve and update my own competence and to help others in developing their digital competence. | 3.1 |

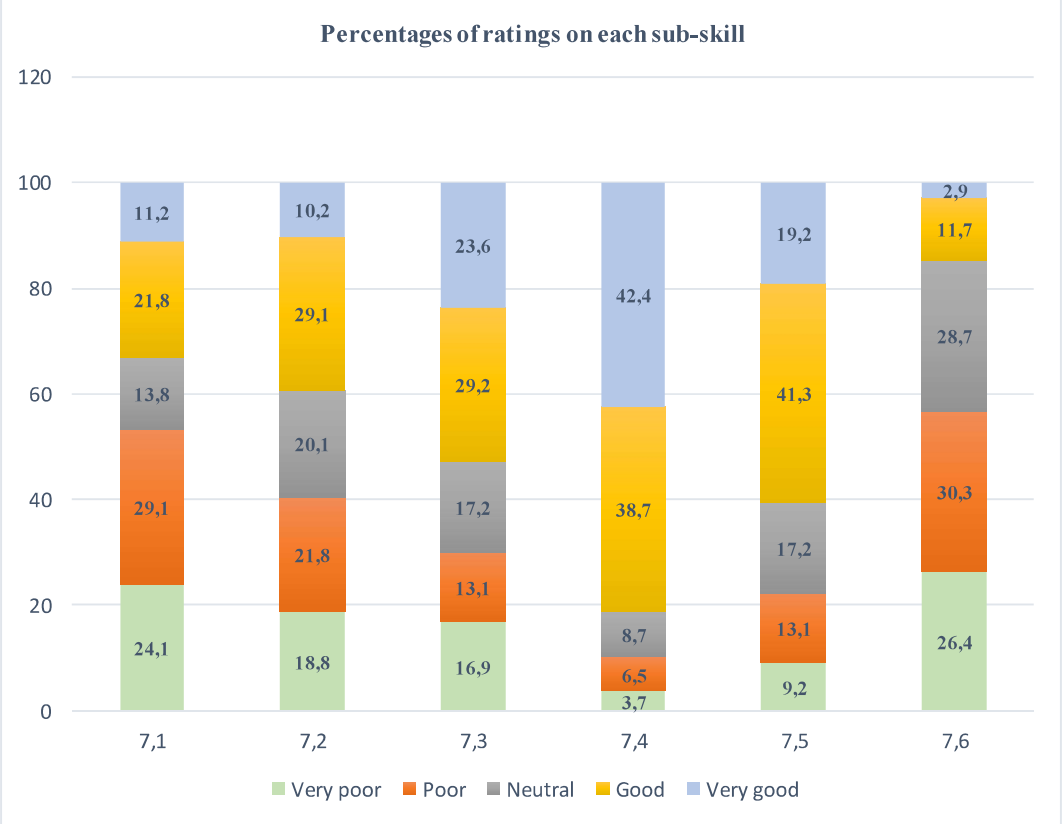
Graph 7. University students' self-evaluation of digital competence on Problem Solving

Graph 7 points out students' self-assessment in the sixth digital skill – problem-solving, whose means are generally lower than other previously mentioned skills. There are no sub-skills whose means are higher than 4.0, with the highest coming to the ability to evaluate and select appropriate tools to meet the needs, at 3.9. In fact, up to 77% of students rate themselves "good" and "very good" in this sub-skill. It is closely followed by sub-skill 6.5, whose mean is 3.7 and the positive rating is around 70%.

Conversely, students do not find themselves familiar with technical problems relating to digital device operation (with up 39% rating "poor" and "very poor" and 22.4% holding a "neutral" idea about that). Half of the students, moreover, do not particularly care about keeping themselves updated on new developments or technology trends. The bright side of the problem-solving literacy skills is that students are able to evaluate and select appropriate tools and sevices to accomplish their tasks (77%) and use a variety of methods and tools such as texts, images and audio to make their expressions more innovative (70.4%).

In Graph 8 below, the seventh competence is the essential digital literacy skill due to its career-related roles. It can be recognized that students gained an acceptable level of career-related competence as the means of subskills are mostly higher than 2.5. In particular, the ability to use different media and methods to present ideas is a proud subskill to the students (with both "good" and "very good" ratings being 80%). In addition, 60% of students have good knowledge of laws of intellectual property and the licensing of information when working with ICTs.

For creating multimedia contents for work purposes, the proportion is relatively lower, accounting for 52.8%. It is then followed by the ability to edit, modify, improve and combine existing resources for new career-related products (40%). Students seem less competent in the operation and process of some specialized digital technologies in their career fields (with only 53.2% rating "very poor" and "poor"). Just a small percentage of them (13.6%) are able to modifications to computer programs, applications and equipment to serve my career purposes.




| 7. Career-related competence | Mean |
|---|---|
| 7.1. I understand how specialised digital technologies of my career field operate and process. | 2.7 |
| 7.2. I am able to edit, modify, improve and combine existing resources to create new and relevant career-related digital products. | 2.9 |
| 7.3. I use a variety of tools and software to create multimedia contents for my work purposes. | 3.3 |
| 7.4. I am able to use different media and methods to present ideas to my colleagues, employers and partners in a creative way. | 4.1 |
| 7.5. I understand my career-specialised knowledge and laws of intellectual property, and the licensing of information and digital content when working with ICTs. | 3.5 |
| 7.6. I make modifications to computer programs, applications, configurations and equipment to serve my career purposes. | 2.3 |

Graph 8. University students' self-evaluation of digital competence on Career-related competence

## Discussion

Digital literacy has become indispensable for every global citizen, whether to communicate, to find

comprehensive employment, to achieve education, to socialize, and even to survive. Acquiring the right series of digital skills is not only compulsory for learning and workforce readiness but also essential to a more open, inclusive and secure community. It is widely known that digital literacy skills, like other 21st-century literacy skills, should start at school. Therefore, it is important to have a very primary consideration of the learners' own assessment of their current level of digital literacy before any further steps should be made. There are no digital competence areas under the survey record low level of students' self-evaluation.

Findings from the study pinpoint that students perceive a moderate level of digital competence. This is an unsurprising finding due to the fact that all of the participants (ranging from 18 to 21) belong to Generation Z, who is coined "digital natives". Although the current outcome is noticeably lower compared to those in developed countries such as Finland in the study of Khan and Vuopala (2019), Canada in the study of Son, Park and Park (2017), in which students rated their own e-skill competence "highly develop" and "very good", the outcome is more positive compared to previous studies in Asian regions. In specific, Vietnamese students surpassed Japanese students in the study of Cote and Milliner (2017), Indonesian students in the study of Mega (2020), and as competent as Malaysian students. Most interestingly, this study is inconsistent with a previous paper conducted in Northern Vietnam by Nguyen and Habók (2021), which depicts the students' level of technological skills just hovering around low to average.

When the defined areas of digital competencies are considered, the obtained results indicate that students in the Mekong Delta stated that their digital competencies are most developed in the areas as follows: device and software operation, information and data literacy, communication and collaboration, and digital content creation. Such results are understandable when Vietnamese children are allowed to use gadgets at the early ages (VVN, 2016). On the other hand, students assess their digital competencies as less developed in the remaining three areas: safety, problem-solving, and career-related competence. This is in line with the study of Zulkarnain et al. (2021) whose participants also claimed not to be very literate in areas of problem-solving and digital content creation. It can be assumed that students perceive basic competencies related to how to run a technological device and software, and use technologies to create digital content serving their study and career purposes. This can be explained by the fact that students have become used to the activities that have frequently conducted at school and in their daily life.

It is known that the Vietnamese curriculum from the very beginning level of education integrates lessons in using technologies. In detail, pupils in primary schools are taught to know how to operate a technological device as the first step before being instructed on how to create digital contents at the secondary level, how to solve digital problems in high school, and finally how to apply digital literacy in a career in tertiary level. Virtually, solving technical problems, and ensuring the protection for devices, data, health and the environment are more complex competencies that require more critical thinking, additional work and more applications. It might be possible that the syllabus and teaching materials at different faculties do not sufficiently incorporate elements from the last three areas of competence, given that they cover different scientific fields.

## Conclusion

To the best of my knowledge, this research can be considered as a pioneer study in the Mekong Delta that uses DGLF as a standard for the self-assessment of the young generation's digital competence. The empirical results show that all the respondents were satisfactorily competent in the areas such as information and data literacy, communication and collaboration, digital content creation and safety, and the abilities for the appropriation of technologies and the digital practices presented by Vuorikari et al. (2016). This pinpoints that they possess the ability to express themselves through digital means with respect the security measures such as reliability and privacy. However, it is not the same in the case of problem-solving (i.e., an individual's capacity to understand and resolve problem situations), which has been found as an under-developed area of competence. More specifically, by identifying the highest and lowest competency, it was delightful that Southern Vietnamese students show a highly moderate proficiency in safety which refers to the awareness of "netiquette" including behavioral norms, online, cultural, and generational diversity in digital environments. Whereas, the finding revealed that career-related competence (i.e., an individual's capacity to perform career- related tasks) is the least well-performed one in the seven areas of DLGF. It is also evident from the findings of the study that individuals' responses toward the information produced and processed by these technologies are unique. However, they possess deep connection with the society where information flows and knowledge evolves (Dunaway, 2011).

In the wake of rapid economic growth and significant innovation in technology, digital literacy is more important than ever. Digital literacy skills are paramount to 21st-century citizens who make the choice of either controlling or being lost out in the world of information explosion that is sweeping through all the sectors. Because our young generations will have to cope with new challenges and risks coming with living with technology, there is no way that we need to expose and prepare them with the skills to stay safe and thrive. A digitally-implemented education system should be in discussion to ameliorate digital citizenship and intense students' cognitive competencies beyond the classroom (Rafi et al., 2019). When it comes to introducing digital learning into the curriculum, it is the role of the government, online providers, parents, and teachers who are prompted to work together to support and protect their children online. This study, to some extent, highlights a case of the Mekong Delta students' digital literacy skills as a useful resource for further curriculum development and research.

The current study cannot avoid some limitations that should be acknowledged when interpreting the results. The research covers a wide range of senior students from different majors in four institutions in Vietnam. Therefore, to draw more specific conclusions, future researchers should focus on students in some particular field. Additionally, the study sample only focused on last year students from universities in the Mekong Delata in Vietnam; hence, the study results cannot be generalized to all educational contexts. It is suggested that further research can be done in which digital literacy level of students in more various age range throughtout Vietnam can be compared using DLGF. Furthermore, regarding to the participants' digital skills, as all survey questions

required them to self-assess their skills, it is also vital that students need to have accurately assessed their digital skills via a test or a tool. In other words, the discrepancy between their perceived and actual skills may be trivial (Aesaert et al., 2017), or there may be some gap between students' self-rated skills and their actual skills (Gross and Latham, 2012). Future studies can discover students' actual skills from practical digital tasks or compare their perceived and actual skills of using technology in some specific context.

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