

Digital Literacy Competence for Scientific Writing: Students' Perceptions and Skills

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Abstract—In this digital era, digital literacy skills must be owned by students to write a good scientific writing. Therefore, this study aims to obtain students' perceptions and skills toward digital literacy in scientific writing. This study was a descriptive study. The data were collected by administering closed-ended questionnaires and conducting semi-structured interviews with the thirty-three students in the seventh semester of the English Language Education Study Program of Teaching Training and Education Faculty of Mahasaraswati University, Denpasar. Data obtained from the questionnaires were analyzed quantitatively, and the data from the interviews were analyzed qualitatively. The result of the study indicated that students had a positive perception of digital literacy and had good digital literacy skills in scientific writing. Students believed having digital literacy skills was essential to help them write good scientific writing. In addition, students have good skills in the digital literacy dimension of critical thinking, finding online information, online writing attitude, and digital function. These skills helped them construct and develop ideas and also avoid plagiarism. However, students' digital literacy skills can be classified as sufficient in the dimensions of online communication, creativity and collaboration, and digital academic culture. Lack of knowledge, competence, and confidence leads students to be less creative and not actively join the online collaboration and digital academic culture.

Index Terms—digital literacy, dimension of digital literacy, scientific writing

I. INTRODUCTION

In this digital era, students and technology cannot be separated since the integration of technology into the learning process provides a flexible, effective, active, and fun learning experience for students (Akram et al., 2022; Odede & Jiyane, 2019; Pangrazio et al., 2020). However, the integration of technology in education does not only have good impacts on education; the rapid development of technology also has terrible impacts on students (Kopecky & Sztokowski, 2017; Purnama et al., 2021; Rocha Estrada et al., 2022). Therefore, learners must have sufficient competencies, including digital literacy skills to use technology critically, effectively, and safely. Digital literacy skills help students operate digital tools and use information from various digital sources (Chan et al., 2017; Gilster, 1997; Leaning, 2019; List, 2019; Park et al., 2021). Hague and Payton (2010) proposed eight dimensions of digital literacy skills, which are the ability to operate digital tools, use digital technology safely, find information on the internet, evaluate digital information critically, share information through digital tools, create digital content, do collaboration through digital technology, and utilize technology in understanding other cultures. More concisely, Iskandar et al. (2022) divided digital literacy into instrumental (ability to use and involve in technology effectively), mental (ability to evaluate, communicate, and create information critically and creatively), and sociocultural (ability to locate and communicate information based proper social, cultural, and moral contexts). In addition, focusing on the main understanding of digital information as the ability to find information, Dudeney and Hockly (2016) constructed four dimensions of digital literacy that is language (how information is communicated through digital technology), information (how information is found and evaluated), connection (how information is achieved by collaborating and joining the social network), and (re)design (how information is adapting). Regarding the stage of an individual's digital literacy, Pérez-Escoda (2019) divided digital literacy into four dimensions: learning, being able, creating, and practicing. In general, digital literacy covers skills to operate digital tools, find and evaluate information on the internet critically, and safely utilize digital technology.

Some researchers conducted studies that focused on digital literacy in language learning. Akayoğlu et al. (2020) explored how pre-service EFL teachers defined the digital literacy concepts, what kind of tools they used, and for which

purposes they preferred digital tools. The result indicated that pre-service EFL teachers' concept of digital literacy consists of many levels, from knowledge to use, to critical, creative, and collaborative use. Moreover, it was found that pre-service EFL teachers use social media platforms for various purposes. In addition, Rinekso et al. (2021) investigated the digital literacy practice of EFL postgraduate students by administering an online opened-ended questionnaire and conducting semi-structured interviews. The result of this study indicated that postgraduate students understood digital literacy as a skill to search, comprehend, evaluate, create, and share information. Students also use digital tools to accomplish their academic and daily purposes. Zan et al. (2020) administered a survey to 226 first-grade students of the Psychology, History, Turkish Language and Literature (TLL), and Contemporary Turkish Dialects and Literature (CTDL) Department at Bartın University to investigate students' awareness and skills in digital literacy. The result of this study indicates that students of the Contemporary Turkish Dialects and Literature (CTDL) Department had the lowest digital literacy awareness and skills that were affected by their habit of using technology.

Moreover, Alfia et al. (2021) used the Theory of Planned Behavior of Ajzen to examine students' beliefs about integrating digital literacy into EFL classrooms. Based on the result of the interview and observation, behavioral (about the advantages of digital literacy in students' learning process), normative (about meeting the social expectations of students' learning), and control (about the opportunity to use technology in the learning process) were students' beliefs that effected students' learning strategy in EFL classroom. Furthermore, Nguyen and Habok (2022) investigated the digital literacy level of 1,661 EFL Vietnamese university students. By administering questionnaires, this study found that students had positive attitudes toward digital literacy, and most students could access digital technology at home and university. However, the level of students' digital literacy knowledge was higher than the level of students' digital literacy skills. Potential reasons for that finding are the lack of opportunities for students to use technology in the learning process and the curriculum only focuses on knowledge.

From the previous research, it can be seen that the digital literacy concept, digital literacy awareness, digital tools, and students' digital literacy level are the most discussed topics. In this study, the researchers only examined students' digital literacy in general English learning rather than focusing digital literacy on specific English language skills. This study focused on students' digital literacy in writing to fill the gap. This research intended to examine and discuss EFL university students' digital literacy skills in scientific writing based on the dimension of digital literacy skills. Since scientific writing is a type of writing designed to communicate scientific topics and information, Lindsay (2011) suggested that scientific writing must be precise and clear. It means that information in scientific writing must be reliable and comes from reputable resources. Technology development makes it easy for students to access various information digitally. To obtain reliable information effectively on the internet, students are better equipped with digital literacy skills. Besides, having digital literacy skills allows students to use various tools and applications that can help them write scientific writing, such as Grammarly, Mendeley, and Publish and Perish application. The most crucial point is that digital literacy can help students be aware of writing ethics, such as avoiding plagiarism. Thus, related to the objective of this study, two research questions were carried out:

1. What is students' perception of the importance of digital literacy skills in scientific writing?
2. What are students' digital literacy skills in scientific writing based on the dimension of digital literacy skills?

II. METHOD

A. Participant

The participants in this study were chosen by using the purposive sampling technique as follows:

1. Formulating the objective of the research
2. Determining the criteria that support the achievement of research objectives, which are:
 - a. Students who had passed the writing course
 - b. Students who actively write scientific writing
 - c. Students who utilized digital technology in writing
3. Determining the population based on the specifications of the conducted research
4. Determine the minimum sample in the study that is feasible and meets the expected criteria

Based on the objective of this study, to know EFL students' digital literacy skills in writing scientific writing, the seventh-semester students of the English Language Education Study Program of Teaching Training and Education Faculty of Mahasaraswati University Denpasar were chosen as the population purposively. Furthermore, thirty-three students in the seventh semester were chosen as a sample of this study since they met the criteria that were: 1) actively writing an undergraduate thesis and article as a graduation requirement; 2) passing three stages of the writing course: paragraph writing in the second semester, essay writing in the third writing, and argumentative writing in the fourth semester; and 3) utilizing digital technology to write their undergraduate thesis and article.

B. Research Design

This study was conducted based on descriptive research design since the purpose of this study is to obtain information to describe the students' digital literacy skills in scientific writing. To answer the research questions, questionnaires and interviews were utilized. Questionnaires were administered to determine students' digital literacy

skills in scientific writing. The interview was conducted to explore the depth of information related to students' digital literacy skills in scientific writing and also students' perception of digital literacy in writing, especially scientific writing.

C. Instrument

To obtain rich data related to students' digital literacy skills in scientific writing, a questionnaire developed by Nabhan (2021) was adopted. Digital literacy dimensions and EFL scientific writing environment were considered in designing the questionnaire. The statements in the questionnaire were about students' digital literacy skills based on seven dimensions of digital literacy. Forty-six statements were divided into seven dimensions of digital literacy: six statements for the critical thinking dimension, five statements for the online writing attitude dimension, six statements for the digital academic culture dimension, four statements for online collaboration and creativity dimension, five statements for online information finding dimension, nine statements for online communication dimension, and eleven statements for digital functional skills dimension. Questionnaires were designed in the form of 5-point Likert scale agreements: strongly agree (5 points), agree (4 points), neither agree nor disagree (3 points), disagree (2 points), and strongly disagree (1 point).

To ensure the questionnaire was eligible to be administered and consistent in measuring, the questionnaire must be valid and reliable. In order to verify the validity of the questionnaire, two experts in English language teaching and ELF writing were invited as validators to check the statements in the questionnaire. The validation result from two validators was calculated and categorized using the Gregory formula. Based on the calculation result, the statements in the questionnaire were valid and categorized as very high, with a point of 1.0. Moreover, the reliability of the questionnaire was examined by using Alpha Cronbach. The result indicated that the questionnaire was reliable, with a score of 0.938. Since the questionnaire was valid and reliable, the questionnaire could be administered.

The interview was conducted with students who responded to the questionnaire to support the data obtained from the questionnaire. The interview was conducted as a semi-structured interview in which the researcher as interviewee had a list of questions as an interview guide. However, questions can be developed during the interview to obtain deeper information. The questions in the interview guide were about students' perception of digital literacy, especially in writing English scientific writing. In addition, to support the result of the questionnaire, the questions in the interview guide were also about students' digital literacy skills.

D. Data Collection Procedures

Data that was used in this study was primary data that came from first-hand sources. The first-hand source of this study was the seventh-semester students who had passed three stages of a writing course and were actively writing their undergraduate thesis and article as a graduation requirement. The primary data in this research were collected by conducting a survey and interview. The questionnaires were administered to the thirty-three seventh-semester students using Google Forms so students could easily respond to the questionnaire. After the responses to the questionnaire had already been collected, the interview was conducted. Among thirty-three respondents, five students were chosen as representatives to be interviewed. Interviews were conducted face-to-face and via Zoom, depending on the student's willingness.

E. Data Analysis

Data obtained from the questionnaires was analyzed quantitatively, and the interview was analyzed qualitatively. Quantitative analysis of closed-ended questionnaires was focused on calculating and interpreting students' responses. The steps of quantitative analysis of closed-ended statements in the questionnaire were (1) counting the percentage of the student's responses, (2) analyzing the students' responses, (3) explaining the students' responses, and (4) interpreting the students' responses. Qualitative data were obtained from the interviews. The qualitative analysis of the interview result categorized students' answers into codes and then interpreted students' answers.

III. FINDING

A. Students' Perception Toward the Important of Digital Literacy in Scientific Writing

Since this study was conducted to find out students' digital literacy that supports them in writing scientific writing, it is better to have students' perceptions of the importance of having digital literacy skills in writing scientific writing. Based on the interview result, six themes regarding students' understanding and perception of digital literacy skills can be revealed, as shown in Table 1.

TABLE 1
STUDENTS' PERCEPTION TOWARD THE IMPORTANT OF DIGITAL LITERACY IN SCIENTIFIC WRITING

THEME	STUDENTS' RESPONDS
Digital literacy is finding information skills	"Digital literacy is a skill to search and find information online." "Having digital literacy skills help us to find articles, journals, or e-books easily on certain website on the internet."
Digital literacy as digital functional skills	"People can be said as digital literate if they can use digital stuff such as laptop or handphone to support their study, works, or daily activities." "Digital literacy is skills to utilize the digital application to help us finish our tasks."
Digital literacy skills to protect ourselves from digital harms	"There are various crimes in the digital world, so we need digital literacy skills to protect our data and self."
Digital literacy skills help students to write scientific writing	"Having digital literacy is important since there are so many applications that can help us to finish our scientific writing such plagiarism checker and paraphrase application." "Since digital literacy is being able to search and find information using digital media, it is important to have digital literacy skills to help us develop ideas."
Limitations of digital tools	"Having proper gadgets is important to be digitally literate, and this is my challenge since my laptop sometimes is not compatible with some applications I need to help me do my writing assignments."
Limitations of digital literacy training	"It would be good if I could join kinds of training to develop my skills in operating digital applications to help me finish my writing."

B. Students' Digital Literacy Skills in Scientific Writing

Since this study focused on scientific writing, students' digital literacy was divided into seven domains related to scientific writing. The student's digital literacy was obtained by administering a survey containing seven domains of digital literacy: digital functional skills, online communication, online collaboration and creativity, digital academic culture, finding online information, critical thinking, and online writing attitude. In addition, the interview was also conducted to add some information related to students' digital literacy skills based on the seven dimensions of digital literacy in the questionnaire.

(a). Digital Functional Skills

Having digital functional skills is one of the indicators of being digitally literate (Tabieh et al., 2021). Students with digital functional skills will be fluent in operating digital technologies to help them write their scientific writing. Regarding scientific writing, this study examined students' digital functional skills that were focused on students' fluency in utilizing word processing applications, spreadsheet applications, presentation applications, image, and video editing applications, sharing information applications, file changing applications, grammar checker applications, plagiarism checker application, paraphrasing and summarizing application, data analysis software, and reference management application. Those applications and software are beneficial to support students in finishing their scientific writings, thesis and article drafts.

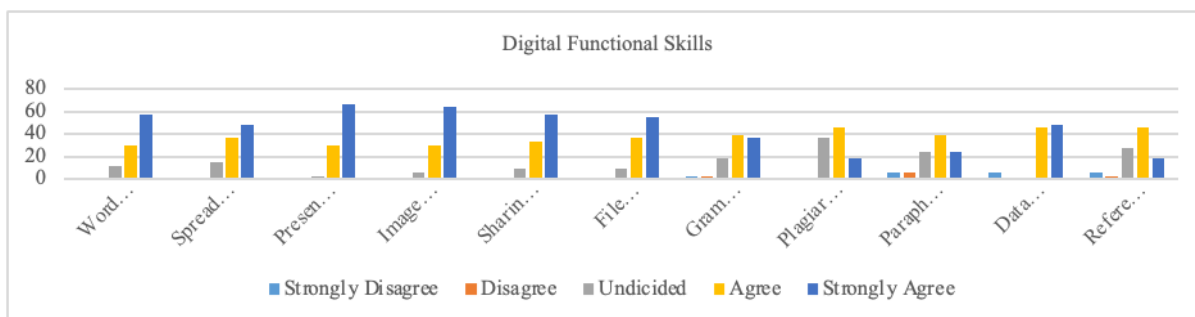


Figure 1. Digital Functional Skills

The questionnaire result indicated that students could use applications to help them write their thesis and article drafts. Students were able to operate word processing applications such as Microsoft Word. However, most students explained that they did not excel at utilizing Microsoft Word since they only knew the essential functions of Microsoft Word.

They said they were still learning tips and tricks on using some functions in Microsoft Word to make their work easier. This condition also happened to their fluency in operating spreadsheet applications. Even students acknowledged that they have difficulty in using spreadsheet applications such as Microsoft Excel, especially formulas.

Conversely, students confidently claimed they were good enough at utilizing presentation applications such as Microsoft PowerPoint, Canva, and Prezi. Based on their opinion, learning about presentation applications was more interesting. It aligns with their ability to utilize image and video editing applications in which students were highly interested. Students stated that editing image and video was fun, and they edited them for their study and daily activity. Related to digital writing, students used grammar checker applications, plagiarism checker applications, and paraphrasing applications such as Grammarly, QuillBot, and Turnitin to ensure that their scientific writing was original and grammatically correct.

(b). Online Communication

Online communication is vital in writing (Kim & Paek, 2019). By utilizing online communication, students can communicate their problems in writing, sharing ideas, and doing peer assessments with their friends. Online communication also helps students to have quick feedback and suggestions from the lecturer. As a result, the writing process will run smoothly, and the student's writing will be composed better. This study explored students' skills in utilizing online communication to support their scientific writing. Specifically, this study focused on obtaining students' skills in using social media, instant messaging, online conference applications, video-sharing applications, personal blog websites, email platforms, learning management systems, and survey applications. In addition, the student's ability to use polite expressions in online communication was also obtained.

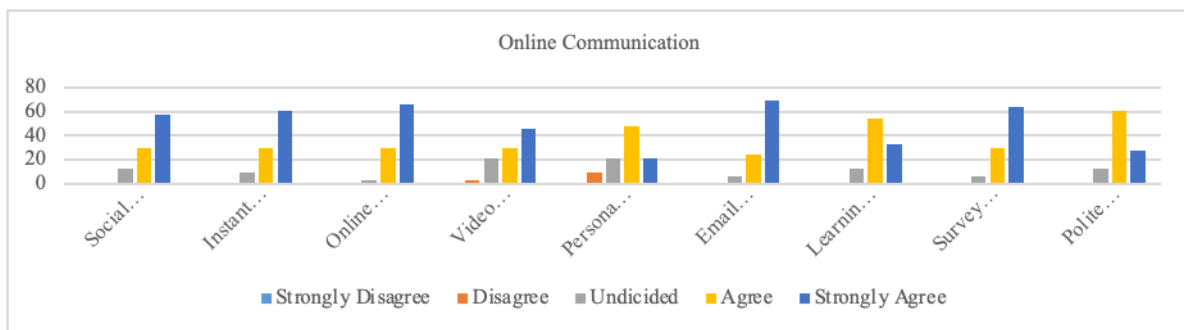


Figure 2. Online Communication

Based on the result of a questionnaire about students' skills in online communication presented in the chart above, it can be seen that students have good skills in using online communication. Students claimed that they were able to use polite expressions in online communication. Moreover, students mentioned in the interview that they have good skills in operating social media and instant messaging since they actively used Facebook, Instagram, Twitter, TikTok, WhatsApp, Line, and Telegram for communication. Students also stated that in writing their thesis and article draft, they used instant messaging to share related references with their friends who had the same topics. Interestingly, they often used social media to get and share videos or articles related to tips and tricks of writing, such as how to make tables or graphs easier, how to set page numbers instantly, how to customize pages, or websites that provide grammar checker and paraphrase maker.

Furthermore, students also used survey applications to collect data for their thesis. They mentioned Google Forms as a survey application they used the most for collecting data. However, they also claimed they could use other survey applications such as Mentimeter and SurveyMonkey. Based on the chart above, it can be concluded that online conference applications and email platforms are the online communication tools that students master the most. Students explained how online conference application and email platform helps them to communicate with their supervisors about their thesis and article drafts. Submitting revisions, giving suggestions, and solving problems related to their thesis and article draft were activities that students and supervisors did using online conferences and email. Despite this, the result of the questionnaire indicates that students' skills in using video-sharing applications, personal blog websites, and learning management systems are not good enough. Students explained that they were not active users that uploaded the videos to video-sharing applications and wrote articles on personal blog websites. Related to scientific writing, they were just passive users of video-sharing applications and personal blog websites to gain knowledge related to their thesis topic. In short, students' online communication skills can help them write their scientific writing.

(c). Online Collaboration and Creativity

Collaboration and creativity are 21st-century skills that students must have to support their digital literacy skills (Kerkhoff & Makubuya, 2022). In addition, by having collaboration skills and creativity, they will be greatly helped in writing their scientific writing. Therefore, this study intended to determine students' collaboration skills and creativity, focusing on how students collaborate in peer assessments and share references. Moreover, students' creativity in creating digital images and videos from words was also examined.

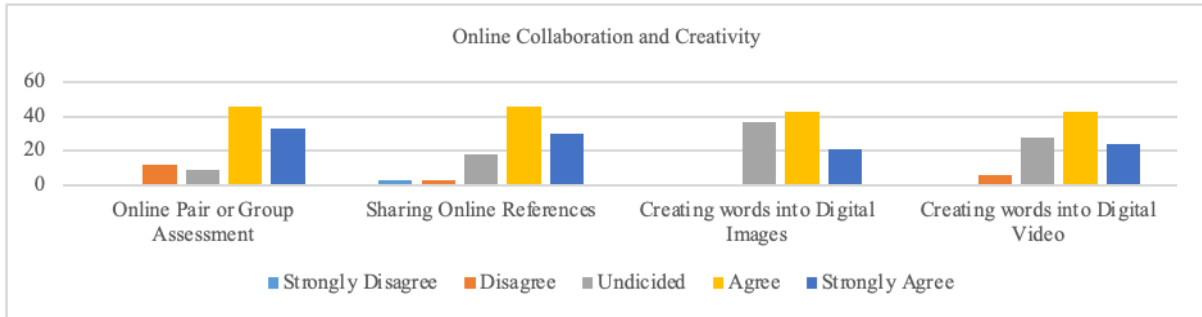


Figure 3. Online Collaboration and Creativity

The questionnaire result showed that most students were fairly good at online collaboration. Students explained in interviews that they shared references with their friends by email or instant messaging applications such as WhatsApp and Telegram. Most students did online pair or group assessments through Google Docs, email, and Padlet with their friends who had the same topic. Students said this online pair or group assessment helped them revise their writing regarding vocabulary and content. However, some students thought that they could not yet give advice on their friends' writing since it needed a high level of critical thinking and writing knowledge. Besides, students stated that they were not excellent at creating digital images or videos. They claimed they could create simple digital images and videos to support their scientific writing.

(d). *Digital Academic Culture*

The rapid development of technology in information and communication helps students find the latest information and communicate easily with others in the same academic concentration to gain knowledge. The culture of sharing academic information and knowledge by utilizing technology changes academic culture into a new digital academic culture (González-Nieto et al., 2021). The digital academic culture encourages the development of academic forums and websites on the internet that can help students more easily find and exchange information and knowledge in the academic field. Therefore, this study intended to examine students' involvement in digital academic culture, such as joining academic forums in social media and messaging services, actively browsing academic websites, having academic websites, subscribing to academic content on YouTube, and joining academic webinars.

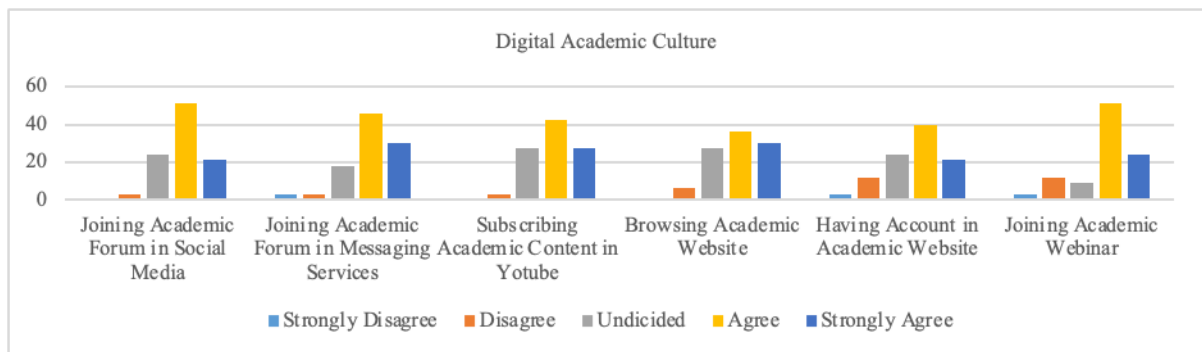


Figure 4. Digital Academic Culture

The result of the questionnaire shows that most of the students are involved in digital academic culture. Most students join academic forums in social media and messaging services since they are fluent in online communication. Based on the result of a questionnaire about students' online communication, it shows that students actively used digital media to communicate. It makes most students actively join academic forums on social media and instant messaging services to get new knowledge, the latest information, tips, and tricks for studying, and also share ideas related to academic topics. Regarding scientific writing, students join academic forums to get knowledge and tips on paraphrasing, plagiarism, template, and writing technique.

Moreover, they also had accounts on some academic websites, such as Academia.edu, Researchgate.net, JSTOR.org, and Google Scholar. Since the COVID-19 pandemic, students were more intent on joining the academic seminars. They stated that joining academic seminars helped them to find ideas for their thesis. They also stated that joining academic seminars about writing is very helpful in making them easier to write their thesis. In addition, students subscribed to academic content on YouTube to learn applications to help them write their thesis.

(e). *Finding Online Information*

Digital literacy is a competency that is closely related to searching and finding information by utilizing technology (List, 2019). In order to find reliable information easily, it is crucial to have knowledge and skill in searching a collection of information through websites or applications. Finding reliable information related to the topic is also

essential in writing. By finding reliable information, students can easily develop their ideas. Therefore, this study examined students' knowledge and skill in finding online information from websites or applications that students used to find reliable information.

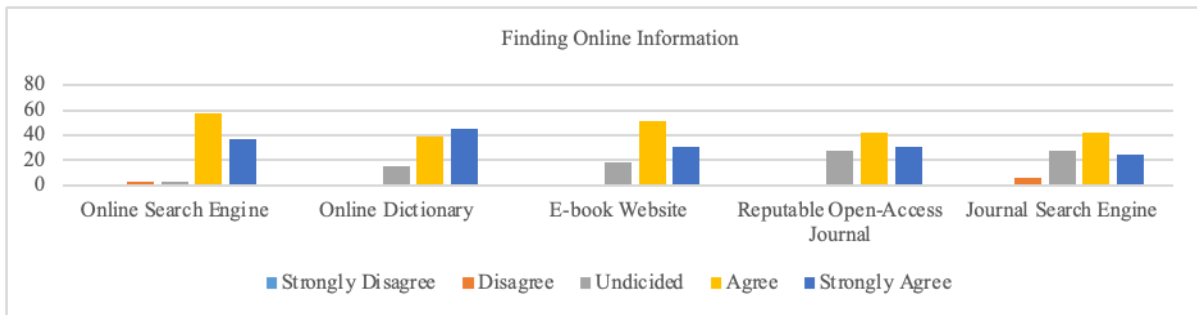


Figure 5. Finding Online Information

Data obtained from the questionnaire indicated that students have knowledge and skill in using online websites and applications to find reliable information. From the interview, it was interesting that most students use online search engines to find information, and Google is the only search engine they use. They believed that Google would provide everything that they needed. Google could direct them to find information through blogs, websites, e-books, e-article, and e-journals. Specifically, students went to PDF Coffee and PDF Drive to find e-books. Elsevier, Sage Open, Eric, JSTOR, and Google Scholar were some reputable journals regularly accessed by students. However, some students used journal search engines such as Open Knowledge and Publish or Perish to narrow the search according to their writing topic. Unfortunately, this journal search engine was not very well known by students. In addition, students used online dictionaries such as Oxford and Thesaurus to find information related to unfamiliar words that they found while reading an e-book or e-article and find synonyms and antonyms of words or phrases they used in their thesis or article.

(f). *Critical Thinking*

Critical thinking is one of the important skills in digital literacy (van Laar et al., 2017). People can easily search, find, and share information in this digital era. Therefore, it is essential to critically analyze and evaluate the information obtained before sharing and using it as a reliable source. While writing the thesis and article draft, students must find various information related to their topic. Students must have critical thinking skills to effectively find reliable sources and analyze information. Related to critical thinking, this study delved into students' critical thinking in digital literacy that focused on how students use their critical thinking skills to find reliable sources and references, analyze information, find and develop ideas, connect different sources, and identify original authors.

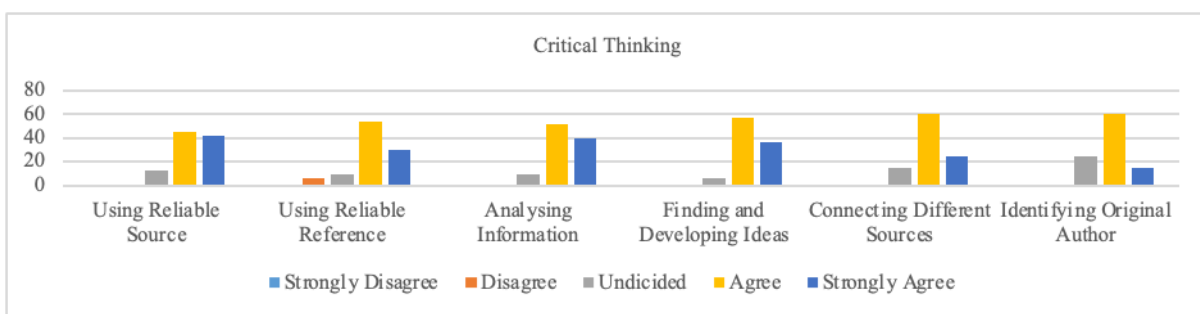


Figure 6. Critical Thinking

The questionnaire showed that students can use critical thinking skills while utilizing technology. Students were able to identify the original author of the information. In an interview, some students claimed that they cited the statements from the original author by browsing the original article or book on the internet. It also indicates that students can use reliable sources and references. The most important thing is that students can evaluate the information they have found on the internet by analyzing it and connecting some information from different sources. As a result, students easily critically find and develop ideas related to their topic.

(g). *Online Writing Attitude*

Technology development provides various kinds of information (Szymkowiak et al., 2021). This information is easy for students to find, download, and read to be used as a reference in completing their assignments. This situation challenges students to write their thesis or article regarding scientific writing. Students need to be honest when they use ideas from other authors to generate their ideas to avoid plagiarism. Therefore, this study examined students' online writing attitude as one of the dimensions of digital literacy in scientific writing. Data were obtained from students' knowledge and attitude about copyright, security, citation, and plagiarism.

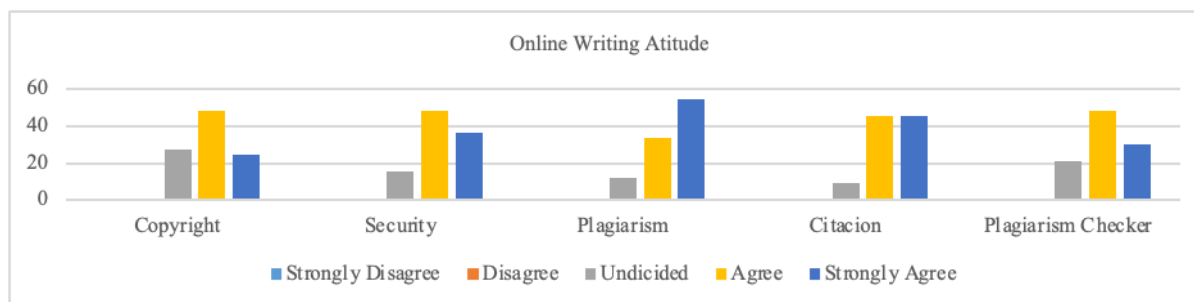


Figure 7. Online Writing Attitude

Students' online writing attitude was categorized as good according to the result of the questionnaire. Regarding security, most students claimed that they understood that information they upload and share online must be factual, polite, and reliable. In addition, students are aware that they must ensure that the information they share will not be used for something that is not good by other people. The interview result also indicated that most students were aware of copyright and plagiarism. Therefore, they did citations for every piece of information that they used. They also checked their writing using plagiarism checkers such as Turnitin to avoid plagiarism.

IV. DISCUSSION

Regarding digital literacy in language learning, this study focuses on students' digital literacy competency in writing English scientific writing. The interview result indicated that students' concept of digital literacy was a skill that must be mastered to utilize technology to find and evaluate information in various online forms. Their concept aligns with the digital literacy concept delivered by List (2019), that digital literacy is skills in operating technological tools to search, evaluate, and communicate digital information in all modes from various resources on the internet. Moreover, students agreed that having digital literacy competency helps them to write their scientific writing correctly and efficiently. They realized that technology, in terms of digital tools, is very helpful in writing. By utilizing technology to write scientific writing, students can develop their ideas, enrich the use of words, and avoid plagiarism. Therefore, having digital literacy skills is crucial to appropriately use digital tools. It is also supported by Reddy et al. (2022) that stated digital literacy is essential for humans as personal and professional since the development of technology makes people need to have the ability to utilize digital tools and information responsibly.

Besides students' concepts and perceptions of the importance of digital literacy in scientific writing, students' digital literacy competency was also obtained. Based on the results of interviews and surveys, students have good skills in the digital functional skills dimension. They can operate digital tools well enough to help them finish their writing, such as typing, making tables, making presentations, checking grammar, checking plagiarism, and compiling. However, students stated that they could operate digital tools but not excellently. It can be seen from the online creativity dimension in which students' creativity to support their scientific writing, such as creating words into images or videos, was not so high. Even so, having proper skills in the digital functional dimension helps students train their skills in online communication. This study showed that students utilized digital technology to discuss their thesis or article draft with their lecturers or advisors through online conference applications and email. They can exchange ideas, share online references, and discuss their writing problems with friends through instant messaging such as WhatsApp, line, and Telegram. As a study conducted by Tang and Hew (2022) proved, instant mobile messaging helped students engage in active communication to exchange ideas, discuss problems, and produce something creatively. In addition, a study by Yasuda (2021) revealed that online discussion through instant messaging would help students acquire knowledge since online communication activities provide phases of online knowledge instruction. Obtaining new knowledge helps students to develop ideas in their writing. Besides instant messaging, students also mentioned social media such as Instagram, Facebook, and YouTube as online communication applications that they regularly use to gain knowledge and skills in writing. It aligns with a study conducted by Yunus et al. (2019) that showed social media help students improve their writing skills since it provides knowledge and tips for writing and scaffolds students in the writing process.

However, the interview result showed that in online communication, most students did not actively utilize online communication media to improve their writing skills. They just passively obtained knowledge about writing from YouTube or any online resources. They did not try to share the knowledge they had obtained before by uploading videos to YouTube or any online media. They also did not actively write on their blogs. Writing on a personal blog can train writing skills (Muslem et al., 2022). The result of a study conducted by Yousefifard and Fathi (2021) proved that learning to write through blog-mediated instruction improved students' writing skills. In addition, the study that was conducted by Han (2023) proved that blog-based writing instruction not only improved students' writing skills but also students' motivation to write. Students also had low participation in the digital academic culture dimension. The survey and interview results indicated that students regularly joined academic forums on social media or instant messaging and academic webinars. Despite this, they did not actively join the forum or webinar as speakers. They also had accounts on

various academic websites, but they did not participate in sharing their writing on academic websites such as Academia.edu. It can be said that students just had passive digital literacy skills in terms of the digital academic culture dimension, in which they joined digital academic culture to achieve knowledge rather than share knowledge or their own ideas. A similar situation also happened in students' online collaboration dimension. Some students did not do online pair or group writing assessments since they thought it required a fairly high level of critical thinking as well as adequate skills and knowledge of writing. Even so, students who did online pair or group writing assessments through Email, Google Docs, or Padlet stated that online pair or group writing assessments helped them decrease their writing errors. It is in line with a study conducted by Lee et al. (2019), in which revising students' writing in pair increased students' creativity, writing performance, and high-order thinking and decreased students writing errors. In addition, a study by Abe (2021) proved that collaboration in writing positively affects students' writing skills.

This study's most important result is students' good digital literacy skills in finding online information, critical thinking, and online writing attitude. These three dimensions are the most critical writing issue in the digital era. Having good skills in finding online information helps students to be able to search and find information through digital tools correctly and efficiently. Related to scientific writing, these skills help students to be able to find appropriate information based on their topic on academic websites or reputable academic online journals through academic journal search engines. It is better if skills of finding online information align with critical thinking skills. Since various information is provided online, it is easy to find information from various sources. However, finding appropriate information from reliable online resources requires certain skills. Critical thinking is one of them. Therefore, many experts include critical thinking when defining digital literacy (Alt & Raichel, 2020; Martínez-Bravo et al., 2022). Related to students' writing, having skills in finding online information dimension and critical thinking dimension can help students produce scientific writing that is well written since students can generate and develop ideas and provide reliable information and references to support their writing.

Furthermore, related to finding information on the internet to support students' scientific writing, it is important to know the original source of information used to avoid plagiarism. Plagiarism is a typical writing problem (Awasthi, 2019; Zhang et al., 2022). In this case, students need to have skills in the online attitude dimension. These skills make students critical and honest in using information they find online as a reference in their scientific writing. This study showed that students paraphrase the information, cite the original source, and check the similarity of their scientific writing to avoid plagiarism. It indicates that students were aware of plagiarism in writing and tried to apply their digital literacy by utilizing technology to avoid plagiarism.

V. CONCLUSION

This study is conducted to obtain students' perceptions and skills of digital literacy. This study focuses on digital literacy skills that can help students finish their scientific writing, such as articles in academic journals or bachelor's thesis. Based on the study result, students had positive perceptions toward digital literacy, and students had good skills in digital literacy. Specifically, students believed that digital literacy skills could help them write their scientific writing. The result of the survey and interview indicated that students have good skills in the digital literacy dimension of critical thinking, finding online information, online writing attitude, and digital functionality. Students also had sufficient skills in the online communication dimension even though they were not fully utilizing online communication tools to improve their writing skills and help them to finish their scientific writing. It also happens in online collaboration and digital academic culture dimension. Students were not actively joining the online collaboration and digital academic culture. Therefore, it is suggested to conduct future studies on improving students' engagement in online writing collaboration and digital academic culture.

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