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# IMPLEMENTATION OF THE '数字素养 (SHÙZÌ SÙYǍNG)' INSTRUMENT TO MEASURE THE DIGITAL LITERACY LEVEL OF MANDARIN LANGUAGE EDUCATION STUDENTS

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**Abstract:** The current presence of the internet undeniably facilitates and accelerates individuals' ability to access and disseminate information, even leading to an information explosion. To manage this situation, digital competence is required to face the 6.0 era. The world's shift toward complete digitalization pushes humans to quickly adapt to digital infrastructure and digital services. To address this, humans need skills referred to as digital literacy. The purpose of this study is to determine the level of digital literacy of Mandarin Language Education students through the "数字素养" instrument.This study uses quantitative data analysis that emphasizes primary data measurement, especially objective digital literacy levels, using numerical data and statistical analysis. The results of this study indicate that the digital literacy level of Mandarin students is at a fairly good level, with an overall average score of 3.25. The Digital Literacy Index across all dimensions falls into the advanced category (81.25%). Among the eight dimensions, two are categorized as "good," namely the Collaboration Dimension (3.45) and Social-Cultural Understanding (3.41). The other six dimensions fall into the "fairly good" category, with scores ranging from 3.11 to 3.40, including Functional Skills (3.40), Creativity (3.22), Communication (3.19), Information Searching and Selection Ability (3.11), Critical Thinking (3.15), and Digital Safety (3.14).

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## Introduction

The world has now entered the Society 5.0 era. Amalia & Munif (2023) posit that the concept of Society 5.0 represents a collaborative paradigm between humans and technology, with humans at the center and technology serving as the foundation. Furthermore, significant transformations in technology utilization have emerged in the post-COVID-19 pandemic period, particularly within the education sector. The pace of change has accelerated dramatically, with internet users proliferating year after year. This widespread adoption of technology and internet usage has ushered in what is termed the era of technological

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disruption. Ramadhani (2022) contends that such technological disruption can propel national progress, provided that society demonstrates effective adaptation capabilities.

The growth in internet usage reflects increased accessibility to digital devices and internet infrastructure, including in Indonesia. Additionally, the rising demand for online services such as digital education, e-commerce, and social media has also contributed to the surge in the number of internet users globally.According to the 2023 survey data published on the GoodStats platform, internet users have demonstrated consistent annual growth since 2015. The report indicates a 1.9% increase in user numbers from January 2022 to January 2023.

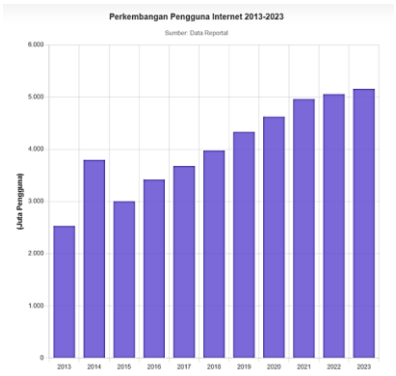


Figure 1. Development of Internet Usage

According to survey results published on Databoks in 2023, the We Are Social report indicates that internet users in Indonesia reached 213 million by January 2023. This figure represents 77% of Indonesia's total population of 276.4 million at the beginning of the year. Internet usage in Indonesia has demonstrated consistent annual growth over the past decade, with user numbers increasing from 70.5 million in January 2013 to 142.5 million in January 2023. The majority of Indonesia's population spends an average of 7 hours and 42 minutes online daily, primarily accessing the internet via mobile devices.

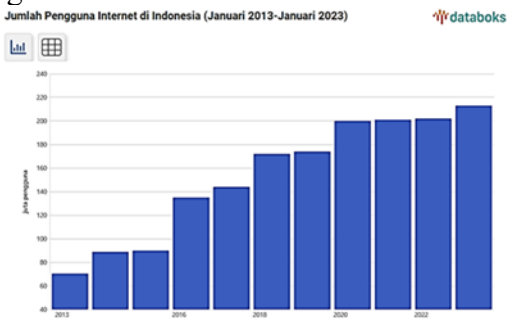


Figure 2. Number of Internet Users in Indonesia

Currently, technology has been widely implemented across various aspects of the learning process, including instructional media, teaching methodologies, learning strategies, and other elements. Ramadhani (2022) asserts that the most prominent changes in education following the pandemic have occurred in educational systems and structures, and these transformations continue to evolve alongside technological advancements. Budiman (2017:41) maintains that technology integration in education has become essential for the learning process.

  

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Several Indonesian universities currently offer Mandarin Language Education programs, including Universitas Negeri Malang and Universitas Negeri Surabaya. Both institutions have integrated technology into their learning processes. Universitas Negeri Malang has implemented the Sipejar LMS (Learning Management System), as stipulated in Rector's Regulation No. 24 of 2020 concerning the Guidelines for Education at Universitas Negeri Malang (2020 Edition), which states that UM's learning management is conducted through a unified Learning Management System (SIPEJAR). In other words, UM has been conducting technology-integrated learning for approximately four years.

Meanwhile, Universitas Negeri Surabaya has implemented the Sindig LMS (Digital Learning System). The Sindig LMS dashboard displays more than 2,000 active classes. Both learning management systems facilitate various academic activities, ranging from online attendance systems (e-attendance), assignment submissions, synchronous and asynchronous material delivery, assessment administration, to online grading. The application of technology is not limited to online learning. Conventional face-to-face learning also predominantly incorporates technological elements, such as PowerPoint presentations, internet-based information retrieval, digital media utilization, and other technological tools. Wati and Desri (2020) emphasize that the internet has become the primary learning resource for students. Furthermore, Hasliyah (2022) notes that internet-based learning significantly enhances students' information acquisition. This phenomenon occurs because the internet enables learners to access diverse information sources rapidly, with virtually unlimited variety and availability.

The Indonesian government places significant emphasis on enhancing the digital literacy of its citizens across multiple dimensions. The survey results published on the official website of Indonesia's Ministry of Communication and Informatics revealed that the national digital literacy index for 2022 stood at 3.54 on a 1-5 scale. When segmented by education level, the digital literacy index reached 3.70.

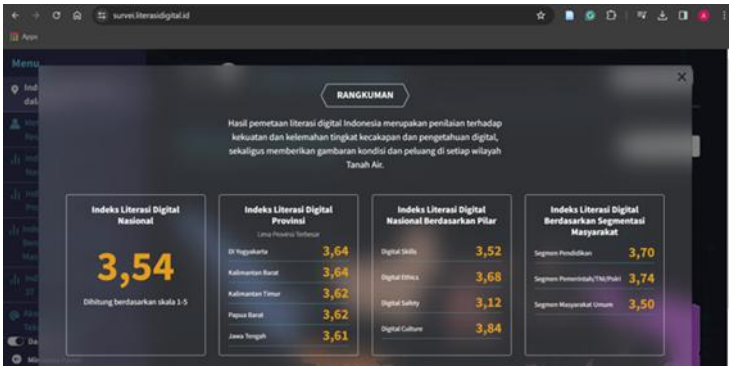

Figure 3. Summary of Indonesia's Digital Literacy Index

Understanding the digital literacy level of students is crucial for lecturers in designing technology-based learning, as it ensures that the selected methods, media, and strategies align with student characteristics and support the achievement of learning objectives (Fitriyani & Mukhlis, 2021). Although numerous studies on digital literacy have been conducted (Nasionalita, 2020; Naufal, 2021; Tazun, 2022; Takariani, 2023), research specifically focusing on Mandarin Language students remains limited, despite the critical need for digital literacy proficiency in enabling students to independently process digital information. To

  

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address this gap, this study utilizes the validated and reliable "数字素养 (Digital Literacy)" instrument, tested on 154 Mandarin Education students, to provide an accurate and contextually relevant assessment of their digital literacy levels..

Digital literacy refers to an individual's capacity to acquire, comprehend, and process information obtained from various digital sources (Hasliyah, 2022). Aligning with Hasliyah's perspective, Hanelahi (2020) defines digital literacy as the ability to understand and utilize digital devices to locate and evaluate information securely, effectively, efficiently, and wisely, thereby facilitating communication and interaction in daily life. Restianty (2018) emphasizes the crucial need for digital literacy comprehension in social interactions, particularly as society evolves with unlimited technological access. A proper understanding of digital literacy fosters informed usage of information technology. The "数字素养" (Digital Literacy) instrument serves as a measurement tool for assessing digital literacy levels among Mandarin language students. This instrument has been developed and pilot-tested with 154 Mandarin Education students. The development results demonstrate satisfactory validation outcomes, with a table r-value of 0.159 and reliability testing yielding a Cronbach's Alpha value > 0.6. These findings confirm that the "数字素养" instrument is both valid and reliable for measuring digital literacy.

## Research Method

This study employs a quantitative research approach. The primary objective of this research is to assess the digital literacy level among students enrolled in the Mandarin Language Education Program. The study emphasizes the measurement of primary data through objective digital literacy assessments, utilizing numerical data and statistical analysis. This approach aligns with Sugiyono's (2018) assertion that quantitative methodology constitutes a scientific method, as it fulfills fundamental research principles including systematicity, measurability, objectivity, empiricism, and rationality. Furthermore, Meliza (2022) maintains that descriptive quantitative research serves to explain or delineate various research situations or variables. Consequently, descriptive quantitative methodology has been identified as the most appropriate approach for this investigation. The research methodology will be elaborated in detail as follows.

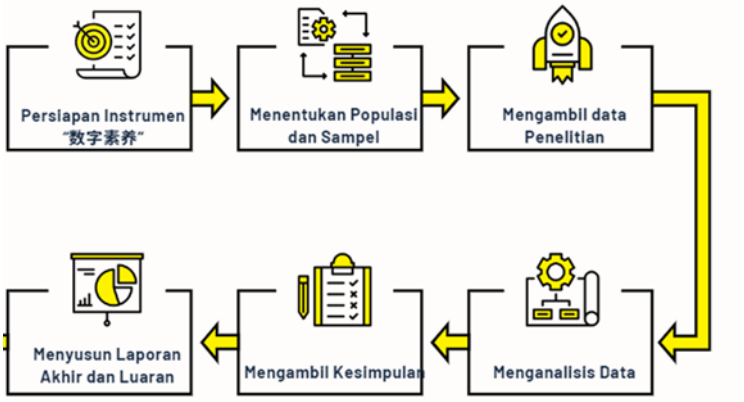


Figure 4. Research Stages Flowchart

The population in this study consists of students from the Mandarin Language Education Study Program at Universitas Negeri Malang and Universitas Negeri Surabaya. The sampling technique employed in this research is random sampling, using Slovin's formula. The total sample size in this study is 232 students. The respondents who completed

  

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the questionnaire were distributed across students from the 2020 to 2023 cohorts. The instrument used in this research is the "Digital Literacy" questionnaire. The data analysis technique applied in this study is statistical. The collected data was then tested for validity using the Mean formula to determine the research results. The researcher classified the Digital Literacy Index based on the Mean score. The scale used for each answer item adopts a Likert Scale with a range of 1-5 points, calculated using the following formula.

$$\textbf{Jarak Interval (i)} = \frac{\textit{Skor tertinggi – Skor terendah}}{\textit{Σ Kelas interval}}$$

$$= \frac{(5 - 1)}{5}$$

= 0,8 (Widoyoko, 2012:112)

Tabel 1. Score Interpretation

| Nilai Tanggapan | Kategori |
|---|---|
| 1,00 – 1,80 | Sangat Kurang Baik |
| 1,81 – 2,60 | Kurang Baik |
| 2,61 – 3,40 | Cukup Baik |
| 3,41 – 4,20 | Baik |
| 4,21 – 5,00 | Sangat Baik |

Furthermore, the researchers categorized the Digital Literacy Index according to the percentage-based Mean score, adhering to the classification established by (Nasionalita, 2020).

Table 2. Digital Literacy Index Classification

| Nilai | Kategori |
|---|---|
| 17%-45% | Basic |
| 45,1%–73% | Intermediate |
| 73% - 100% | Advance |

To measure the respondents' achievement level (TCR) in percentage form, the following formula is used:

$$\textbf{TCR} = \frac{(\textit{Rata-rata skor} \times 100)}{\textit{Skor Maksimum}}$$

  

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## Result and Discussion

The data were collected using the "Digital Literacy" questionnaire instrument, distributed to respondents via Google Forms. The "Digital Literacy" instrument consists of 33 items related to digital literacy. These items are divided into eight components of digital literacy: Functional Skill and Beyond, Creativity, Collaboration, Communication, The Ability to Find and Select Information, Critical Thinking and Evaluation, E-Safety, and Cultural and Social Understanding. The following is the distribution of the question items.

Table 3. Distribution of Questionnaire Items

| **Dimensi** | **Jumlah item pertanyaan** |
|---|---|
| Functional Skill and Beyond | 11 |
| Creativity | 3 |
| Collaboration | 3 |
| Communication | 5 |
| The Ability to find and select Information | 5 |
| Critical Thinking and Evaluation | 2 |
| E-Safety | 2 |
| Cultural and Social Understanding. | 2 |
| **Jumlah** | **33** |

The questionnaire was made accessible to respondents for a one-week period, from May 7, 2024 to May 14, 2024. After respondents completed the questionnaire within the given timeframe, the research team conducted quantitative analysis. The digital literacy results of the students are presented in the table below.

Table 4. Summary of Students' Digital Literacy Results

| Instrument | No | Dimensi | Tanggapan Capaian Responden | | |
|---|---|---|---|---|---|
| | | | Skala Likert | Mean | Prosentase |
| 数字素养 | 1 | *Functional Skill and Beyond* | 789.7 | 3.40 | 85% |
| | 2 | *Creativity* | 746 | 3.22 | 80.5% |
| | 3 | *Collaboration* | 801.3 | 3.45 | 86,25% |
| | 4 | *Communication* | 739.4 | 3.19 | 79.75% |
| | 5 | *The Ability to Find and Select Information* | 721.6 | 3.11 | 77,75% |
| | 6 | *Critical Thinking and Evaluation* | 730.5 | 3.15 | 78,75% |
| | 7 | *E-Safety* | 728.5 | 3.14 | 78,5% |
| | 8 | *Cultural and Social Understanding* | 790.5 | 3.41 | 85,25% |
| | Jumlah rata-rata | | 755,93 | 3,25 | 81,25% |
| | Kategori | | | **Cukup Baik** | **Advance** |

  

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For a more comprehensive overview, the average results of each digital literacy dimension will be presented in the following graph.


Figure 5. Average Digital Literacy Scores of Students Across Each Dimension

## Discussion

a. Students' Digital Literacy Level Viewed from the Functional *Skill and Beyond* Dimension

Table 5. Respondents' Achievement Responses in the Functional Skill and Beyond Dimension

| Instrument | Dimensi | Tanggapan Capaian Responden | | |
|---|---|---|---|---|
| | | Skala Likert | Mean | Prosentase |
| 数字素养 | Functional Skill and Beyond | 789.7 | 3.40 | 85% |

According to Hague & Payton (2011), the Functional Skill and Beyond dimension assesses students' digital literacy based on their ability to operate technology related to various types of media content. This dimension evaluates the utilization and operation of technology in terms of: (1) students' understanding of technology, (2) accessibility of technological tools, (3) use of technology to generate data, (4) awareness of copyright issues, and (5) ability to create final products using technology. This dimension comprises 10 statements concerning operating digital devices, utilizing the internet, skills in operating video conferencing applications (Zoom, Google Meet, VooV), having an email account, managing email and Google Drive. In this dimension, Mandarin Language students demonstrated a digital literacy score of 3.40, which falls into the upper threshold of the "fairly good" category based on Widoyoko's (2012) interpretation scale (2.61-3.40 = fairly good). Notably, the score was merely 0.1 points short of reaching the "good" category. Meanwhile, the Digital Literacy Index for this dimension reached 85%, classified as "advanced" according to Nasionalita's (2020) criteria.

  

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b. Students' Digital Literacy Level Viewed from the *Creativity* Dimension

Table 4. Respondents' Achievement Responses in the Creativity Dimension

| Instrument | Dimensi | Tanggapan Capaian Responden | | |
|---|---|---|---|---|
| | | Skala Likert | Mean | Prosentase |
| 数字素养 | Creativity | 746 | 3.22 | 80.5% |

According to Hague & Payton (2011), the Creativity dimension refers to the component related to thinking, developing, and sharing knowledge through various ideas using digital technology. In this context, Creativity encompasses the development of products or outcomes by utilizing digital technology, as well as creative and imaginative thinking skills that include planning, content creation, idea exploration, and managing digital-based creative processes. This dimension contains 3 statements concerning the ability to creatively and imaginatively produce simple digital technology-based products such as PowerPoint presentations, animations, posters, etc. In this dimension, Mandarin Language students demonstrated a digital literacy score of 3.22, which falls into the "fairly good" category. According to Widoyoko's (2012) interpretation scale, scores between 2.61-3.40 are classified as fairly good. In terms of the Digital Literacy Index, the Creativity dimension achieved 80%, placing it in the "advanced" category (Nasionalita, 2020).

c. Students' Digital Literacy Level Viewed from the *Collaboration* Dimension

Table 5. Respondents' Achievement Responses in the Collaboration Dimension

| Instrument | Dimensi | Tanggapan Capaian Responden | | |
|---|---|---|---|---|
| | | Skala Likert | Mean | Prosentase |
| 数字素养 | Collaboration | 801.3 | 3.45 | 86,25% |

According to Hague & Payton (2011), the Collaboration dimension is a component rooted in the inherent characteristics of digital technology itself. Digital technology provides opportunities for teamwork and facilitates participatory processes that support collaboration. This component emphasizes the importance of individual engagement in dialogue, discussion, and idea development to build mutual understanding. For instance, it includes the ability to participate in digital spaces, as well as to explain and negotiate ideas with other group members. This dimension contains three statements related to digital participation capabilities, including: (1) the ability to submit assignments or work through Google Forms or Google Drive, and (2) the capacity to actively engage by asking questions, providing answers, and offering comments or suggestions in digital spaces. In this dimension, Mandarin Language students achieved a digital literacy score of 3.45, which falls into the "good" category. According to Widoyoko's (2012) interpretation scale, scores between 3.41-4.20 are classified as good. Furthermore, the Digital Literacy Index for this dimension reached 86.25%, indicating that the Collaboration dimension qualifies as "advanced" (Nasionalita, 2020).

  

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d. Students' Digital Literacy Level Viewed from the *Communication* Dimension

Table 6. Respondents' Achievement Responses in the Communication Dimension

| Instrument | Dimensi | Tanggapan Capaian Responden | | |
|---|---|---|---|---|
| | | Skala Likert | Mean | Prosentase |
| 数字素养 | Communication | 739.4 | 3.19 | 79.75% |

According to Hague & Payton (2011), the Communication dimension posits that being digitally literate entails possessing the ability to communicate effectively through digital media. Effective communication in digital literacy is closely associated with the capacity to articulate thoughts, ideas, and comprehension. Furthermore, it is essential to understand and recognize the target audience to ensure that created content aligns with their needs and anticipated impact. This dimension comprises five statements assessing digital communication competencies, including: proficiency in using digital communication platforms (WhatsApp, WeChat, or QQ) for academic purposes such as class discussions, class WhatsApp groups, and material access, ability to articulate ideas to others in digital group spaces, capability to design Google Forms according to specific requirements and preference for collaborative task completion via Google Docs rather than Microsoft applications. In this dimension, Mandarin Language students achieved a digital literacy score of 3.19, categorizing them as "fairly good" according to Widoyoko's (2012) interpretation scale (2.61-3.40 = fairly good). The Communication dimension attained a Digital Literacy Index of 79.75%, which classifies it as "advanced" based on Nasionalita's (2020) criteria.

e. Students' Digital Literacy Level Viewed from *the Ability to Find and Select Information* Dimension

Table 7. Respondents' Achievement Responses in the Ability to Find and Select Information Dimension

| Instrument | Dimensi | Tanggapan Capaian Responden | | |
|---|---|---|---|---|
| | | Skala Likert | Mean | Prosentase |
| 数字素养 | The Ability to Find and Select Information | 721.6 | 3.11 | 77,75% |

Hague & Payton (2011) assert that The Ability to Find and Select Information dimension constitutes a component focused on information retrieval and selection skills. As outlined in Digital Literacy Across the Curriculum (2009), this competency requires critical thinking regarding information-seeking processes and selective source utilization. This dimension encompasses five assessment items evaluating digital information retrieval capabilities, skills in selecting and exploring information across various digital platforms, secure navigation of Chinese-specific platforms (e.g., accessing Baidu for searches, downloading materials from Youku). Mandarin Language students demonstrated a mean score of 3.11 in this dimension, classifying their proficiency as fairly good according to Widoyoko's (2012) interpretation framework (2.61-3.40 = fairly good). The dimension

  

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achieved a Digital Literacy Index of 77.75%, qualifying as advanced under Nasionalita's (2020) classification system.

f. Students' Digital Literacy Level Viewed from the *Critical Thinking and Evaluation* Dimension

Table 8. Respondents' Achievement Responses in the Critical Thinking and Evaluation Dimension

| Instrument | Dimensi | Tanggapan Capaian Responden | | |
|---|---|---|---|---|
| | | Skala Likert | Mean | Prosentase |
| 数字素养 | Critical Thinking and Evaluation | 730.5 | 3.15 | 78,75% |

Hague & Payton (2011) emphasize that the Critical Thinking and Evaluation dimension constitutes an essential component that underscores the importance of moving beyond passive information reception to actively contributing, analyzing, and refining critical thinking skills when engaging with digital content. This dimension focuses on the ability to critically evaluate digital information rather than merely accepting it at face value. The dimension comprises two key assessment items evaluating students': capacity to analyze various required information sources, critical thinking skills during digital space interactions. In this dimension, Mandarin Language students achieved a mean score of 3.15, categorizing their performance as fairly good according to Widoyoko's (2012) interpretation framework (2.61-3.40 = fairly good). Furthermore, the dimension attained a Digital Literacy Index of 78.75%, classifying it as advanced based on Nasionalita's (2020) criteria.

g. Students' Digital Literacy Level Viewed from the *E-Safety* Dimension

Table 9. Respondents' Achievement Responses in the E-Safety Dimension

| **Instrument** | **Dimensi** | **Tanggapan Capaian Responden** | | |
|---|---|---|---|---|
| | | Skala Likert | Mean | Prosentase |
| **数字素养** | E-Safety | 728.5 | 3.14 | 78,5% |

According to Hague & Payton (2011), the E-Safety dimension represents a critical component focused on strategic choices that ensure user security while exploring, creating, and collaborating through digital technologies. This dimension encompasses two key indicators assessing learners' ability to: (1) engage in creative activities and (2) participate in collaborative work across various digital platforms while maintaining security protocols. In this dimension, Mandarin Language Education students achieved a mean digital literacy score of 3.14, which falls within the "fairly good" classification according to Widoyoko's (2012) interpretation framework (2.61-3.40 = fairly good). Notably, the E-Safety dimension attained

  

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a Digital Literacy Index of 78.5%, qualifying it as "advanced" based on Nasionalita's (2020) categorization criteria.

h. Students' Digital Literacy Level Viewed from the *Cultural and Social Understanding* Dimension

Table 10. Respondents' Achievement Responses in the Cultural and Social Understanding Dimension

| Instrument | Dimensi | Tanggapan Capaian Responden | | |
|---|---|---|---|---|
| | | Skala Likert | Mean | Prosentase |
| 数字素养 | Cultural and Social Understanding | 790.5 | 3.41 | 85,25% |

Hague and Payton (2011) posit that the Cultural and Social Understanding dimension represents digital literacy practices that should align with socio-cultural contexts. This dimension comprises two assessment items evaluating students' ability to recognize boundaries in digital space interactions and nderstand ethical protocols for information exchange in digital environments. In this dimension, Mandarin Language students demonstrated a mean digital literacy score of 3.41, classifying their performance as good according to Widoyoko's (2012) assessment framework (3.41-4.20 = good). Furthermore, the dimension achieved a Digital Literacy Index of 85.25%, meeting the advanced classification threshold established by Nasionalita (2020).

## Conclusion

The research findings analyzed in the preceding sections indicate that Mandarin Language students achieved an overall mean digital literacy score of 3.25, with an average percentage of 81.25%. Consequently, it can be concluded that the students' digital literacy level falls within the fairly good category, while their Digital Literacy Index qualifies as advanced. Subsequent research should prioritize enhancement of dimensions still at the threshold of the fairly good classification, particularly the Communication, Critical Thinking and Evaluation, and E-Safety dimensions. Furthermore, the practical applications of these findings may include designing more digitally integrated learning curricula, developing holistic skill enhancement strategies encompassing both Creativity and Cultural and Social Understanding dimensions and implementing systematic measures for continuous improvement of students' digital literacy capabilities.

## Recommendation

Future studies could investigate factors contributing to the relatively lower digital literacy performance in these specific dimensions and develop targeted intervention programs to improve competencies in these areas.

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