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Validity and Reliability Testing of Student Digital Literacy Instrument in Distance Education

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Abstract – One of the characteristics of Distance Education (DE) is the separation between students and lecturers, so various media are needed for learning activities. In addition to print media, digital media and various digital platforms have also been developed to support the learning process. This requires good digital literacy skills from students. Measuring students' digital literacy, especially in Distance Education, requires an instrument that has been tested for accuracy and consistency. This study aims to develop an instrument and test the validity and reliability of the instrument, so that it can be used to measure student's digital literacy in distance education. The instrument used was a questionnaire consisting of 33 questions covering aspects of digital skills, digital ethics, digital security, and digital culture, with a simple random sampling data collection method. Then the validity test of the instrument was carried out using the Pearson correlation method and the reliability test of the instrument using the Cronbach's Alpha technique. The test results showed that all question items on each aspect of students' digital literacy in the context of Distance Education had met the validity and reliability criteria at a significance level of 1%, so that the instrument was valid and reliable.

Keywords: Digital literacy, distance education, reliability test, validity test

1 Introduction

Based on college regulations number 12 of 2012 clausal 31 concerning Distance Education (DE), The teaching and learning process in distance education is carried out through the use of various communication media. The learning system in distance education is designed to enable students to study independently. This is because the proportion of independent learning is greater compared to face-to-face or direct learning with lecturers or tutors. The use of technology in education can create opportunities to enhance accessibility, provide greater flexibility, and allow for personalized learning experiences [1]. In principle, students can study independently anywhere, anytime, and with anyone. The distance education system is designed so that every individual can continue their education to a higher level, without being limited by space, time, and place. Thus, students from distance education institutions can come from various backgrounds, ranging from age, occupation, and region of origin.

Learning media in Distance Education can be in the form of printed media such as books, and digital media. Current technological developments make various learning sources accessible to

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anyone digitally, such as learning videos, articles, e-books, and others. Every user can easily search for and access the information they want to get. The existence of digital media makes the information search process faster. Moreover, based on the results of a survey by the Indonesian Internet Service Providers Association (APJII), in 2024 the number of internet users in Indonesia will increase by 1.4% from the previous period, namely with an internet penetration rate of 79.5% of the total Indonesian population [2]. However, every user must also be able to critically evaluate any information or learning resources they use to ensure that the information received is accurate and valid. The vast availability of information presents additional challenges, such as the spread of hoaxes, threats to personal data security, and even issues related to digital ethics [3]. This is because anyone can easily publish content and share opinions or information across various digital platforms. Therefore, strong digital literacy skills are essential for every user. Higher education institutions serve as the main driving force in promoting digital literacy [4].

In terms of learning, since the Covid-19 pandemic, distance learning has become an alternative due to limited space and time, so it is no longer a barrier to the learning process. However, with the current technological developments, students are expected to be able to master digital literacy adequately to support the learning process [5]. This includes distance learning, it is also a challenge for students to have good digital literacy skills. Distance learning uses digital platforms, such as e-learning platforms, video conferencing, and other online learning resources. Digital literacy refers to a person's ability to find, evaluate, and write clear information through writing and other media on various digital platforms. Digital literacy not only includes mastery of technology, but also requires creativity, collaboration, and the ability to adapt to rapid changes [6]. Digital literacy skills are also influenced by self-determination and access to technology [7]. According to the Ministry of Communication and Information in Indonesia, there are four pillars in digital literacy, namely digital skills, digital ethics, digital safety, and digital culture [8]. Students can prepare themselves well during the distance learning process by mastering these four pillars.

Digital skills are related to a person's ability to know, understand, and use both hardware and software, as well as digital operating systems in everyday life [8]. In distance learning, digital skills include students' ability to use various devices that support distance learning. The learning process in distance learning requires students to have good digital skills due to the separation between students and teachers, so that learning is predominantly carried out using digital media. Students must be able to utilize and access various learning platforms provided, such as e-learning, reading sources in the form of e-resources, virtual face-to-face devices such as zoom and microsoft teams, and so on.

Then digital ethics is a person's ability to realize, consider, and develop digital ethics governance in everyday life. This pillar emphasizes the importance of behavior and moral values in the use of digital technology [8]. The application of digital ethics in distance education is essential for students. This relates to behavior and responsibility in using digital technology ethically, such as refraining from spreading false information or hoaxes, avoiding plagiarism, and similar actions.

Furthermore, digital safety is a person's ability to recognize, implement, and improve personal data protection in terms of digital security. The implementation of digital safety includes efforts to protect oneself and personal information from risks that may arise in the digital world, such as fraud, hacking, cyber bullying, and others [8].

Meanwhile, digital culture is a person's ability to understand and apply cultural values (especially Indonesian) in the digital space. In distance education, students are spread throughout Indonesia so that they have high diversity, ranging from ethnicity, language, culture, and religion, so it is important to apply the values of Pancasila and diversity in interacting digitally. Someone who has digital culture literacy will be able to adapt quickly to changing trends [8].

Digital literacy skills are one of the key factors supporting success in distance education. To measure digital literacy skills, an instrument is required. An instrument serves as a tool used for collecting research data, allowing the collected data to be processed into meaningful information [9]. The selection and development of an instrument are crucial components in data collection. This is because the research results obtained will depend on the instrument used as the measuring tool [10].

A good instrument is one that can produce valid and reliable results. A valid instrument means that it has been tested for its accuracy and correctness. The validity of an instrument is verified through a validity test. This test ensures that the questions in the research questionnaire are capable of generating accurate data that appropriately represent the variables or indicators being measured [11]. Furthermore, an instrument that produces reliable results means it has been tested for its consistency in measuring the same phenomenon. A reliability test is conducted to determine the extent to which the instrument can be trusted or depended upon [12]. Thus, after the instrument is formed, it is necessary to test the validity and reliability of the instrument.

Testing the validity and reliability of the instrument is an important process to ensure that the instrument used is accurate and provides consistent results. Digital literacy skills can be one of the factors to trace students' readiness for distance education. Therefore, this study aims to develop a digital literacy instrument for students in the context of distance education, as well as to test its validity and reliability. Thus, the developed instrument is expected to encompass and measure the four pillars of students' digital literacy in distance education.

2 Materials and methods

2.1 Building Instrument

This study uses a questionnaire as a data collection instrument. Respondents are new students who are taking distance learning at distance education institutions. The questionnaire that was built consists of two parts. The first part is the respondent profile. Students in Distance Education have diverse characteristics, both in terms of age, work background, level of mobility, and activities in using digital media. The second part is the question items that are divided into four pillars of digital literacy based on the Ministry of Communication and Information, namely digital skills, digital ethics, digital safety, and digital culture. The question items formed for the digital skill variable are shown in Table 1, for the digital ethics variable are shown in Table 2, then the digital safety variable is shown in Table 3, and for the digital culture variable is shown in Table 4.

Table 1. Digital Skill Variable Question Items

No	Question Items	Answer choices			
		Very Poor	Poor	Good	Expert
1	I can interact in distance education through Microsoft teams				
2	I can use the features in Microsoft Teams (share screen, unmute, chat, record, virtual background)				
3	I can interact in distance education through elearning.ut.ac.id				
4	I can use the features in elearning.ut.ac.id (discussion forum, upload file assignment, quiz, absence checklist, etc)				
5	I can interact in distance education through silayar.ut.ac.id (Learning Service System of Universitas Terbuka)				
6	I can use the features in silayar.ut.ac.id (discussion forum, upload files assignment, quiz, etc)				

No	Question Items	Answer choices			
		Very Poor	Poor	Good	Expert
7	I can access the digital library of Universitas Terbuka (virtual reading space) via www.pustaka.ut.ac.id				
8	I can store data, information, and content in digital media				
9	I can connect my device to the internet network (WIFI, LAN, mobile data)				
10	I can utilize UT Jakarta's online service (Microsoft Teams service)				
11	I can utilize UT Jakarta's online service (media social service)				
12	I used to compare various sources of information in the distance education process				

Table 2. Digital Ethics Variable Question Items

No	Question Items	Answer choices			
		Often	Sometimes	Rarely	Never
1	I upload someone else's answer with or without permission as my answer				
2	I create a virtual group and add others as members without permission				
3	I contact UT Jakarta's online services outside of working days/hours				
4	I make abusive comments on UT Jakarta's social media				
5	I retrieve digital information without paraphrasing (restating a sentence/phrase without changing the meaning of the sentence)				
6	I take digital information without citation (citing the source of the information used)				
7	I re-share information about UT that I am not sure is true with friends/virtual groups				
8	I share private screenshots of lectures on social media/with others				

Table 3. Digital Safety Variable Question Items

No	Question Items	Answer choices			
		Never	Rarely	Sometimes	Often
1	I back up or save data related to my lectures/learning that I've done in several places, not just one				
2	I used to create secure passwords with a combination of numbers, letters, and special characters for my learning account				
3	I don't upload my personal data to lecture groups				
4	I don't share my UT distance learning account username and password with others				
5	I don't upload my personal data to social media				
6	I report any fraud that occurs during the process of distance learning (impersonation, plagiarism, etc)				
7	I am careful in using my device (PC) to log into my distance learning account				

Table 4. Digital Culture Variable Question Items

No	Question Items	Answer choices			
		Never	Rarely	Sometimes	Often
1	I consider the readability of my answers that have been submitted through distance learning applications (LMS, elearning, etc)				
2	I use polite language when giving any responses in discussion forums in elearning/LMS				

No	Question Items	Answer choices			
		Never	Rarely	Sometimes	Often
3	I use polite and non-offensive language when asking questions in UT Jakarta's online services				
4	I consider the lecturer's feelings when giving responses and asking questions in the discussion forum				
5	I consider the cultural, religious, and age diversity of friends in distance learning apps and virtual groups when sharing information				
6	I use polite and non-offensive language when sending emails to lecturers				

2.2 Data and Method

The largest distance learning institution in Indonesia is Universitas Terbuka. Based on the Universitas Terbuka website (www.ut.ac.id/ut-dalam-angka), the number of active students and those registering in the odd-numbered academic year of 2024 is 671,971 people. Students are spread throughout Indonesia and abroad, with the largest number of students coming from Universitas Terbuka Jakarta, which is 82,035 people. Data collection was carried out on new students of Universitas Terbuka Jakarta and the sampling process was carried out using the simple random sampling method, where all populations have an equal chance of being selected as samples. Instrument testing uses a quantitative approach, including:

2.2.1 Instrument Validity Test

The validity test of the instrument in this study used the Pearson correlation method. The hypotheses are:

H_0: question items cannot measure the same aspects (not valid)

H_1: question items can measure the same aspects (valid)

To obtain a conclusion, the correlation value (r value) of each question item is compared with the critical value obtained from the R table, or the significance value is compared with its significance level. The significance level used is 1%, so that:

- If the r value > r table or the significance value < 0,01 then the question item is valid
- If the r value < r table or the significance value > 0,01 then the question item is not valid

2.2.2 Instrument Reliability Test

One of the techniques in testing the reliability of an instrument is the Cronbach's alpha technique. Testing is carried out with a Cronbach's Alpha coefficient value. According to [13], if Cronbach's Alpha value > 0,6 then the variable can be said to be reliable.

3 Results and discussion

3.1 Respondents Profile

The number of samples collected in this study was 4.347 new students of Universitas Terbuka Jakarta who were actively studying. Students come from various backgrounds, ages, jobs, and domiciles, so that exploration of this diversity can be carried out. Respondents consist of 4 generations, namely the Baby Boomers Generation, Generation X, Generation Y, and Generation Z. Based on Fig. 1, students

from the baby boomers generation are 0,14% and generation X are 4,16%. Students are dominated by generation Y and generation X with 45,85% and 49,85% respectively.

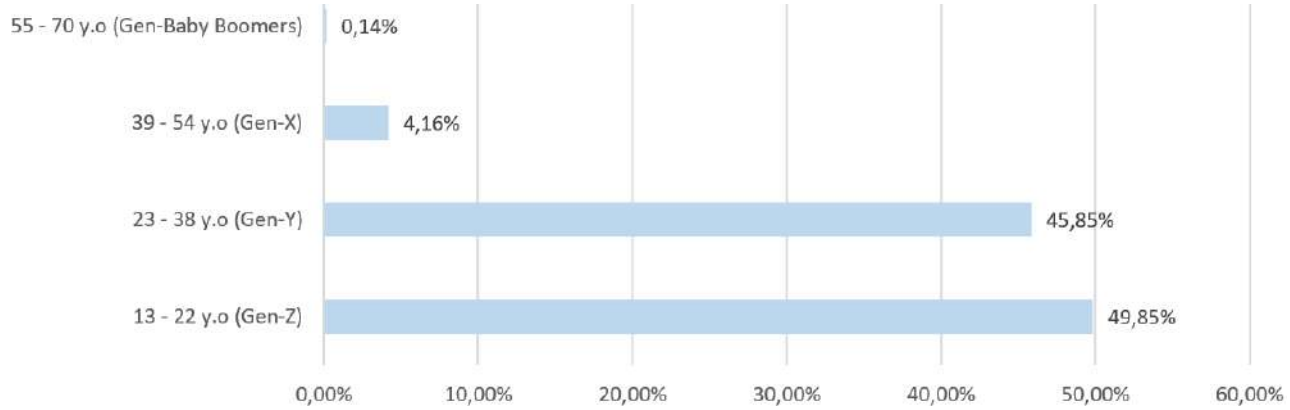

Fig. 1. Percentage of respondent generation profile

In distance learning, students can study anywhere and anytime so that in addition to being active as students, respondents also have other activities with various professional backgrounds, such as civil servant, part-time/freelance, private employees, self-employed, and others. Based on Table 5, the highest percentage is respondents who work as private employees, namely 54,29%.

Table 5. Percentage of Respondent's Job Profile

Job Profile	Percentage
Private employees	54,29%
Civil servant	8,19%
Self-employed	3,93%
Part Time/ Freelance	3,89%
Profesional (consultant, lawyer, etc)	0,64%
Housewife	1,52%
Not/ not yet working	16,47%
Others	11,07%
Total	100,00%

Furthermore, Information was collected about the period of respondents accessing the internet. Based on Fig. 2, as many as 54,33% of respondents accessed the internet at 18.01-24.00 WIB. This period is the most used by respondents in accessing the internet.

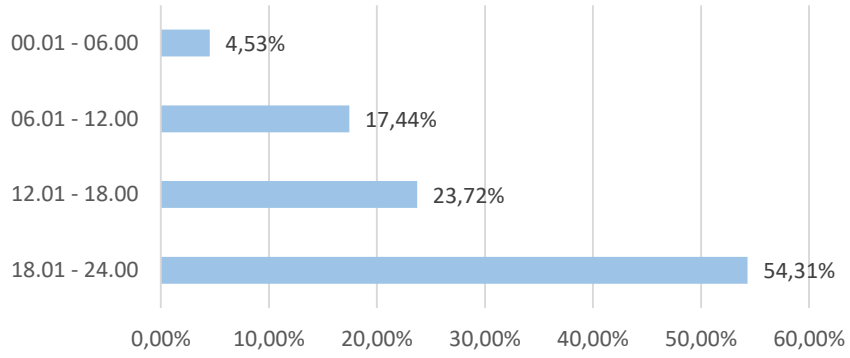

Fig. 2. Percentage of respondents internet access period

Based on Table 6, the activity most often carried out by respondents when accessing the internet is communicating via short messages such as WhatsApp, Telegram, and other apps that are similar namely 61,33%. Thereafter, followed by using social media which is 24,68%, and using Google/safari and other similar apps for searching information, which is 9,94%.

Table 6. Percentage of Internet Usage Activity

Most frequently accessed features	Percentage
Communicating via short messages (WhatsApp/ telegram, etc)	61,33%
Using social media	24,68%
Looking for information/browsing from the internet (google/safari/ etc)	9,94%
Entertainment	2,58%
Game Online	1,17%
Online Shopping	0,30%
Total	100,00%

In searching for information, there are many sources that can be used. In Table 7, 86,13% of respondents used social media to get information. Then the types of social media most frequently used by the respondents are WhatsApp, Instagram, and TikTok with each percentage of 55,67%; 25,47%; and 8,49% (Fig. 3).

Table 7. Mostly Frequently Accessed Source of Information

Information Sources	Percentage
Social Media	86,13%
Online News	6,35%
Official Government Website	3,34%
TV	0,51%
Print Media	0,35%
Radio	0,02%
Others	3,31%
Total	100,00%

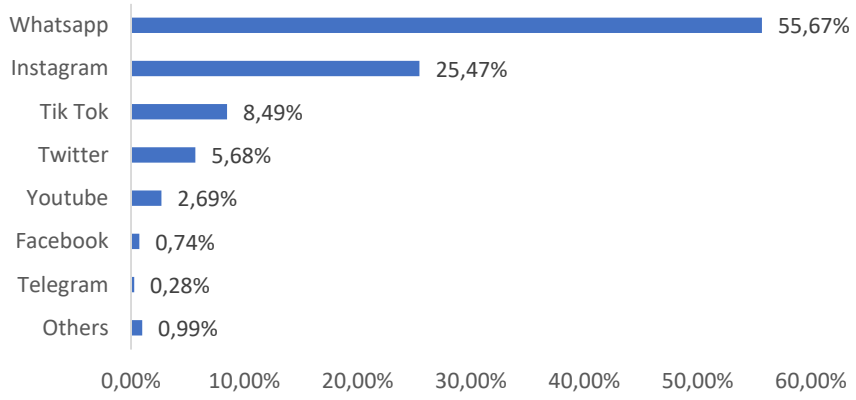

Fig. 3. Most Frequently Accessed Information Sources

In a day, the duration of time spent by respondents accessing social media is quite varied. Based on Figure 4, the length of time spent by the respondents accessing social media is 3 – 5 hours a day, with a percentage of 44,19% (Fig. 4). Then 21,39% accessed social media for 5 – 7 hours. Respondents who only spent 0 - 2 hours are 17.99%. Then another 16,43% of respondents spent quite a lot of time on social media, namely more than 7 hours a day.

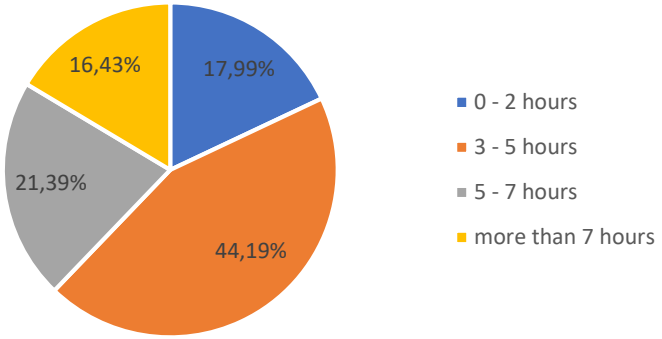

Fig. 4. Percentage Duration of Accessing Social Media in A Day

3.2 Validity Test and Reliability Test

The test was conducted using a significance level of 1%. With a sample size of 4.347 respondents and a degree of freedom (df) = 4.347 – 2 = 4.345, then the value of $r_{table} = 0{,}039$. Furthermore, validity and reliability testing were carried out for each variable, namely digital skill variable (X1), digital ethics (X2), digital safety (X3), and digital culture (X4). The results of the correlation calculation for the digital skill variable are shown in Table 8.

Table 8. Results of Pearson Correlation Value Calculation for Digital Skill Variable (X1)

Question Item	*r* Value	Signification Value	Conclusion
X1.1	0,716	0,000	valid
X1.2	0,716	0,000	valid
X1.3	0,723	0,000	valid

Question Item	r Value	Signification Value	Conclusion
X1.4	0,691	0,000	valid
X1.5	0,718	0,000	valid
X1.6	0,700	0,000	valid
X1.7	0,727	0,000	valid
X1.8	0,758	0,000	valid
X1.9	0,670	0,000	valid
X1.10	0,812	0,000	valid
X1.11	0,788	0,000	valid
X1.12	0,760	0,000	valid

The values in Table 8 are the calculation of correlation value between the score of each question item and total score. Based on the calculation results in Table 8, each question item which is X1.1 to X1.12 in the digital skill variable, has a value of r greater than 0,039 ($r_{value} > r_{table}$) or significance value $<$ 0,01. Thus, all question items in the digital skill variable are valid. Furthermore, the results of the reliability test for the digital skill variable are shown in Table 9. The Cronbach's Alpha value obtained is 0,921 $\geq$ 0,6. In this way, the digital skill variable can be said to be reliable.

Table 9. Reliability Test Results in Digital Skill Variable

Cronbach's Alpha	N of Items
0,921	12

Furthermore, Table 10 shows the results of the Pearson correlation value calculation for each question item on the digital ethics variable. Based on Table 10, the value of question items X2.1 to X2.8 is more than 0,039 ($r_{hitung} > r_{table}$), with a significance value of less than 0,01. Thus, all question items on the digital ethics variable can be said to be valid.

Tabel 10. Results of the Pearson Correlation Value Calculation for the Digital Ethics Variable(X2)

Question Item	r Value	Signification Value	Conclusion
X2.1	0,588	0,000	valid
X2.2	0, 556	0,000	valid
X2.3	0,558	0,000	valid
X2.4	0,493	0,000	valid
X2.5	0,665	0,000	valid
X2.6	0,699	0,000	valid
X2.7	0,576	0,000	valid
X2.8	0,580	0,000	valid

The results of the reliability test of the digital ethics variable using Cronbach's Alpha technique are shown in Table 11. Because of the Cronbach's Alpha value is 0,710 which is greater than 0,6 the digital ethics variable can be said to be reliable.

Table 11. Reliability Test Result Digital Ethics Variable

Cronbach's Alpha	N of Items
0,710	8

Then the result of Pearson correlation calculation for the digital safety are shown in Table 12. The value of r (r_{value}) obtained for each question item X3.1 – X3.7 is greater than 0,039 ($r_{value} > r_{table}$) with a significance value of less than 0,01. Thus, all question items in the digital safety variable can be said to be valid.

Table 12. Results of the Pearson Correlation Value for the Digital Safety Variable (X3)

Question Item	r Value	Signification Value	Conclusion
X3.1	0,503	0,000	valid
X3.2	0,516	0,000	valid
X3.3	0,866	0,000	valid
X3.4	0,883	0,000	valid
X3.5	0,884	0,000	valid
X3.6	0,535	0,000	valid
X3.7	0,562	0,000	valid

The results of the reliability test for the digital safety variable are shown in Table 13. The Cronbach's Alpha value obtained 0,826 and is greater than 0,6 so the digital safety variable can be said to be reliable.

Table 13. Reliability Test Result for Digital Safety Variables

Cronbach's Alpha	N of Items
0,826	7

Furthermore, Table 14 shows the result of calculating the Pearson correlation value for each question item on the digital culture variable. Based on Table 14, the values of r on question items X4.1 to X4.6 are more than 0,039 ($r_{value} > r_{table}$), with a significance value less than 0,01. Thus, all question items on the digital culture variable can be said to be valid.

Table 14. Results of the Pearson Correlation Value Calculation for the Digital Culture Variable (X4)

Question Item	r Value	Signification Value	Conclusion
X4.1	0,642	0,000	valid
X4.2	0,771	0,000	valid
X4.3	0,801	0,000	valid
X4.4	0,815	0,000	valid
X4.5	0,775	0,000	valid
X4.6	0,800	0,000	valid

Based on the test results in Table 15, the Cronbach's Alpha value for the digital safety variable is 0,854. Therefore, the Cronbach's Alpha value is greater than 0,6 the digital safety variable is reliable.

Table 15. Reliability Test Results for Digital Safety Variable

Cronbach's Alpha	N of Items
0,854	6

4 Conclusion

In the testing of the instrument regarding student's digital literacy in distance education, with respondents being students from the Universitas Terbuka Jakarta, four variables were tested. These variables include digital skills, digital ethics, digital safety, and digital culture. The digital skills variable consists of 12 items, each of which was tested for validity and reliability. The results showed that all 12 items were valid, and the digital skills variable was found to be consistent. Next, the digital ethics variable consists of 8 items, which were also tested for validity and reliability. The results showed that all 8 items were valid, and the digital ethics variable was found to be consistent. The digital safety variable consists of 7 items, which were tested for validity and reliability. The results showed that all 7 items were valid, and the digital safety variable was found to be consistent. Similarly, the digital culture variable consists of 6 items. The validity and reliability tests showed that each item was valid, and the variable was found to be consistent. Thus, all variables in the digital literacy instrument for distance education students have been proven to be valid and reliable at a significance level of 1%, making the instrument suitable for use. Furthermore, this instrument can be used as a tool to conduct further analysis of the digital literacy skills of students in distance education.

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