

## Chapter 16

# The Role of Literacy in The Global Crisis: A Case Study of Indonesian Perspective

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### A. The Importance of Being Literate in Society

Being literate is one of the targets of Sustainable Development Goals (SDGs) 4: “Ensure inclusive and quality education for all and promote lifelong learning”. Some studies have already emphasized the importance of being literate in society. For instance, excellent scientific literacy can be achieved when someone understands, uses, and reflects on written words. Sørvik and Mork (2015) suggested that writing and reading literacy are essential for students who want to be literate in science and reach long-term goals in science education. In the broader objective, reading literacy also affected labor productivity and reflected the economy’s growth in a country (McCracken & Murray, 2009).

Being literate is also essential to develop in early childhood since this is vital to acquiring habituation during their learning process.

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Rangkuti, M. A., & Hidayat, M. L. (2022). The role of literacy in the global crisis: A case study of Indonesian perspective. In M. A. Hidayatulloh, I. Jati, & D. Sumardani (Eds.), *Indonesia post-pandemic outlook series: Social perspectives* (321–346). BRIN Publishing.  
DOI: 10.55981/brin.536.c475 ISBN: 978-623-7425-84-7 E-ISBN: 978-623-7425-88-5

Wildová and Kropáčková (2015) emphasized that the most critical phase for children to build habituation is when they are in the age of 3–6 years old. For example, students' reading performance in primary school would stay successful when they obtain good reading skills early in their education (Boland, 1993).

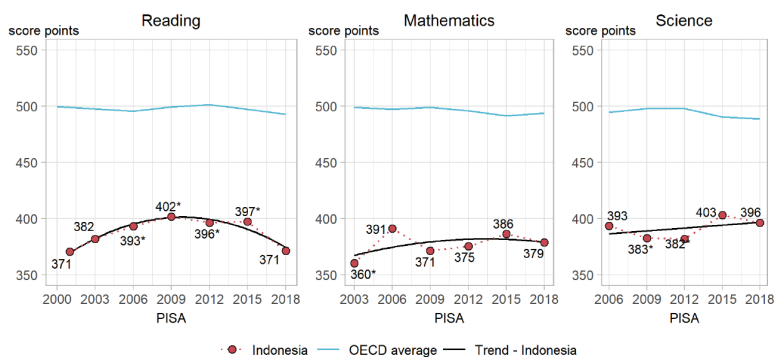
The global crisis due to COVID-19 undoubtedly created a social and economic challenging situation as well as the education sector. Although most of the impacts degrade the direction of education quality, some elements are improving positively. In ordinary literacy, such as reading, writing, and science, the pandemic brings new challenges for learners due to limited access to physical resources like books, libraries, or other school facilities. Meanwhile, this situation forces students to become more digitally literate since all the learning processes are mainly conducted online. Even after the pandemic, this type of teaching will probably be part of our education system. This chapter will try to reveal the role of literacy in the time of global crisis because of the pandemic COVID-19. Therefore, we examine the role of literacy in two different views regarding the challenges and benefits of students' literacy due to the COVID-19 pandemic.

## **B. The Disruption of the COVID-19 on Literacy Skills**

The COVID-19 pandemic brought us into a new area of teaching-learning settings, which has been transformed from offline to online (digital) delivery. One perspective saw this condition as a setback due to the insufficiency of appropriate tools that facilitate students learning digitally. In 2017, UNESCO stated that 617 million children and youth globally failed to achieve minimum skills in reading and mathematics. Looking from specific regions, the education inequality spread across many continents, and literacy underachievement already became a challenge in many countries before the COVID-19 pandemic. Africa and Asia became a continent with the most non-literate adults and youth, with 60% of the world's non-literate adults residing in Asia. The pandemic even resulted in a more challenging situation for most of them because three out of ten students struggled to access facilities for distance learning (UNESCO, 2020).

Some studies reported the impact of COVID-19 in several circumstances. One study indicated that the achievement of The Program for International Student Assessment (PISA) results could have a gap of 30% compared to the result before the pandemic due to the closure of schools for months (Haeck & Lefebvre, 2020). One study in the US found that the pandemic had a more significant negative impact on mathematical literacy than on reading (Renaissance Learning, 2020). Another study in Singapore suggested that the limited access to reading facilities at home led students to read less than before the pandemic. (Sun et al., 2021). This literature shows a significant challenge and risk among students at school during the pandemic. This condition can even be more difficult since the absence of actual data on the impact of the pandemic on youth and adult literacy (UNESCO, 2020).

In Indonesia, the literacy competencies can be seen in PISA. PISA is an international assessment to see the achievement of reading, mathematics, and sciences of 15-year-olds (OECD, 2019). The result from 2000 to 2019 indicated that students in Indonesia lacked skill literacy in almost 20 years of assessment, showing a minor improvement from all skills that PISA had assessed.



Source: OECD (2019)

**Figure 16.1** The Trend of PISA Literacy Skills in Indonesia since 2000

Figure 16.1 shows that the trend of literacy skills in Indonesia slightly fluctuates, and the score was far below the average OECD score estimated at around 500 since the first assessment. Moreover, the most striking finding can be seen from reading literacy, which shows an impressive increase from 2000 to 2009, but then a significant decrease from 2009 to 2018. The latest score in 2018 even shows the exact number in the assessment in 2000. Meanwhile, the other two skills, mathematics and science, show a slight decline, indicating no significant improvement in Indonesian PISA results for almost 20 years of participation.

PISA results alone cannot be interpreted as a warning to pursue a higher achievement, but at least, this can be used to reflect education quality and the plan to establish a better education system. Furthermore, one study shows that PISA results could directly impact the economic system of a nation (Grey & Morris, 2018). Nevertheless, the PISA assessment results indicate problems in the Indonesian education system. This phenomenon needs to be addressed, as the present state becomes even more challenging during the pandemic.

Scientific and reading literacy becomes more critical in a pandemic situation since there is numerous new information to digest, including the COVID-19 vaccine, which is one of the most important tools to end the pandemic. However, the pros and cons of vaccine acceptance are becoming a worldwide phenomenon. This condition happened for three main reasons: confidence in vaccine safety, personal preferences of those who believe they do not need the vaccine, and the accessibility of vaccines (Troiano & Nardi, 2021). Furthermore, the resistance to the COVID-19 vaccine was also found among older adults with a higher risk if exposed to the virus. They are more likely to develop a pessimistic acceptance of the vaccine from reading inappropriate information on the internet and social media (Bhagianadh & Arora, 2021).

### C. Indonesian Literacy during the Pandemic

To discuss this section, we conducted a survey to see the pandemic's impact on Indonesian society's literacy skills with the university students as our case study. First, we randomly selected students in one Indonesian university between the ages of 17 and 23. We assessed their reading and scientific literacy because we argue that these are the most demanding skills during the pandemic. We then revealed the impact of being literate in those two skills on their perception of the COVID-19 vaccine.

All the questions regarding this skill were posted using a Google survey, and the amount of 120 university students participated in our study. We used a questionnaire adopted from Loh and Sun (2018) using 27 questions to see the detailed information on the perception of reading. The questionnaire will search for students' literacy in four-component assessments, namely reading habituation, reading preferences, reading facility, and the role of gender in reading literacy.

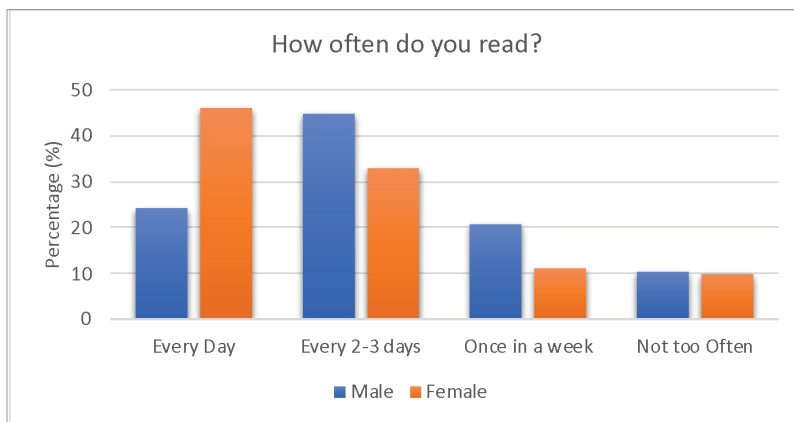
Scientific literacy was measured using Fernbach et al. (2019) survey, which asked students 15 true-false questions about basic scientific knowledge. Using the same assessment, we calculated the result by giving three if the answer is correct and -3 if the answer is incorrect. The final score will be divided into three scales: low, medium, and high scientific literacy. Meanwhile, COVID-19 vaccine literacy was evaluated using the questionnaire adopted from Biasio et al. (2021), which initially measured skills, perceptions, attitudes, behavior, and beliefs. However, we decided to adjust the questions to the Indonesian situation by not using the behavior item since the annual vaccine (like the flu) is uncommon in society.

Using the result from our survey, we arrange this section by discussing students' reading literacy first as we argue that this skill is a foundation and significantly influences two other skills. Then, we examined students' performance in scientific literacy and connected those parameters to their perception of the COVID-19 vaccine.

## 1. Reading Literacy

Reading literacy is the ability to respond to and understand written language forms valued by the individual (Bormuth, 1973). This definition has evolved since numerous research and assessments related to describing someone as literate in reading. This literacy can be applied to all ages, from children in the playground to adults. The written arrangement also has transformed into many forms, not only physical books or newspapers but also written languages in digital platforms such as e-books, articles, and information on social media.

Some studies found that gender difference in reading accomplishment is becoming a concerning issue for some educational researchers (Mullis et al., 2003; Chui & McBride-Chang, 2006). In a more specific case, the result shows that female students outperformed male students in children and adolescents in more than 40 countries (Mullis et al., 2003; Mullis, 2007; Chui & McBride-Chang, 2006). We can perceive these results by looking at our survey that female students read more than male students, indicating that the amount of time someone spends reading will result in better achievement. Figure 16.2 shows that female students read more than males, with more than 45% answering that they read daily. In contrast, around 24% of male students read daily, and more than 40 % only read once every two or three days.

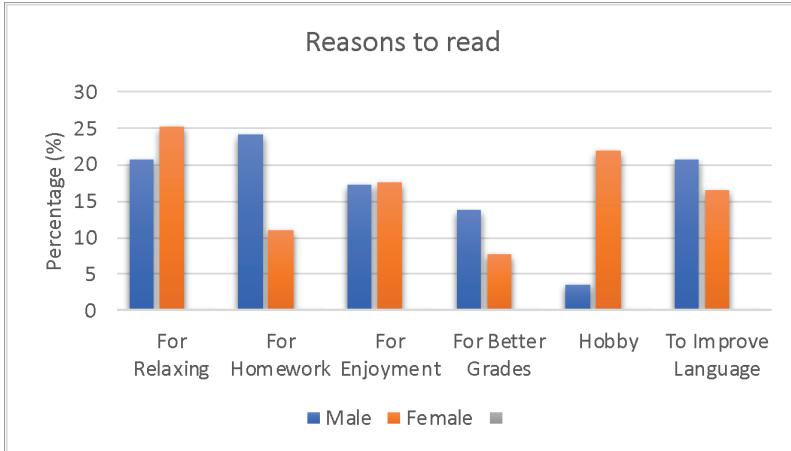


Source: Authors

**Figure 16.2** How Often Students Read

The reason behind the difference in reading achievement between male and female students was explained in several studies. These studies show that female students use more effective reading strategies than boys, and female students tend to have more positive attitudes towards reading (Logan & Johnston, 2009, 2010).

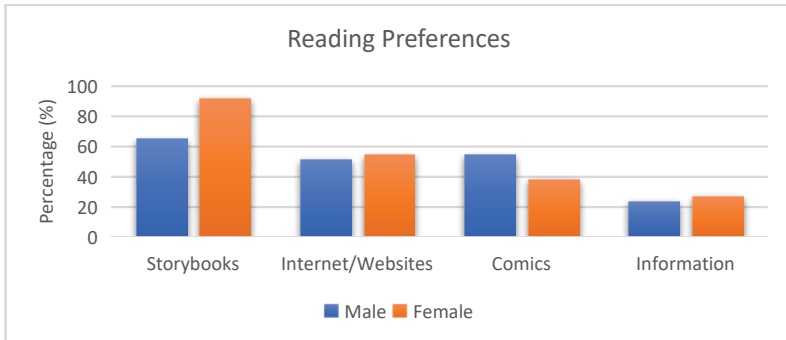
Students generally prefer to read for pleasure (relaxing, enjoyment, and hobby) rather than for functional reasons (homework, grade, and language), as shown in Figure 16.3. However, reading for pleasure does not indicate someone has a bad habit of reading. Some findings suggest that reading for pleasure contributes to academic achievement, cognitive development, and emotional health (Clark & Rumbold, 2006; Horbec, 2012). The contrast trend between gender can be seen for two reasons: reading because of homework and reading because of a hobby. The gap in these two items is quite noticeable, with male students preferring to read because they need it to finish the homework and the female students choosing to read. After all, it is their hobby.



Source: Authors

**Figure 16.3** Reasons Why Students Read

If we can see further related to their preferences, female students who mostly read because of a hobby tend to choose to read storybooks, with more than 80% choosing this item, as shown in Figure 16.4. Meanwhile, male students were more interested in reading storybooks instead of reading comics and articles on the internet as the second preference.



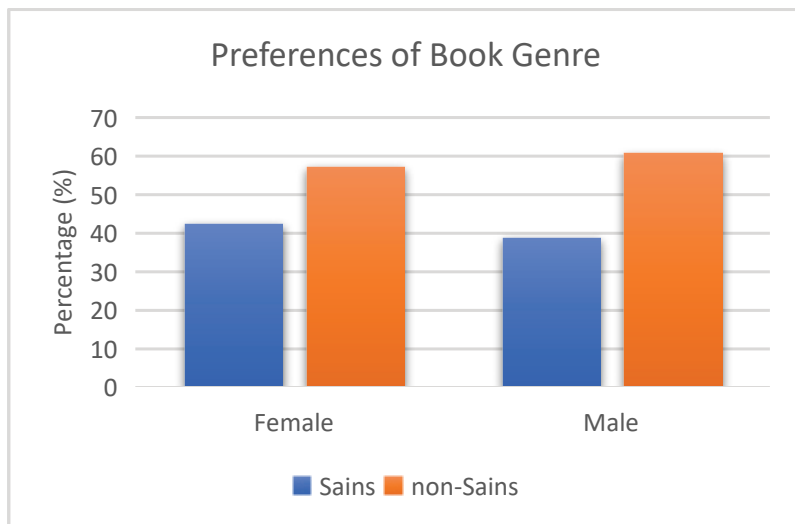
Source: Authors

**Figure 16.4** Reading Preferences between Students



The implication of reading preferences is essential regarding the choice of teaching strategies by the teachers in the classroom. One study shows that the book preferences between boys and girls at the school do not differ in reading achievement. This study also emphasized the importance of creating an environment that provides them with reading materials that match their reading preferences. This environment will generate a more effective and enjoyable learning process for improving their reading performances (Bouchamma et al., 2013).

Regarding students' preferences, Figure 16.5 shows that both male and female students shared the same interest in reading non-science books instead of science books. In this case, non-science books included fairytales, horror, mysteries, etc., and science books related to animals, geography, etc.



Source: Authors

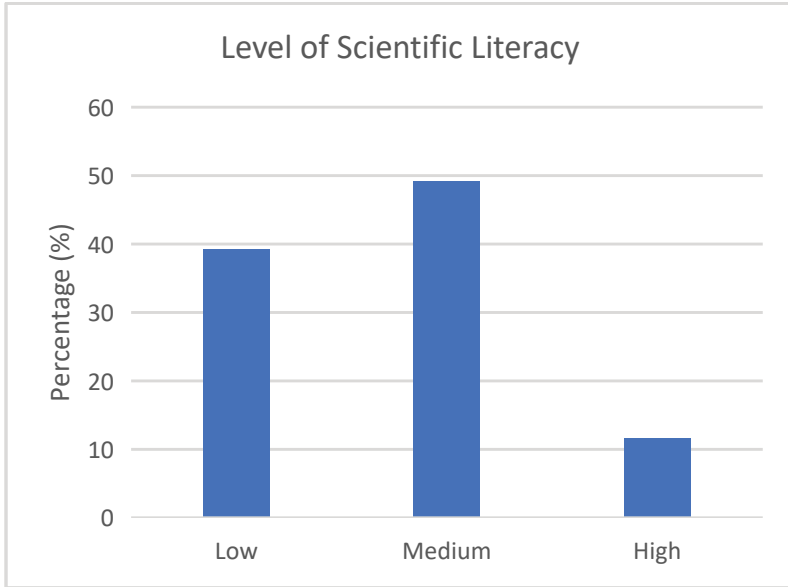
**Figure 16.5** Students' Preferences Regarding Science and Non-Science Books

The students' reading literacy findings generally show a similar phenomenon to other studies. Therefore, we tried to find different approaches by relating their reading performances to scientific and COVID-19 vaccine literacy. For instance, we suggested that students' preferences in choosing fiction books reflect their scientific literacy performance.

## **2. Scientific Literacy**

Scientific literacy is the ability to engage with science-related issues and with science and reflective citizens (PISA, 2015). This term is used in various studies, explaining the importance of being scientifically literate for helping achieve the goals of many essential societal aspects. For instance, Correia et al. (2010) found that good student achievement in scientific literacy is necessary to achieve the proper education for sustainability. Furthermore, scientific literacy is also an instrument for economic development and national security (Liu, 2009, 2013).

In the COVID-19 outbreak, the need to be literate scientifically is even more crucial. Especially for social media users to prevent misinformation about COVID-19 (Vraga et al., 2020). Figure 16.6 shows the result of students in our study regarding their scientific literacy skills. Almost half of the students were classified as having a medium category, and nearly 40 % had low scientific literacy skills. Meanwhile, less than 15 % have high literacy skills.



Source: Authors

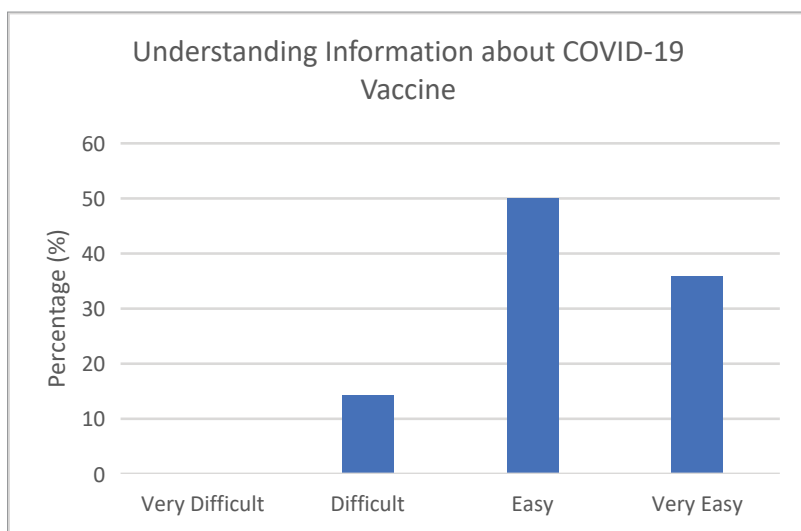
**Figure 16.6** Level of Scientific Literacy of the Students

One study found that the level of trust in science played an excellent role in accepting scientific findings, such as nanotechnology and genetically modified food (Drummond & Fischhoff, 2017). Our survey found that most participants have either medium or low scientific literacy skills. We will see how this condition reflects their attitude towards the COVID-19 vaccine, which shows pros and cons since it was given to a human for the first time in December 2020, less than one year since the pandemic was spread globally in March 2020.

### 3. COVID-19 Vaccine Literacy

COVID-19 outbreak in early 2020 is a new challenge for all people worldwide. Since then, scientific research has been a crucial reference for helping stop the pandemic. However, the role of society to trust science is also essential because this condition will build a mutual

benefit between scientific results and people who will use them. One study found that people who trust science and think COVID-19 is a severe threat were more compliant with the COVID-19 prevention guidelines (Plohl & Musil, 2021). In our study, we tried to see the perceptions and beliefs about the COVID-19 vaccine and its relation to scientific literacy and reading literacy that have been discussed in previous sections. In the first part of the survey, we assessed challenges and difficulties in understanding information about the COVID-19 vaccine, considering the participants were not experts in the field.



Source: Authors

**Figure 16.7** Challenges to Understand Information about the COVID-19 Vaccine

Figure 16.7 shows that only around 14% of students found the information about the COVID-19 vaccine challenging to understand. Their tendency to read more non-science books seems unrelated to that habit. One study found that the confusion of COVID-19 mostly happened among people who had a lower health literacy. Moreover,

understanding information about COVID-19 does not necessarily imply that someone would easily trust the information in the media (Okan et al., 2020).

The next item questioned the participants' perceptions and attitudes towards the COVID-19 vaccine. There were five questions as follows:

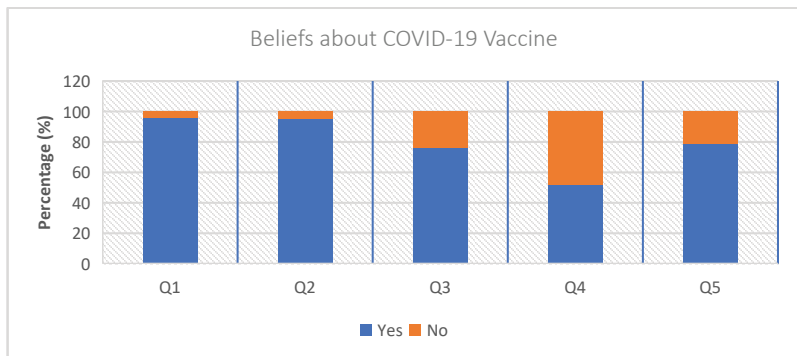
Q1: Will it be possible to produce safe and efficacious vaccines?

Q2: Would you get vaccinated, if possible?

Q3: Will health authorities succeed in vaccinating the entire population?

Q4: Would you pay a fee to be vaccinated?

Q5: Should children be vaccinated too?



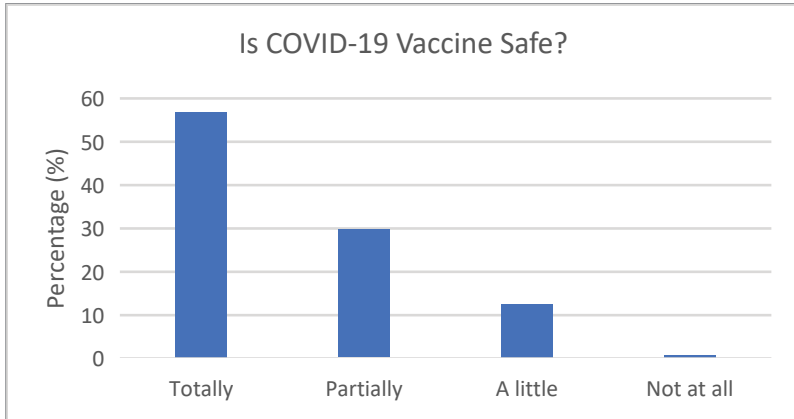
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**Figure 16.8** Perceptions and Attitudes towards COVID-19 Vaccines

Figure 16.8 shows that all the participants' choices had a good perception and attitudes toward the presence of the COVID-19 vaccine, including the willingness to get vaccinated. However, this condition would significantly change regarding question 4, in which almost 50% of participants refused to accept the vaccine if it was not accessible. This finding is similar to the study in China that found that

vaccine acceptance was 20% lower if they had to pay to be vaccinated against COVID-19 (Han et al., 2021).

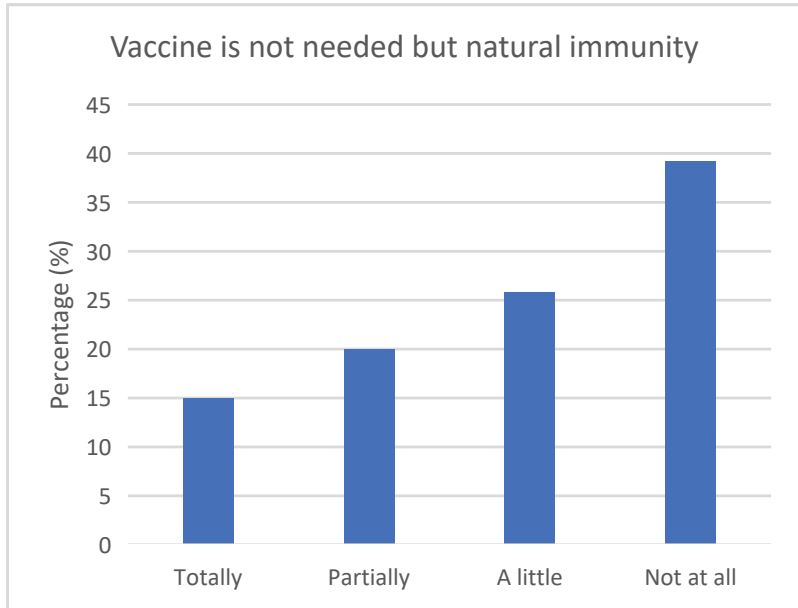
We also found that more than half of the participants thought the vaccine was safe, but the rest doubted it, with more than 13% firmly believing it was unsafe. This trend can be seen in Figure. 16.9 as follows:



Source: Authors

**Figure 16.9** Belief about the Safety of the COVID-19 Vaccine

However, we found the belief that the need for a vaccine slightly decreases if it comes to natural immunity. For example, Figure 16.10 shows that only 39% of participants trusted that vaccine is the most critical tool to protect someone from COVID-19. Meanwhile, more than 35% of the participants had strong confidence that natural immunity in our bodies can prevent severe disease due to the COVID-19 infection.



Source: Authors

**Figure 16.10** Beliefs on Natural Immunity instead of Vaccine

## D. The Lessons Learned from the Survey

Our survey indicated that many participants faced constraints regarding their beliefs and perceptions of the COVID-19 vaccine. Although 95% of our participants were willing to get vaccinated, almost half of them still had a slight and strong skepticism about the vaccine's safety. The explanation regarding this can be detected in some studies that found some factors behind vaccine hesitancy, including the side effects, unfamiliarity with the COVID-19 vaccine, effectiveness, and the duration of immunity (Fisher et al., 2020; Neumann-Böhme et al., 2020; Reiter et al., 2020; Wong et al., 2020).

Someone's belief toward the COVID-19 vaccine is also linked to their scientific literacy skill level. Rosenthal and Cummings (2021) suggested that promoting scientific literacy in society is even more

essential to boost the citizen' beliefs to accept the vaccine, regardless of its speed of development. In our study, less than 15% of participants had a high level of scientific literacy, reflecting their high doubt regarding the safety of the COVID-19 vaccine. Despite the high percentage to accept the vaccine, this decision might be polarized due to the role of the news and social media in shaping the perception and determination in the society. One study found that social media, like Twitter, contributed to the misperception regarding the truth of COVID-19. (Bridgman et al., 2020). Thus, the general population and journalists as content creators are also important to being literate in science to ensure that they share reliable information with the public (Serpa et al., 2021).

One way to improve scientific literacy skills is by implementing fundamental literacy such as reading and writing in science education. Levine (2001) found that reading scientific articles and sharing them in the discussion session will create meaningful learning and promote the achievement of scientific literacy. Thus, the reading skill cannot be neglected to improve the population's scientific literacy. The implementation can be started by integrating writing, reading, and science literacy in the school curriculum to support meaningful teaching and learning in science (Glynn & Muth, 1994).

## **E. The Prominence of Digital Literacy for the Future Global Crisis**

According to Okan (2020), people easily trust digital media information. However, to stop the spread of COVID-19, the government faces challenges from hoax news or misleading information (infodemic) quickly spreading through social media. This infodemic is any excess information on a problem that can interfere with efforts to find solutions to the problem. The rise of infodemic or hoaxes and rumors about COVID-19 in the community can worsen the pandemic situation itself. The spread of hoax news often occurs because someone is not used to double-checking, comparing with other information, or having information literacy. As a result, when spreading or sharing



information with others, e.g., through social media or groups, people do not understand the impact and dangers of the information they disseminate later. Therefore, in the recent era of abundant information, people also urgently need to be digitally literate or competent besides being scientifically literate.

## **1. The Proposed Solution**

A concept and framework for citizens to be digitally literate came from the European Union Commission in early 2016. The framework's name is The Digital Competency for citizens. The framework explained the latest concept that describes skills in using digital technology, such as utilizing information technology and information and data literacy (Instefjord & Munthe, 2017; Reisoğlu & Çebi, 2020). Digital competence consists of a) technical skills in using digital technology, b) the ability to use digital technology meaningfully for work, study, and everyday life in general in various activities, c) the ability to critically evaluate digital technology, and d) motivation to participate in digital culture (Tsankov & Damyanov, 2019). This digital competency is important and recognized as one of the eight main competencies for entire life and activity, including how to be aware and avoid misleading news, hoaxes, and black campaigns, for instance, regarding COVID-19.

Therefore, the European Union Commission developed the Digital competency framework for citizens, including the following competencies (Carretero et al., 2017; Science & Policy, 2017).

**Table 16.1** Digital Competency Proficiency 2.0 of the European Union

No	Competency area	Competencies
1.	Data and Information Literacy	1.1 Browse, search, and filter data, information, and digital content 1.2 Evaluating data, information, and digital content 1.3 Managing data, information, and digital content
2	Communication and collaboration	2.1 Interacting through digital technology 2.2 Sharing via digital technology 2.3 Engaging citizenship through digital technology 2.4 Collaborating through digital technology 2.5 Netiquette 2.6 Managing digital identities
3	Digital content creation	3.1 Developing digital content 3.2 Integrating and redefining digital content 3.3 Copyright and license 3.4 Programming
4	Digital security	4.1 Device security 4.2 Protecting personal data and privacy 4.3 Protecting health and well-being 4.4 Environment security
5	Problem-solving	5.1 Troubleshooting technical problems 5.2 Identifying technology needs and responses 5.3 Using digital technology creatively 5.4 Identifying digital competency gaps

Source: Carretero et al. (2017) and Science and Policy (2017)

In this discussion, regarding a global solution for COVID-19 post-pandemic, we will focus on the first skill, namely data and information competency. The competencies in information and communication technology are required for the citizen to be digitally literate, have digital skills, understand change, and filter much information. Thus, to articulate their knowledge in a digital environment, citizens need the capability to continuously update their information skills, such as to search strategies on the internet, analyze, compare, and critically

evaluate the credibility and reliability of the information. Competency to filter and compare the validity of information is strongly required to prevent and deal with hoaxes or false news amid the abundance of data and information in cyberspace (social media). Finally, an equally important competency is managing and preserving the information they get carefully so that when it is necessary to retrieve or access the information, they can efficiently access and process it in a structured data environment.

Besides, the development of technology and more excellent ICT resources, especially during the COVID-19 pandemic, has also influenced education and work-life and is very likely to completely change the conventional learning and work environment in the future (Herliandry et al., 2020). The government must implement different policy measures over the previous decade according to the times to address the problems resulting from one transition to the next. For example, steps have been implemented to access ICT materials and resources and help instructors integrate ICT in their schools. These digital competencies are essential for a future national school curriculum (Prayogi & Estetika, 2019).

## **2. Digital Competencies for Educators**

The DigCompEdu framework (Ghomi & Redecker, 2019) aims to capture and explain these educator-specific digital competencies by proposing 22 basic competencies organized in 6 areas: professional engagement, digital learning resources, teaching, and learning, assessment, empowering learners, and facilitating learners with digital competence.

The framework also proposes a developmental model to help educators assess and digitally develop their competencies. It outlines the six stages in which an educator's digital competence typically develops to help educators identify and formulate steps to improve their competence at the current stage. Educators assimilate new information and develop basic digital practices in the first two stages, Arrivals Beginner (A1) and Explorer (A2). In the following two stages, Integra-

tor (B1) and Expert (B2), they apply, expand, and further structure their digital practice. Lastly, at the highest stage, the Leader (C1) and Pioneer (C2) convey their knowledge, criticize existing methods, and develop new approaches.

The DigCompEdu framework aims to provide a general reference for developers of digital competency models, i.e., relevant regional or national governments, educational organizations, and public or private professional training providers. This framework is aimed at educators at all levels of education, from early childhood education to higher and adult education, including general and vocational training, special needs education, and non-formal learning contexts. It invites and encourages adaptation and modification to specific contexts and goals.

### **3. Digicomp-Edu Components**

The DigComp-Edu framework proposed in this report aims to reflect on existing instruments for educator digital competencies and synthesize them into a coherent model that will enable educators at all levels of education to comprehensively assess and develop their digital pedagogical competencies (Ghomi & Redecker, 2019). DigCompEdu focused on six areas of the educator's professional activity, as described below.

- Area 1: Professional Engagement. Digital technology is used for communication, collaboration, and professional development. Competencies in this area are directed at the wider professional environment, namely the use of digital technology by educators in professional interactions with colleagues, students, parents, and other interested parties for individual professional development and the collective good of the organization.
- Area 2: Digital learning resources. Competencies are needed to use, create, and share digital resources for learning effectively and responsibly.
- Area 3: Teaching and learning. This area is dedicated to managing and regulating digital technology in the teaching and learning process.

- Area 4: Assessment. Competence regarding the use of digital strategies to improve assessment.
- Area 5: Empowering learners. This area focuses on the potential of digital technology for learner-centered teaching and learning strategies. In addition, this competency directs educators to use digital technology to increase students' inclusion, personalization, and active involvement.
- Area 6: Facilitating learners with digital competence. This area details the pedagogical competencies needed to facilitate students' digital competence, namely how to enable students to use technology for information, communication, content creation, and well-being, and how to creatively and responsibly solve digital problems.

Hopefully, with the simultaneous implementation of the digital competency framework from the citizen stage to being implemented systematically in the teaching curriculum in schools, a solution to this post-COVID-19 global problem can be achieved. Citizens and future generations who are highly literate and digitally competent in science and technology will undoubtedly make wise decisions to create a resilient and intelligent society.

## **F. Conclusion**

This chapter highlights the impact of being literate in science and digital on their perception of the COVID-19 vaccine. Our findings suggest that scientific literacy and digital literacy, particularly a critical attitude towards information obtained on a perceived understanding of the COVID-19 vaccine, are positively related to acceptance of the COVID-19 vaccine. In addition, knowledge of COVID-19 prevention behavior through types of reading and reading habits is positively associated with attitudes towards/practices of COVID-19 prevention behavior. These findings show the role of cognitive factors, objective and subjective knowledge, and digital skills in filtering information on the acceptance of COVID-19 vaccination and its prevention.

Our findings contribute to scientific and digital literacy's role in respondents' attitudes towards trust in scientific and technological research findings. The insignificant scientific literacy relationship is mainly consistent with previous studies (Fernbach et al., 2019). Our participants showed more positive attitudes towards COVID-19 prevention behavior than COVID-19 vaccination. Moreover, respondents have implemented COVID-19 prevention behaviors in their daily lives. The further work of this research is the need to investigate whether high scientific literacy supports high levels of preventive behavior against COVID-19 with more in-depth correlation analysis. We also argue that the strong need for literacies such as reading and scientific literacy contributed massively to society to the end of the pandemic era. We also proposed that concurrently implementing the digital competency framework from the citizen level to being effectively systematized in the teaching curriculum in schools could be a solution to this post-COVID-19 global problem.

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