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ORIGINAL ARTICLE

Understanding Coronavirus (COVID-19) as a Small Particle to Students with Special Needs

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ABSTRACT

The purpose of this study was to assess students with special needs' understanding of the size and shape of the COVID-19 as a particle. This study was conducted by giving 60 questions to the students to investigate their level of understanding. To ensure the evaluation precisely, the students from four special needs schools in Kuningan District in Indonesia were assisted by their parents when answering the questions. Different levels of the students' understanding were obtained. As many as 8 students (or 35% of students) scored below 70, while 15 students (or 65% of the students) scored more than 70. Students aged 15 years had the lowest average score of 4.7, while students aged 8 years had the highest average score of 9.2. Most of the students with special needs understood that COVID-19 is a small particle, however, the strategies for improving their understanding need special techniques. This study is important to give knowledge on how to prevent COVID-19 among students with special needs. Indeed, this can lower the spreading of the virus.

Keywords: coronavirus (COVID-19), particles, level of understanding, students with special needs.

Introduction

A virus is a microorganism that reproduces in living host cells. The viruses do not have cells and they form new viruses in the infected host cell (Sakurai *et al.*, 2015). Viruses can infect humans. The world nowadays has been experiencing the pandemic due to coronavirus. Coronavirus is a virus originating from animals (Omrani, Al-Tawfiq, & Memish, 2015). There are six types of coronaviruses that can infect the human body. One of them is the severe acute respiratory syndrome coronavirus 2 (SARS-COV-2) (Lai *et al.*, 2020). Nowadays, the disease comes as coronavirus disease (COVID-19). This virus can affect anyone and cause respiratory system disorders, acute pneumonia, and death.

The COVID-19 can be transmitted through coughing and sneezing and direct contact with the patients. This virus quickly spreads because of its very small size (Li *et al.*, 2020). Furthermore, this virus is tiny and it is invisible particles so it can only be seen using certain tools. The COVID-19 has a round shape and is surrounded by nails attached to it like a crown.

People infected by this virus have symptoms of fever, cough, and shortness of breath. Symptoms of COVID-19 will appear within 2 to 14 days after exposure to the coronavirus (Lauer *et al.*, 2020). We can prevent the spread of this virus in several ways by maintaining physical distancing (keeping a distance of at least 1 meter from others), using a mask when we leave the house, diligently washing hands with soap, applying hand sanitizers, boosting the body immune by taking vitamins and balancing diets, avoiding contact with the patients, maintaining cleanliness, covering our mouth and nose when sneezing and coughing, and not touching our nose and mouth before washing our hands.

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As this is one of the dangerous viruses, therefore, providing education about COVID-19 prevention is very important. At present, many inventions that explained the understanding of the COVID-19 (Tetro, 2020), the form of the COVID-19 (Tian *et al*., 2020), symptoms of people with COVID-19 (Shi *et al.*, 2020), the spread of the COVID-19 (Lai *et al.*, 2020), the data of infected people (Word Health Organization, 2020a), and the prevention in contracting the virus (Qian *et al.*, 2020). However, almost all the research explained about COVID-19 is for the general society. Up to the present, we have not found any researches discussing the comprehension of students with special needs about the coronavirus.

We believe that it is also very important to educate children with special needs about the COVID-19. In order to establish their knowledge on COVID-19 such as its size and its form, its transmission and also the prevention, in the same way we teach our students in general. As known, most of the children with special needs are very susceptible to be infectious, especially children with intellectual disabilities because they are less in maintaining personal hygiene (Giust & Valle-Riestra, 2017). The students with intellectual disabilities also have difficulties in performing daily living tasks (Kang & Chang 2019). Additionally, they have problems in life skills and independent personal hygiene in activity daily living, especially in hand and body hygiene (Cihak *et al.,* 2016; Cannella-Malone *et al.,* 2016).

Therefore, we examined how children with special needs understand the coronavirus and its relation to the smallest particle shape. We gave as many as 60 questions to students by empowering their parents. Some questions related to understanding particle size because when the students know and understand the shape and size of the virus as well as how its spread, they become more aware of the virus and its transmission.

Research Methodology

Sample

This study focused on limited research subjects (*i.e*., students' understanding of the comparison of the size and shape of the coronavirus as a particle). The research participants were students with special needs (students with autism, students with down syndrome, students with hearing impairment, and students with intellectual disabilities) from the four special schools (*Sekolah Luar Biasa*) in Kuningan Regency, Indonesia. The schools are specialized for students with special needs.

Variables

The variables in this study are the students' knowledge and COVID-19 as particles. The students are individuals who encounter problems in the developmental and academic aspects. They also have difficulties in understanding information and doing daily activities. There are several categories of the children with special needs, including the students with autism, down syndrome, the students with hearing impairments, and the students with intellectual disabilities. Generally, in the learning process, they need concrete learning media to grasp the idea of the lesson, clear and concise explanations, and repetitions. They also need special teaching methods and learning that can accommodate their diversed needs. Additionally, the learning environment is very much influencing the student's knowledge level (Nakayama, 2019). Therefore, during the current pandemic outbreak, providing knowledge about the COVID-19 is very important to students with special needs because it has been declared as a Public Health Emergency of International Concern. It is also one of the hideously destructive viruses and students with special needs are at a higher risk of getting severe COVID-19 disease. As per 21 April 2020, Indonesia reported 6760 laboratory-confirmed COVID-19 cases with 590 deaths (World Health Organization, 2020b).

COVID-19 is a coronavirus coming from animals or often called zoonotic diseases. The development began in December 2019, and originally appeared in Wuhan city with the name 2019-nCoV or Novel Coronavirus (Anggraeni *et al*., 2020). WHO has finally officially named it as COVID-19. COVID-19 stands for 'corona', 'virus', and 'disease', whereas 19 is the beginning year of the virus spreads (Ana, 2020). This virus has a round shape surrounded by crown-like spikes. This virus has a very small size or small particles, so it can only be seen using electron microscopes. Since the virus is a tiny particle, therefore, it gets into the human body easily. This virus causes lung damage and attacks the immune system. Being based on the facts, we think educating students with special needs about COVID-19 is essential to help them understand about the disease in order to help them prevent the transmission and to protect themselves and their families.

Instrument

In this study, we gave tests to the students by asking a few questions to assess their level of understanding of the COVID-19 size. We made 50 polar questions and

analyzed it as 0 for *no* and 1 for *yes* with a total score of 100 if students answered *yes* to all the questions. We also provided 10 multiple-choice questions with three answer choices (a, b, and c). We simplified the analysis of students' level of understanding and all information obtained was assessed using a scale score.

Table 1 shows the 50 polar questions related to the COVID-19 and particles given to students. Table 2 is 10 multiple-choice questions. For evaluation and analysis, we asked sixty questions. Each question scores 1. The maximum score is 60, then it is divided into 6 which equals 10 (the score obtained is divided by six).

Table 1: Question about coronavirus and particles

No	Question	Answer	
		No	Yes
1	Do you know what particles are?		
2	Do you know what atom is?		
3	Do you know that every material is made up of particles called atoms?		
4	Do you know that atoms cannot be damaged?		
5	Do you know that atoms cannot be destroyed and it created through chemical reactions?		
6	Do you know that particles are very small and cannot be subdivided?		
7	Do you know that the smallest particles of the same element have the same size and mass?		
8	Do you know what size viruses and particles are?		
9	Do you know corona is a virus?		
10	Do you know that there are 6 types of coronaviruses that can infect humans?		
11	Do you know what CoVID-19 stands for?		
12	Do you know what a C0VID-19 is?		
13	Do you know that the CoVID-19 originated from animals?		
14	Do you know that the CoVID-19 is caused by the zoonotic virus?		
15	Do you know that SARS, MERS, and SARS-Cov-2 are types of CoVID-19 viruses?		
16	Do you know the other name for CoVID-19?		
17	Do you know the form of the CoVID-19?		
18	Do you know that the CoVID-19 is round?		
19	Do you know the size of the CoVID -19?		
20	Do you know how coronavirus gets into the human body?		
21	Do you know what organs can be infected by the CoVID -19?		
22	Is the CoVID-19 transmitted by coughing?		
23	Is the CoVID-19 transmitted by sneezing?		
24	Is washing your hands an effective way to avoid CoVID-19?		
25	Is wearing a mask one of the effective ways to prevent the transmission of CoVID-19?		
26	Is keeping a minimum distance of 1 meter an effective way to prevent transmission of the CoVID-19?		
27	Is avoiding crowds one of the effective ways to prevent the CoVID-19 transmission?		
28	Do you know the CoVID-19 case that is currently becoming viral?		
29	Do you know why you need social distancing (stay at home)?		
30	Do you know why the CoVID-19 is spreading?		
31	Do you know why the CoVID-19 spreads so quickly?		
32	Do you know the symptoms of CoVID-19 infection?		
33	Will someone exposed to the CoVID-19 have a fever?		
34	Will someone exposed to CoVID-19 experience shortness of breath?		
35	Will someone exposed to the CoVID-19 experience a sore throat?		
36	Will someone exposed to the CoVID-19 cough?		
37	Do you know that CoVID-19 can be in mucus or droplets?		
38	Do you know what sneezing is?		
39	Do you know why we sneeze?		

(*continues*)

Table 1: (Continued)

No	Question	Answer	
		No	Yes
40	Do you know that sneezing contains water droplets?		
41	Do you know that cough also contains water droplets?		
42	Do you know the proper way to sneeze or cough?		
43	Do you know what red zone is?		
44	Do you know about *Orang Dalam Pengawasan* (people suspected to have contact with CoVID-19 patient)?		
45	Do you know about CoVID-19 suspect?		
46	Do you know about self-isolation?		
47	Do you know the importance of self-isolation after traveling from the red zone area?		
48	Do you know the incubation period for the coronavirus?		
49	Do you know which country was first infected by the coronavirus?		
50	Do you know which animal transmitted the coronavirus first?		
Total			

Table 2: Questions about Coronavirus and Particles

No	Question	Answer	
		False	True
1	What does coronavirus look like?		
2	What is the size of the coronavirus?		
3	Where does the coronavirus come from?		
4	How does the coronavirus get into the human body?		
5	How long is the coronavirus incubation period?		
6	Why do we need social distancing?		
7	What was done to prevent contracting the coronavirus?		
8	CoVID stands for ...		
9	The smallest particles of a material are called …and how does it relate to CoVID-19 virus?		
10	What is the combination of some of the smallest particles and how does it relate to CoVID-19?		
Total			

Procedure and Data Analysis

First, we conducted a field study and the literature study about COVID-19 and the student with special needs at the beginning of this research. Then, we gave an explanation about the COVID-19 that resembles particles to the students. Second, we conducted tests by giving test instruments to the students. The test was given in order to assess the student's level of knowledge regarding COVID-19 as a particle. We collaborated with the students' parents, asked them to help in asking students questions and after that, we collected the data. The obtained data then processed using qualitative and quantitative data analysis as presented in the results and discussion section.

Results and Discussion

Student Demographics

Figure 1 is the percentage of the students' data based on their age. Students who were the research subjects in this study range from ages 8 to 19. In general, 4% of students are 8 years old, 13% of students are 12 years old, 22% of students are 13 years old, 13% of students are 14 years old, 13% of students are 15 years old, 13% of students are 18 years old, and 22% of students are 19 years old.

Figure 2 is the students' data based on the types of disabilities they have. As many as 4% of subjects are students

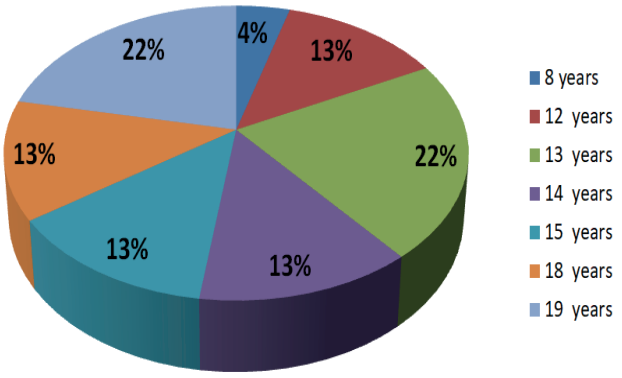

Figure 1: Percentage of subjects based on their age

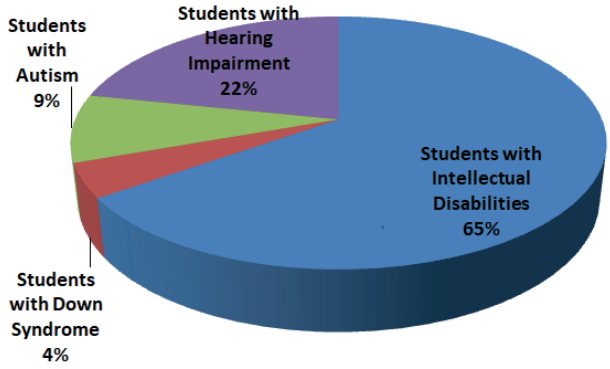

Figure 2: Presentation of the Types of Subject Disabilities

with down syndrome. Particularly, students with down syndrome have the physical characteristics of a thick tongue (Alesi & Pepi, 2017), resulting in unclear pronunciation, thick fingers, motor barriers, boredom, and difficulty understanding something complex. 9% of the subjects are students with autism. Students with autism have obstacles in interaction and communication (Toor, Hanley, & Hebron, 2020). They usually have difficulties in making eye contact, interact, and often upset. 22% of the subject are students with hearing impairment, and generally, they have problems in language, communication, understanding something abstract and learning visually (Handayani, Hufad, Tukimin, Rochyadi, & Nandiyanto, 2020; Hidayat *et al*., 2020; Komaladini, Hufad, Rochyadi, Shyhabuddin, & Nandiyanto, 2020). Furthermore, 65% of the subjects are students with intellectual disabilities. In general, they have problems in adaptive behavior, concentration, and intelligence. Students with intellectual disabilities have an intelligence quotient (IQ) below 70, and usually, they find it difficult to understand something in abstract and have problems in independence (Nordahl *et al*., 2016).

Phenomena in Learning and Teaching Process

COVID-19 is a threatening virus because when this virus infects humans it can cause respiratory problems and

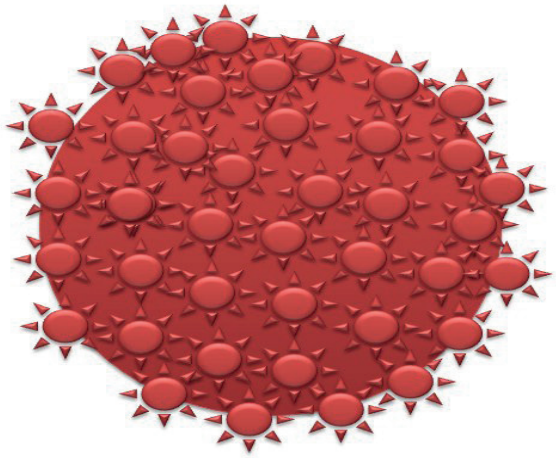

Figure 3: Illustration of a round coronavirus surrounded by crown-like spikes, shown to students.

death. COVID-19 comes from the zoonotic virus (Millan-Onate *et al*., 2020). This virus has a very small size such as the smallest particles, therefore this virus cannot be seen by the naked eye. We must use a tool or microscope to see this virus. The small size of the virus as a particle causes the virus to gets into the human body through the eyes, nose, and mouth easily. Figure 3 is an illustration of a round coronavirus surrounded by crown-like spikes when we explained about the virus to the students.

The students with special needs found it difficult to study and understand viruses and particles due to their small size and lack of visible appearance. During the lesson, students were taught that the smallest part of a particle is called an atom (Hatzoglou, Radiguet, & Pareige, 2017), and the combination of several atoms form an element. If several elements are combined, it will form a molecule. In molecular learning, students have difficulties to understand. Also, in this teaching and learning, viruses are explained as small-shaped which is similar to particles. During the lesson, the students with hearing impairment learn something by maximizing their sense of sight. However, students with intellectual disabilities, autistic, and down-syndrome need concrete learning media because they have difficulties in understanding the abstract concept (Taylor, Vasquez, & Donehoer, 2017).

Generally, students with intellectual disabilities learn something in repetitive situations. It means that when they often get information about the COVID-19 and they often see pictures on the news about the virus, they will most likely be able to understand what the COVID-19 is, its shape, and its size. Therefore, the teaching process for students with special needs requires special techniques (Nandiyanto *et al*., 2018). Specifically, teachers need to provide interesting methods to attract students'

concentration and focus. Otherwise, the level of students' understanding cannot be predicted. In the end of the lesson, a final test on the COVID-19 and particles was given to the students, constraints from elementary to intermediate level in order to ensure students' level of understanding during the teaching process.

Analysis Data

Figure 4 explains the average scores obtained by students based on their age. The average score for the students aged 8 years is 9.2 while the students aged 12 years had an average score of 8.4. The students aged 13 years had an average score of 7 and the students aged 14 years had an average score of 8.6 while the 15-year-old students had an average score of 4.7. Furthermore, the students aged 18 years had an average score of 6, and the students aged 19 years have an average score of 8.1. Meanwhile, the students aged 15 years had the lowest average score of 4.7, while students aged 8 years had the highest average score of 9.2. This is probably because students aged 15 have complex obstacles and issues. Also, they have limited knowledge, and have concentration issues.

Besides, student A is 8 years old receives a maximum score of 55 or 9.2. Students B, C, and D are 12 years old get a maximum score of 56 (or 9.3), 48 (or 7.7), and 50 (or 8.3), respectively. These students have poor knowledge about particle matter. Students E, F, G, H, and I are 13 years old get a maximum score of 44 (or 7.3), 42 (or 7), 38 (or 6.3), 50 (or 8.3), and 36 (or 6), respectively. These students have less knowledge about particle matter. Additionally, the students have the lowest score of 6 and the highest score of 8.3.

Students J, K, and L are 14 years old get a maximum score of 51 (or 8.5), 55 (or 9.2), and 49 (or 8.2), respectively. These students have the lowest score of 8.2 and the highest score of 9.2.

M, N, and O students are 15 years old get a maximum score of 28 (or 4.7), 14 (or 2.3), and 43 (or 7.2), respectively. The students have the lowest score of 2.3 and the highest score of 7.2. Students P, Q, and R are 18 years old get a maximum score of 58 (or 9.7), 39 (or 6.5), and 11 (or 1.8), respectively. These students have the lowest score of 1.8 and the highest score of 9.7.

S, T, U, V, and W students are 19 years old get a maximum score of 41 (or 6.8), 34 (or 5.7), 56 (or 9.3), 60 (or 10), and 52 (or 8.7), respectively. These students have poor knowledge about particle matter and they also have the lowest score of 6 and the highest score of 8.3.

From the data obtained, R student who is 18 years old has the lowest score of 1.8 because the student only answered 11 questions correctly. Being based on the data, students who get the lowest score are students with intellectual disabilities. As aforementioned, they have problems in behavior, concentration, easy to forget, and in understanding information (Maryanti, Hufad, Sunardi. & Nandiyanto, 2020; Hermawan *et al., 2020*). They also have difficulty in understanding something abstract. In addition, students seldom get stimulation and intervention from their community, whereas students with hearing impairments often do not experience intelligence barriers. However, students with hearing impairment usually have difficulties in understanding and accepting information because they have problems in their hearing or speaking organs. They learn something using the visual senses (Hidayat *et al*., 2020). Nevertheless, they will gain a low level of knowledge if the community does not support their development and maximize their potential. From the data, student V who is 19 years old has the highest score of 10 because the student answered all the questions correctly.

As many as 8 (or 34.78%), students scored below 70. Whereas 15 (or 65.22%) of students scored more than 70. This happens because students with special needs have limitations in understanding abstract and complicated theories (Hong, 2015). The community where students live affects the level of students' understanding. Students who get used to obtaining information from their community could continuously enhance their knowledge, specifically about the coronavirus, its sizes and its shapes which similar to particles.

Being based on the study we conducted, we found that the present study has specific objectives and the aims have been fulfilled. The first objective is to understand the students with special needs knowledge level on COVID-19 in Kuningan and the second objective is to give education on COVID-19 to students after gaining the results. We believe this present information shows the significance of education in preventing COVID-19 to all people in Indonesia regardless of their disabilities.

It is also expected that people will aware that educating students with special needs for knowing COVID-19 is very essential. Therefore, we conclude that attempts to improve students with special needs understanding and knowledge on COVID-19 must include some aspects. We need to provide concrete teaching media, give clear and

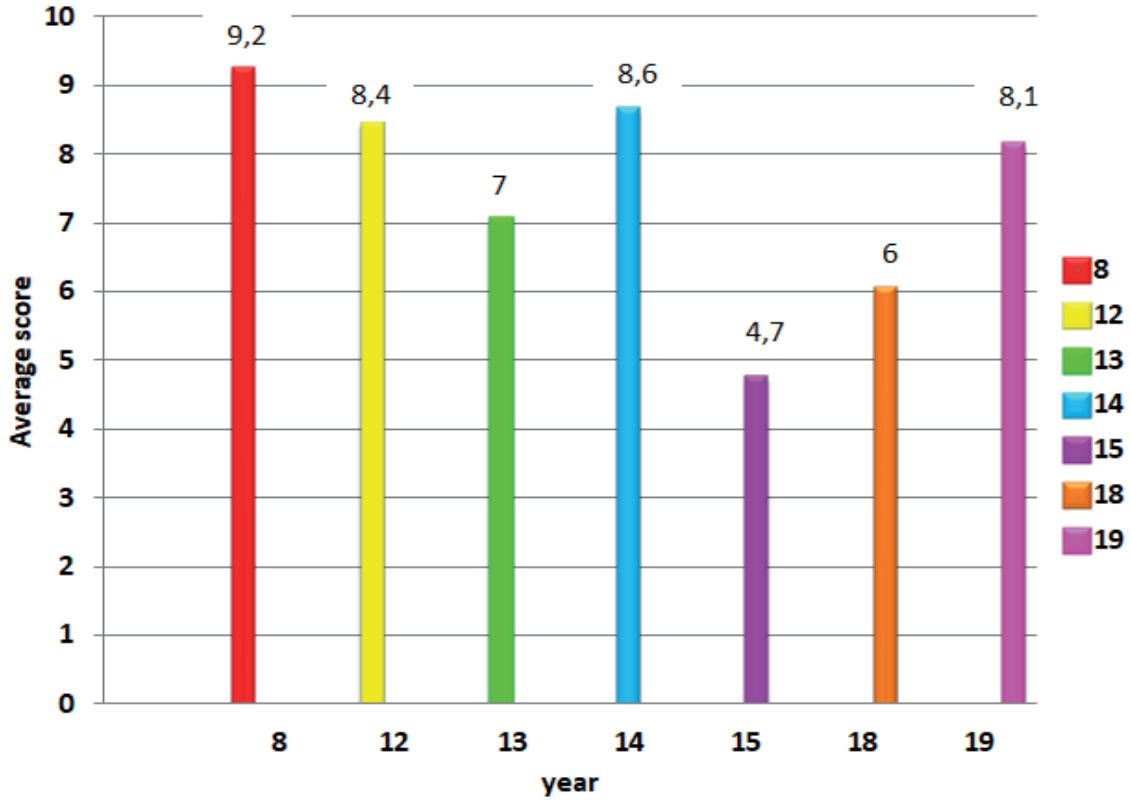

Figure 4: Percentage of average values obtained based on age

concise explanations, create supportive learning atmosphere, and do repetitions of the lesson. In addition, this research can be used as a reference for further research on how to educate and give information on COVID-19, including its transmission and prevention to students with special needs.

Conclusion

This study aimed to assess the knowledge level of students with special needs in the context of COVID-19 and its comparison to particles. The data was obtained from the tests given consisting 50 polar question and 10 multiple-choice questions to the students. We collaborated with parents and asked them to ask the questions to the students. The results showed that 78% of students level understanding is below 70, while the other 22% is greater than 70. The lowest score was obtained by R who is 18 years old while the highest score was obtained by V who is 19 years old. Therefore, we can conclude that age does not affect the level of students' knowledge. It also depends on the barriers and challenges that students experience and the support given by the community. Students with special needs gain more learning benefits based on repetition and using concrete objects as the teaching media. We also found that information that the students receive from their environment affects students' level of understanding.

Competing Interest Statement

All authors have read and approved the manuscript and take full responsibility for its contents. The authors have declared that no competing interest exists.

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