

Distance learning for Indonesian Mathematics Students with Hearing Impairments in Pandemic Situation: A Case Study

Fadhilah Rahmawati¹, Megita Dwi Pamungkas², Aprilia Nurul Chasanah³, Arief Budi Wicaksono⁴, Yesi Franita⁵, Zuida Ratih Hendrastuti⁶

¹ Universitas Tida, Indonesia; fadhilahrahmawati@untidar.ac.id

² Universitas Tidar, Indonesia; megitadwip@untidar.ac.id

³ Universitas Tidar, Indonesia; aprilianurul@untidar.ac.id

⁴ Universitas Tidar, Indonesia; ariefbudw@untidar.ac.id

⁵ Universitas Tidar, Indonesia; yesi.franita@untidar.ac.id

⁶ Universitas Tidar, Indonesia; zuidaratihh@untidar.ac.id

ARTICLE INFO

Keywords:

Learning process;
distance learning;
deaf

Article history:

Received 2021-11-22

Revised 2022-02-02

Accepted 2022-04-21

ABSTRACT

This study aimed to identify the distance learning process of deaf students during the pandemic. This research is qualitative research with a case study approach. The subjects of this study were mathematics teachers, deaf students, and stakeholders. The research was carried out at the SLBN Kota Magelang and SLB-B YPPALB Magelang . This study's data collection techniques were carried out by questionnaires, interviews, and document studies. The main instrument in this study was the researcher, while the auxiliary instruments were questionnaires and interview guidelines. The validity used in this research is source triangulation. The results showed that the mathematics distance learning process for deaf students could be implemented in various ways and could be adapted to school conditions and student conditions. Distance learning can be done with the help of media in hand-out modules taken at school before the mathematics learning schedule is implemented. In addition, the distance learning process on the mathematics topic of deaf students can also be carried out through learning videos with additional translated texts. Deaf students can simultaneously watch videos and read explanations from math teachers

This is an open-access article under the [CC BY-NC-SA](https://creativecommons.org/licenses/by-nc-sa/4.0/) license.



Corresponding Author:

Fadhilah Rahmawati

Universitas Tidar, Indonesia; fadhilahrahmawati@untidar.ac.id

1. INTRODUCTION

Children with special needs who are commonly referred to as ABK are children with different conditions, characteristics, and needs in interaction and treatment (Syafrudin, 2019). Because of these different conditions, characteristics, and needs, it is possible for ABK students to be unable to do things like standard students (regular students). However, ABK students do things differently according to their conditions (Maftuhin, 2016). Several types of disabilities are often experienced by ABK students, one of which is hearing impairment.

In general society, children who have hearing impairment are often referred to as mute and deaf in contrast to the world of education, which classifies them in a particular discussion, namely the deaf. The term deaf comes from "tuna," and "deaf" tuna means more minor, and deaf means hearing. Hearing loss or deafness is a general term that denotes the inability to hear with level severity from mild to severe (Ariapooran, 2017). According to *the World Health Organization*, usually, deaf people communicate through spoken language and can use hearing aids, cochlear implants, and other assistive devices (WHO, 2015). However, the deaf can still communicate through reading, speech and expressions, and gestures to understand what other people are saying (Goldmann & Mallory, 1992).

Deaf students have difficulty learning vocabulary, grammar, word order, idiomatic expressions, and other aspects of verbal communication (*National Information Center for Children and Youth with Disabilities*, 2004). The majority of studies show that the academic achievement of deaf students is lower than that of regular or non-hearing students (Traxler, 2000) (Richardson & Woodley, 2001) (Richardson, Long, & Foster, 2004). Deaf students are often described as visual learners or have a visual learning style (Marschark & Hauser, 2012). The most effective teaching and learning process is adapted to their learning style (Marschark et al., 2013).

Mathematics has become an exciting subject to study in recent years for deaf students (Pagligo & Kritzer, 2012; Vesel & Robillard, 2013; Shelton & Parlin, 2016; Ariapooran, 2017; Techaraungrong, Suksakulchai, Kaewprapan, & Murphy, 2015). Many studies report that the ability of deaf students in mathematics is lower than regular students. This happens because mathematics is related to the mastery of symbols, terms that have meaning, and their abstract nature (Kelly, 2003). In some specific areas of mathematics, mathematical problem solving and measurement (Pagliaro & Kritzer, 2012), number operations, and mathematical reasoning (Bull et al., 2011) are the weaknesses of deaf students. Therefore, deaf students need accommodation and modifications in the Education program they are participating in to benefit from Education services (Hasanah, Kusuman, Ulya; 2017). Accommodation and modifications that can be made to support the teaching and learning process of mathematics for deaf students is the use of media following the needs and abilities of deaf students.

In designing a media for deaf students, their strengths in the visual aspect must be considered (Marschark, Lang, & Albertini, 2006) because deaf students rely more on visual abilities than hearing abilities both in communication and information processing (Marschark, Morrison, Lukomski, Borgna, & Convertino, 2013; Marschark et al., 2017). Electronic media is the primary demand and characteristic of 21st-century learning (Chalkiadaki, 2018). However, in reality, the mathematics learning process for deaf students and students with other disabilities is no different and tends to be generalized. At the same time, deaf students and students with other needs have different needs and characteristics. Based on this explanation, research is needed to analyze the needs of mathematics learning media materials for deaf students.

Following current events, namely in March 2020, the emergence of infectious disease in Indonesia, namely Covid-19. Covid-19 is an infectious disease caused by the acute respiratory syndrome coronavirus 2 (extreme). Intense respiratory syndrome coronavirus 2 or SARS-CoV-2). That is why this disease is called COVID-19 (Coronavirus disease-2019). Since the emergence of Covid -19 to Indonesia in March 2020, the Indonesian Government and the Ministry of Education and Culture closed the learning process to reduce the spread of the infection. All learners and teachers should undertake home study programs or use distance learning. Distance Learning, or what we call PJJ, is learning that prioritizes independence. The teacher delivers teaching materials to students without meeting face to face in the same place.

Learning like this can be done at the same time as well as at different times (Anggi, 2020). Distance learning, or what is commonly called PJJ, is carried out by all education actors except deaf students. The problems faced in the distance learning process during this pandemic are the lack of attention from parents to these students resulting in a lack of understanding and lack of understanding of the material presented; deaf children usually follow the learning process at school with assistance and use learning materials that are following their abilities (Hudzaifah et al. 2021).

Distance learning is a form of educational service for students experiencing distance barriers. Distance learning bridges between being at home and avoiding transmission of Covid-19 while still providing learning services for children (Wardani, 2020). Wardani (2020) said distance learning is a teaching approach where students are not physically present at school. The advantages of distance learning are flexibility, accessibility, the ability to create a self-directed learning environment, and less time wasted. However, the disadvantage of distance learning is the loss of learning rights for students with low motivation and discipline in learning, which is influenced by how trained teachers deliver and make meaningful learning during distance learning.

Distance learning is the best alternative that can be done so that learning can take place even though students are at home. Online learning is carried out using the internet to transmit knowledge (Syarifudin, 2020). Research (Syafarana & Chairani, 2020) concluded that online learning is not as easy as learning in schools that do face-to-face. Teachers face so many challenges, such as children who do not have the desire to learn and the lack of concentration of children with special needs when doing online learning. On the other hand, research (Jannah, Wulandari, & Budi, 2020) explains that online learning gives children with special needs new experiences in operating cell phones as a learning tool like other children, which can grow their confidence.

According to the results of Huszaifah's (2021) regarding distance learning for deaf students, deaf students show less interest in studying at home, which occurs for various reasons, including; feelings of children who are forced to carry out learning, lack of attention in learning, teaching materials that are not suitable for deaf students. One of the factors that can arouse student interest is teaching interesting materials following student needs. This is in line with Slameto (2010) that interest influences learning if the subject matter studied is not following students' interests. Students will not learn as well as possible because there is no attraction. Students' distance education experience is not always the same as students who hear because they cannot listen well. Lessons with subtitles are not enough. Many students have poor reading skills and do not receive adequate benefits from subtitles (Alqraini & Paul, 2020).

Meaningful learning can be implemented if teachers and students interact and build strong bonds. Chakraborty & Nafukho (2014) state that there are five things teachers should do to strengthen bonds with students, namely (1) create and maintain a positive learning environment; (2) build a learning community; (3) provide consistent feedback promptly; (4) practice flexibility in using technology to deliver the right content; and (5) provide an appropriate support system. Pacheco et al. (2020) examined the challenges of instructional accommodation for students with disabilities during the COVID -19 pandemic at school. Many students cannot maintain the required instructional attention during online classes at home (Ayas et al., 2020). The physical attention given to every student at school cannot be replicated at home, and accessibility issues are common. Online teaching for students is a new way of teaching for most Indonesian teachers. The lack of proper training for teachers is a critical problem hindering progress in the online education system. Teachers can only assess the condition of students in the classroom; it is difficult to evaluate each student during distance education (Pacheco et al., 2020). More importantly, some students have an extra-national disability and other critical health issues that make distance education a challenge for teachers. Individual attention in distance education is also an obstacle because students learn in a group format. The communication gap is a significant obstacle for teachers and students because gestures that are very important for students can never be appropriately managed.

In addition to the challenges students face, their families also face significant problems, including the availability of a learning environment, technological support, and addressing their children's health.

COVID-19 has left everyone socially isolated, and students are the most affected. Krishnan et al. (2020) describe the mental stress faced by students persons with disabilities at home, which poses a challenge to their curriculum during the COVID-19 isolation period. About 80% of children with disabilities cannot continue their studies under such conditions (Krishnan et al., 2020). Lack of a learning environment at home and lack of specialized equipment are significant problems many student families face. Parents need to take extra time to pay special attention to their children during online learning (Stenhoff et al., 2020). As students cannot sort out problems related to distance education, parents must communicate with teachers about their child's condition (Alsadoon & Turkestan, 2020). Teachers with poor knowledge of children's interests and understanding during distance education are a significant problem. The quality of education has been marginal during the COVID-19 pandemic since teachers cannot understand each student's individual development (Alsadoon & Turkestani, 2020). The lack of understanding during distance education has further reduced students' interest in distance learning programs and has made the whole learning program a disaster. Distance learning for students is not accessible to everyone, and most children face problems related to classroom activities. Communication barriers are difficult to overcome in distance education, and parental involvement in such sessions makes routines complicated learning process to continue (Chodosh *et al.*, 2020, Spinczyk *et al.*, 2019).

Communication is limited, especially for children with special needs who have problems communicating. Therefore, the right strategy is needed when online learning takes place. In this case, a collaboration between teachers and parents is needed to run online learning smoothly (Nurkholis, 2021). The process of learning mathematics for deaf students requires more preparation and adjustment than for regular students. Media and learning methods are needed to follow the needs of deaf students without overriding their limitations. One media used in distance learning and *blended learning* is Google Classroom. However, these media are not necessarily following the abilities of deaf students. This study provides a clear picture of the distance learning process for deaf students during the pandemic.

2. METHODS

This research is a qualitative descriptive study. The type of qualitative descriptive research used in this study was intended to obtain information about the analysis of learning media needed by deaf students. The qualitative research method is a research method where the researcher is the key instrument, sampling is done purposively or snowball, data collection techniques are triangulation (combined), data analysis is inductive/qualitative, and the results of qualitative research emphasize meaning rather than generalization (Sugiyono, 2013).

This study uses a descriptive method on a qualitative approach because this research is only limited to describing the state of a subject by using a theory following the theoretical study for further use in conditions that exist in the field.

This research took place in two special schools located in Magelang, namely SLB Magelang City and SLB-B YPPALB Magelang City. Both of these places are in Kedungsari, Kec. North Magelang, Magelang City.

The main instrument in this research is the researcher. Researchers as planners, implementers of data collectors, analyzers, interpreters of data, and finally reporting the results of their research, other instruments are in the form of learning media questionnaires and interview guidelines. This research's data collection techniques are observation (observation), interviews, and questionnaires to teachers and students.

Data analysis is the process of systematically searching and compiling data obtained from interviews, field notes, and documentation by organizing data into categories and compiling data in patterns, choosing which ones are important and will be studied, and making conclusions so that they are easily understood by the public (Sugiyono, 2011). This study uses three stages of data analysis, namely data reduction, data presentation, and conclusion drawing. Reducing data means summarizing, choosing the main things, and focusing on the essential things. The presentation of the data used in this study is a

narrative text. Presentation of data in qualitative research includes clarifying and identifying data and writing down organized and categorized data sets to conclude.

3. FINDINGS AND DISCUSSION

Based on the results of interviews that have been conducted at SLB Negeri Magelang City, information was obtained that every deaf student who registers for the school must be accepted with the conditions he has. Thus, schools are not screen students' initial conditions. Regular students (without visual impairment) are not accepted at this school. At the junior high school level at SLB Negeri Magelang, there are 12 deaf students. At the junior high school level, all deaf students in the Magelang City State SLB are also mild mentally disabled students. While at the high school level, there are 10 deaf students with a composition of 2 students without intelligence disorders and 8 students with hearing impairment and mild mental retardation.

Data on deaf students at the junior high school level at SLB-B YPPALB Magelang City were 19 students, and at the high school level, 17 students. When registering for SLB-B YPPALB Magelang City, there is a requirement to be selected, namely the condition of intelligence. Students with intellectual disabilities will be directed to SLB-C YPPALB, specifically for students with mild mental retardation and autism categories. Data on the distribution of deaf students in Magelang City is presented in Figure 1 below.

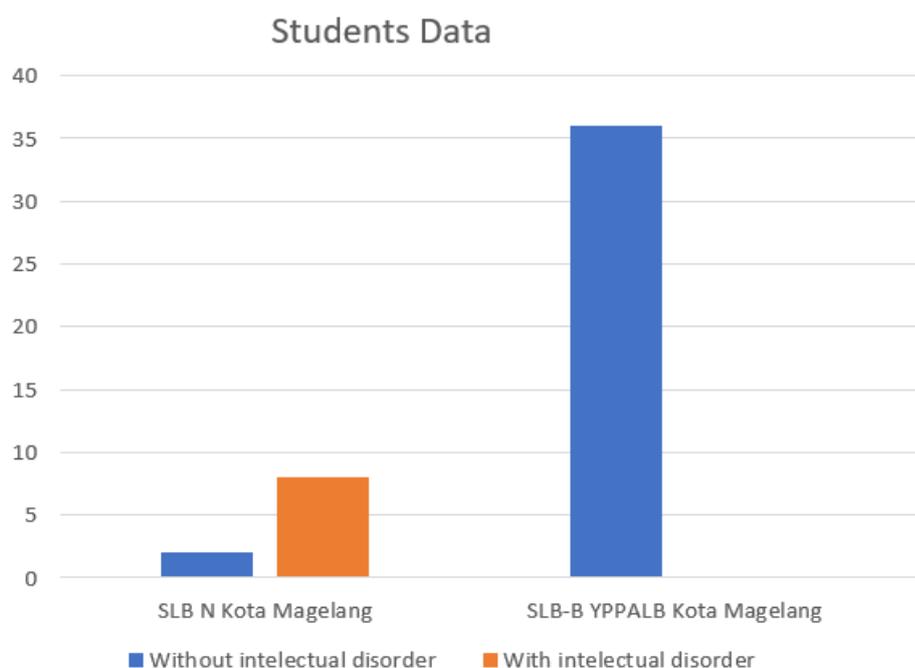


Figure 1. Students Distribution

The curriculum for learning mathematics at SLB Negeri Magelang is different from the curriculum for regular students. The curriculum is structured according to the conditions of classically deaf students. Meanwhile, the mathematics learning curriculum at SLB-B YPPALB Magelang City is arranged according to the national mathematics curriculum. The curriculum of deaf students follows the national curriculum so that deaf students also take the National Examination. Meanwhile, the curriculum at SLB YPPALB is the same as the curriculum for regular students. In some conditions for deaf students, the mathematics curriculum is modified by lowering the level of difficulty according to the characteristics of the students. The sub-material with a high level of difficulty is not given to deaf students with language disorders and

mild intelligence disorders. Deaf students with severe intellectual impairment are advised to enter SLB-C YPPALB Magelang City.

Based on the results of the questionnaires that have been distributed, it is found that deaf students need learning with the help of learning media. Deaf students do not just need printed modules taken to school on schedule. However, deaf students also need to learn according to their characteristics and the current pandemic conditions. Deaf students take the modules that have been prepared by the teacher along with details of the activities that must be carried out within a certain period. Some of the learning aids needed by deaf students are sign language videos, demonstration videos of teaching aids, and fundamental teaching aids. Data on the need for learning aids for deaf students during the pandemic is presented in Figure 2 below.

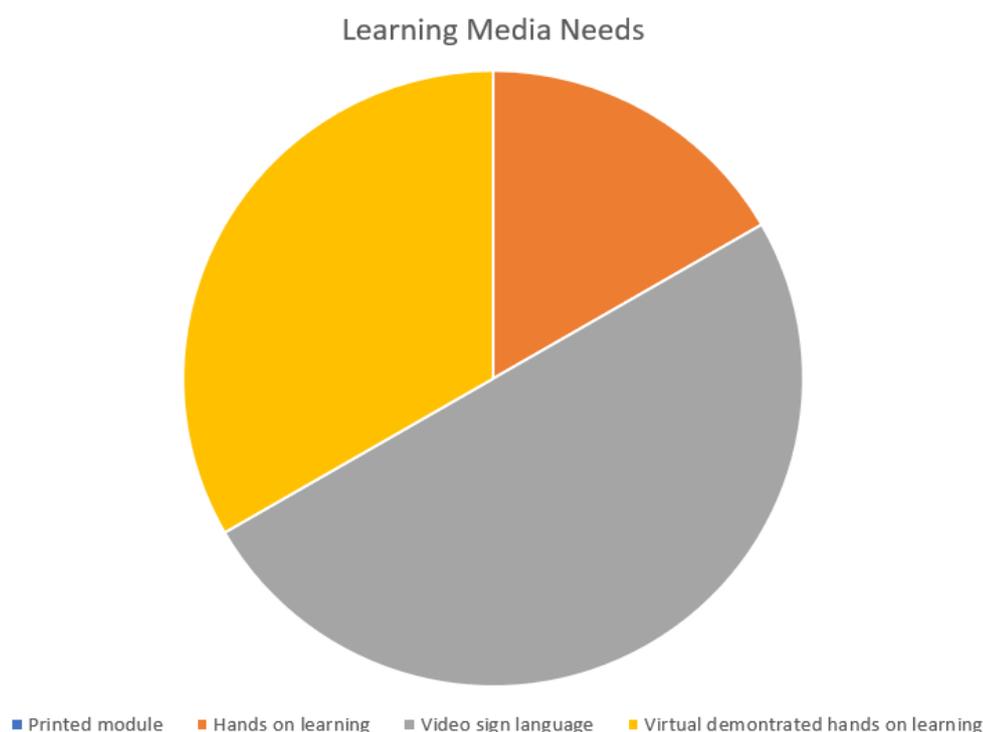


Figure 2. Learning Media Needs

In implementing mathematics learning, deaf students at SLB N Magelang City carry out individually. The teacher's role is to provide *feedback* on the work of deaf students sent via *Whatsapp Group*. If there are students who do not understand the material, the teacher explains through text messages. The use of mathematics teaching aids in distance learning is minimal. The limitations of learning mathematics experienced during the Covid-19 pandemic became a significant obstacle to the use of teaching aids. In addition, teachers still find it challenging to determine mathematics learning media that is suitable for the condition of deaf students.

Meanwhile, learning mathematics for deaf students at SLB-B YPPALB Magelang City is online through *Whatsapp Group*. The teacher distributes mathematical material that has been compiled through *Whatsapp Group*, and then students study the material that has been distributed. Mathematics material is compiled through videos that are given a translation. Deaf students understand the material from the translated text given by the teacher on the video. Students pay attention to the movement of the image and the translated text simultaneously. The weakness of using video with this translation is the focus that students have. Not all deaf students have good focus. However, deaf students can repeat the video according to their needs so that students understand the material.

In evaluation activities, Mathematics learning at SLB N Magelang City is carried out through periodic evaluations, mid-semester and end-of-semester exams. The math teacher printed the mid-semester and end-of-semester exam questions and then taken by the students. Math problems are done by students individually at home and sent 1 week later. Meanwhile, the evaluation at SLB-B YPPALB Magelang City was carried out online. The mid-semester and end-of-semester exam questions are sent online via *Whatsapp Group*. However, the results of student work are collected directly from the school.

Based on the data description above, the learning of deaf students in Magelang City is still independent. This means that the teacher does not assist. Learning is meaningful if students and teachers interact (Santia et al., 2019). Meaningful learning during a pandemic can be carried out with the help of visual aids or virtual media according to the characteristics of students (Hasanah et al., 2017). In the case of deaf students, learning can be carried out using sign language videos or teacher recordings when using teaching aids.

4. CONCLUSION

Distance learning for deaf students in Magelang City is carried out by providing printed and electronic modules accompanied by instructions through an online platform. Deaf students read both printed and electronic modules independently. The obstacle experienced by deaf students is the language limitations of deaf students, so it is difficult to understand mathematical terms. Deaf students need media and learning aids according to their characteristics. In addition, deaf students also need media that train them to adapt to learning technology.

REFERENCES

- Alqraini, F. &. (2020). The Effects of a Vocabulary Intervention on Teaching Multiple-Meaning Words to Students Who Are d/Deaf and Hard of Hearing. *The Journal of Deaf Studies and Deaf Education*, 25(4), 469–489. DOI: <https://doi.org/10.1093/deafed/ena015>
- Alsadoon, E. &. (2020). Virtual Classrooms for Hearing-impaired Students during the Coronavirus COVID-19 Pandemic. *Revista Romaneasca Pentru Educatie Multidimensionala*, 12(1) , 01–08. DOI: <https://doi.org/10.18662/rrem/12.1sup2/240>.
- Peggy G. Prawiyogi, d. (2020). The Effectiveness of Distance Learning on Student Learning at SDIT Cendikia Purwakarta. *Journal of Basic Education*, 95.
- Anyway, Oos M. 2006. "Evaluative Study of the Utilization of School Education Videos in Learning," *Teknodik Journal*, Vol. 10, No. 18. p. 59-74.
- Ayas, MA (2020). Impact of COVID-19 on the access to hearing health care services for children with cochlear. *Implants: a survey of parents. F1000Research*, 9 . doi:690. <https://doi.org/10.12688/f1000research.24915.1>
- Basilaia, G., & Kvavadze, D. (2020). Transition to Online Education in Schools during a SARS-CoV-2 Coronavirus (COVID-19) Pandemic in Georgia. *Pedagogical Research*, 5 (4). <https://doi.org/10.29333/pr/7937>
- Branch, Robert Maribe. 2009. *Instructional Design: The ADDIE Approach*. New York: Springer Publications.
- Burton, JK, and Merrill, PF 1977. "Need assessment: Goals needs, and priorities," In Leslie J. Briggs (ed), *Instructional design: Principle and application*, 24-46, New Jersey: Educational Technology.
- Chakraborty, M. &. (2014). lengthening student engagement: what do students want in online courses? *European Journal of Training and Development*, 38(9), 782 - 802.
- Chodosh, JW (2020). Face masks can be devastating for people with hearing loss. *BMJ*. DOI: <https://doi.org/10.1136/bmj.m2683>.
- Directorate General of Primary and Secondary Education, Ministry of Education and Culture, 2017, *Core competencies and basic competencies of subjects of national content, restricted content, basic skill*

- programs, and competency skills, Jakarta: Ministry of Education and Culture. Downloaded June 20, 2018, <http://psmk.kemdikbud.go.id/kikd2017>.
- Dwiningsih, K. and Rahma, PT, 2018. Development of Chemistry Learning Media Using Virtual Laboratory Media Based on Learning Paradigms in the Global Era. Kwangsan: Journal of Educational Technology, 6(2), 156. DOI: <http://dx.doi.org/10.31800/jtp.kw.v6n2.p156--176>
- Fullan, M. 1996a, The new meaning of educational change, Cassell, London.
- Hasanah A, Kusumah YS, Ulya Z'. The Development of Mathematics Learning Media for Deaf Students: Preliminary Implementation Result. J Pengajaran MIPA [Internet]. 2017;22(2):102–5. Available from: <https://ejournal.upi.edu/index.php/jpmipa/article/view/8622>
- Hudzaifah, d. (2021). Analysis of the Needs of Deaf Children in SDLB at SLB B YRTRW Surakarta in Understanding Distance Learning Materials. *Journal of orthopedagogics*, 2(1). Retrieved from <http://ejurnal-mapalus-unima.ac.id/index.php/orthopedagogik/article/view/1793>.
- Hidayat, Feriawan. 2016. *Regarding the ability to speak English, Indonesia is still lagging*. Downloaded March 2, 2018, <http://www.beritasatu.com/education/403858>.
- Khairani, A., Daud, A., & Adnan, M. (2020). Students' Acceptance of the Use of Google Classroom As a Platform in Blended Learning. *AL-ISHLAH: Journal of Education*, 12 (1), 1–16. <https://doi.org/10.35445/alishlah.v12i1.193>
- Jannah, RN (2020). Online Learning Experience of Students with Special Needs in the Covid Pandemic at Inclusive Elementary Schools. *Elementary Islamic Teacher Journal*, 8(2), 359–375.
- Krishnan, IA (2020). Challenges Faced by Hearing Impairment Students During COVID-19. *Malaysian Journal of Social Sciences and Humanities (MJSSH)*, 5(8), 106–116. DOI:<https://doi.org/10.47405/mjssh.v5i8.472>.
- Nurkholis, d. (2021). Teacher's Strategy in Online Learning for Children with Special Needs (Abk) (Case Study in Prince Cakrabuana State SLB, Depok District, Cirebon Regency. *Journal of education and development*, 9(3), 364-468.
- Pacheco, NM (2020). Challenges in Teaching Human Anatomy to Students with Intellectual Disabilities During the Covid-19 Pandemic. *Anatomical Sciences Education*, 13(5), 556–557. doi:<https://doi.org/10.1002/ase.1991>
- Palmer, GR & Short, SD 2010, Health care and public policy: an Australian analysis, 4th and, Palgrave Macmillan, South Yarra, Vic.
- Purnomo, Eddie. 2007. *Development of instructional video media for deaf extraordinary elementary school students*, Master of education thesis, Surabaya: PGRI Adibuana University.
- Santia I, Purwanto, Sutawidjadja A, Sudirman, Subanji. Exploring mathematical representations in solving ill-structured problems: The case of a quadratic function. *J Math Educ*. 2019;10(3):365–78.
- Sanusi, Rukan. 2014. *The Relationship between Students' Interest in Watching English Films and Students' Learning Achievement in Speaking Class 2 of SMPN 1 Gandusari Trenggalek*. thesis, _ IAIN Tulungagung. Downloaded April 19, 2018, <http://repo.iain-tulungagung.ac.id/478>.
- Slamet. (2010). *Learning & Influencing Factors*. Jakarta: Rineka Cipta.
- Spinczyk, D., Maćkowski, M., Kempa, W., & Rojewska, K. (2019). Factors influencing the process of learning mathematics among visually impaired and blind people. *Computers in Biology and Medicine*, 104, 1–9. <https://doi.org/10.1016/j.compbiomed.2018.10.025>.
- Stenhoff, DM (2020). Distance Education Support for Students With Autism Spectrum Disorder and Complex Needs During COVID 19 and School Closures. *Rural Special Education Quarterly*, 39(4), 211–219. doi:<https://doi.org/10.1177/8756870520959658>
- Sugiyono. (2011). *Qualitative quantitative research methods and R & D*. Bandung: Alfabeta.
- Sugiyono. (2013). *Educational Research Methods Quantitative Approach. Qualitative, and R&D*. Bandung: Alphabeta .
- Syafarana, IA (2020). Implementation of Learning for Children with Special Needs During the Covid Pandemic Sdn 12 Gedong. *Journal of Orthopedagogia*, 6(2), 125–129.
- Syarifudin, USA (2019). Implementation of Online Learning to Improve the Quality of Education as an

- Impact of the Implementation of Social Distancing. *Journal of Indonesian Language and Literature Education Metalingua*, 5(1), 31–34. doi:<https://doi.org/10.21107/Metalingua.V5i1.7072>
- Ulum, Omer Gokhan. 2015. " A Needs Analysis Study for Preparatory Class ELT Students." *European Journal of English Language Teaching*, Vol. 1, issue 1, pp. 14-29.
- Wardany, OF (2020). Implementation of distance learning for children with special needs (Survey of parents and teachers in Lampung). *JPK (Journal of Special Education)*, 16(2), 48-64. Retrieved from <https://journal.uny.ac.id/index.php/jpk>
- Zairi, M. (ed) 1999, Best practice: process innovation management, Butterworth-Heinemann, Oxford.

