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Communication Barrier Towards Orphanage Student Learning Process During Covid-19 Pandemic

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A B S T R A C T

Validity and reliability are the most important aspects to determine the quality of research conducted by researchers. This study aims to measure the validity and reliability of the communication barrier instrument in the learning process of orphanages during the pandemic. The instruments used in this study were 20 items. This research design applies a quantitative paradigm. The validity and reliability of the communication barrier instrument were measured by Rasch Model Analysis (RMA) using Winsteps version 3.71.0.1 software. The students involved in this study comprised 380 students from orphanages in the city and district of Bogor. RMA analyzed six aspects of the instrument's stability: person and item reliability, item difficulty level, item polarity, misfit item, unidimensional, and person map item. Based on these seven aspects, the instrument used in this study was valid and reliable for measuring students' communication barriers during the pandemic. The importance of Valid and reliable instruments can help determine the condition of students during the learning process during the pandemic. The instruments are

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essential for parents and teachers to deal with student changes during the learning process. Public educators can use the implications of this research and interested people to measure the communication barrier condition of students of the process during the pandemic. Future studies are needed to conduct testing for all students, from elementary to higher education institutions, with more comprehensive research sites.

INTRODUCTION

The Covid-19 pandemic has forced most countries to implement a system of social restrictions in the education sector, including in Indonesia. Covid-19 has widened the education gap in Indonesia. In 2020, the pandemic resulted in the immediate closure of 530,000 schools. The World Bank estimates that the pandemic has caused 91,000 children to drop out of school in Indonesia (Unicef for Every Child, 2020).

The Covid-19 pandemic has severely impacted the education system in Indonesia. The closure of schools and the transition to online learning has left many children without access to education. As a result, many children in Indonesia are dropping out of school, putting their futures at risk (Kusumaningrum et al., 2022; Wijana et al., 2022).

According to the Indonesian Ministry of Education and Culture, around 4.1 million students in Indonesia have dropped out of school due to the pandemic. The pandemic is a significant increase from previous years and represents a major setback for the education system in Indonesia.

One of the main reasons children drop out of school is the economic impact of the pandemic (Tsolou et al., 2021). Many families have lost their sources of income, making it difficult to afford school fees or provide necessities such as food and shelter. As a result, children are forced to drop out of school to help support their families.

Another reason for the dropouts is more access to technology and the Internet (Onyema et al., 2020). With schools closed and classes moved online, many children in Indonesia need access to the necessary devices or internet connectivity to participate in online learning. This condition has created a significant barrier to their education and is forcing many children to drop out.

Schools' closure has also significantly impacted the mental health of children in Indonesia (Kaligis et al., 2020). The lack of socialization and interaction with peers and teachers has led to feelings of isolation and loneliness. This condition, combined with the stress and anxiety caused by the pandemic, has harmed their overall well-being and can lead to a lack of motivation to continue their education (Anggrayni & Siregar, 2022; Lestari et al., 2021).

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In addition, the pandemic has disrupted the routine of many children in Indonesia (Fahriani et al., 2021). The closure of schools and the uncertainty surrounding the situation has made it difficult for children to maintain a consistent study schedule or stay motivated to continue their education. This situation can lead to a lack of progress and eventual dropout.

The closure of schools has also significantly impacted the quality of education in Indonesia (Lestari et al., 2021). Many children need access to the same resources or support as they would have in a traditional classroom setting. This case can lead to a lower quality of education and a lack of engagement, which can result in dropping out.

Children in rural areas are particularly affected by dropouts due to the pandemic (Indrawati et al., 2020). These areas often need more access to technology and internet connectivity, making it difficult for children to participate in online learning. In addition, these areas may need more access to schools and resources, making it challenging for children to continue their education.

The dropouts have also significantly impacted the gender gap in education in Indonesia. Cultural and economic factors make girls more likely to drop out of school than boys. The pandemic has exacerbated this trend, putting the education of girls at even greater risk (Burzynska & Contreras, 2020).

The Indonesian government must take immediate action to address the issue of children dropping out of school due to the pandemic (Indrawati et al., 2020). This case includes providing financial support to families struggling to afford school fees, increasing access to technology and internet connectivity, and providing mental health support to children struggling with the pandemic's impact. By taking these steps, Indonesia can work towards ensuring that every child has access to education, regardless of their circumstances.

The vastness of the Indonesian archipelago causes infrastructure constraints and poor internet connections for many people, especially students and teachers in rural and remote areas, who must surrender to this situation. Apart from infrastructure, the readiness of teacher human resources to carry out online learning activities is also an obstacle. Teachers in Indonesia are trying to adapt to innovate in understanding the learning material presented. The pandemic has accelerated social change in society, especially in school teaching and learning activities.

The restriction system can implement distance learning or the so-called "pembelajaran jarak jauh" (PJJ) for all students. This rapid and sudden change has created polemics for students, teachers and parents throughout Indonesia. However, this home-based learning requires teacher skills so students can follow the lesson well without pressure impacting their communication skills. Based on Unicef data, In 2020, 67 percent of teachers reported having difficulty operating the device and using it online. The available learning platforms have been unable to maximize the learning process, so students have difficulty understanding the material.

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Children with disabilities are hardest hit because many cannot access the services needed for their learning. An estimated 4.4 million children and adolescents aged 7–18 years are still out of school, and only 55 per cent of children from low-income families are enrolled in secondary school (Unicef for Every Child, 2020). Implementing a more effective distance learning system; that can maximize the learning process must be carried out to save Indonesia's golden generation in the future.

Communication is essential in every aspect of life, including education. Effective communication is crucial for learning (Reddy & Gupta, 2020). It helps learners to understand and grasp the subject matter easily. However, the Covid-19 pandemic has presented a unique set of challenges, especially for orphanage students, who are already disadvantaged. The communication barrier that orphanage students face is the need for access to technology (Al-Jarf, 2021). Often, orphanage students need more resources to access online classes or e-learning platforms. This situation can lead to a significant disadvantage in their learning process.

Another significant communication barrier is the need for more reliable internet connectivity (Rahiem, 2020). With a stable internet connection, orphanage students can attend online classes or access e-learning materials. This condition creates a significant disadvantage compared to other students accessing these resources. Language barriers can also create a communication barrier for orphanage students (Brinn et al., 2022). Some students may need to learn the language used in online classes or learning materials, making it challenging to understand the content.

Orphanage students also need more face-to-face teacher interaction, hindering their learning process (Toquero, 2021). Online classes may need more to help them understand complex topics or ask questions, which can lead to a lack of engagement and a lower quality of education.

Another significant communication barrier is the need for more socialization in traditional classroom settings (Adnan & Anwar, 2020). Orphanage students may feel isolated and lonely, leading to a lack of motivation and engagement in the learning process. In some cases, the lack of support from teachers or caregivers can also create communication barriers for orphanage students. Teachers may need more time or resources to support each student, leading to a lack of engagement and a lower quality of education.

Communication barriers can also arise due to the need for more trust and understanding between teachers and orphanage students. Students may feel they need to be more understood, leading to a lack of engagement and a lower quality of education. Cultural differences can also create communication barriers for orphanage students. Teachers may need to be more familiar with the cultural background of orphanage students, leading to misunderstandings or miscommunication.

Lastly, lacking motivation and interest in education can also create communication barriers for the community (Ummah, 2021). With proper motivation and interest, students may be engaged in the

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learning process, leading to a higher quality of education. In the current condition, every teacher is still trying to discipline himself using the Distance Learning (PJJ) system recommended by the government. Teachers prefer to interact online with students, such as using Google Classrooms and WhatsApp. However, the learning system with this media has been unable to maximize the learning process, so students still need help understanding the material (Fachriansyah, 2020; Indonesian Child Protection Commission, 2020). One of the most basic weaknesses of learning through PJJ is the learning process that is less than optimal. Communication interactions between teachers and students, verbally and non-verbally, needed to materialize properly. Often the contents of the messages students receive cannot be understood properly.

The percentage of comfortable communication between teachers and students in online learning is 40.8%. This quality still needs to be met, or there is an imbalance in teacher preparation in online learning, which is 65.7%, resulting in ease of communication when the learning process occurs in online spaces (Karasneh et al., 2021). Nevertheless, it cannot be denied that the flexibility of using the online learning process is easier than the conventional learning process (Lassoued et al., 2020).

Communication barriers that occur when PJJ are: (1) the cost of purchasing internet packages for students who have economic limitations, (2) unstable internet connections, especially students who live in rural areas, (3) difficulty understanding the subject matter, (4) difficulty doing homework (assignments), (5) concerns about future studies, and (6) technical obstacles encountered (Oktavirawan, 2020). While under studyKarasneh et al. (2021) found that students feel communication barriers because of the online learning process. During the PJJ process, many students complained about poor internet connection (78.3%, n = 398), and environmental conditions during learning were not conducive (69.3%, n = 352). In addition, students also complained about limitations related to technical skills (74.0%, n = 376) and computer operating skills (49.2%, n = 250). Even though students' ability to master information and communication technology (ICT) is a mandatory and fundamental requirement in the online learning process (Pibriana & Ricoida, 2017).

Communication barriers to students during the learning process are influenced by several factors, including students becoming less motivated, students not getting instructions that they can understand clearly, learning media that are too challenging because students are not equipped with the skills to use them, and students need quite a long time. Many costs, including the cost of electronic equipment and internet costs, family conditions that are not conducive during the learning process at home, unstable internet connection for students who live in remote areas (village), lack of trust between students and parents with online learning, limited device capacity used by students in accessing teaching materials provided by the teacher (Feriadi et al., 2022; Karasneh et al., 2021). In addition, students' physical condition does not allow communication interactions to occur in the

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learning process, so there is no feedback from students. Fadhal (2020) added that the virtual reality of communication is only symbolic, not objective reality. Therefore, it is difficult for every student to adjust to the learning conditions from face-to-face to online classes.

The online learning process using digital media is one of the major contributions to presenting communication barriers between teachers and students. Based on the results of research from Emeilia and Muntazah (2021) found that several aspects become barriers to communication in the learning process during the digital learning period. Namely, students feel bored in communicating because they need more communication between teachers and students, students and students, as well as students and the surrounding environment. Furthermore, students feel the limitations of space and time (students cannot solve problems by asking digitally), so students cannot solve learning problems properly. Another problem that arises is that the aspect of student self-confidence is greatly reduced. Limitations of technology and information for some students, especially those in the regions. Students also provide little interaction when learning, so it is very limited to exchange ideas during learning. Even though the government is trying to provide financial assistance to teachers and students in accessing digital devices and the internet to continue the learning process online, learning disruptions during school closures can increase student communication barriers.

The results of a survey conducted on 200 orphanage students in the Bogor area on November 15, 2020, showed that the learning process taught by the teacher online causes 90% of student communication barriers. These conditions indicate that most teachers still need the knowledge and training to change their pedagogical skills in learning using digital platforms. Teachers also face challenges in explaining the concept of learning online to students. Digital learning requires teachers to be more creative in choosing suitable learning methods so students can easily understand them. Thus, redesigning digital learning practices should be an urgent concern for teachers and the minister of education.

Measurement of the communication barriers of junior high school orphanage students can be used to develop instruments at the advanced level. The subjects in this study were residents of an orphanage in the Bogor area at the junior high school level. The reason for choosing an orphanage is that students with many limitations, especially in the economic aspect, can participate in the learning process online.

There are several units of analysis in this study. When discussing the communication barrier towards orphanage student learning during the Covid-19 pandemic, the unit analysis is the unit of time. The pandemic has disrupted the usual educational routines, and orphanage students have been particularly affected. The sudden shift from in-person classes to online learning has created time-related challenges, such as scheduling conflicts and managing different time zones. Orphanage students may also have different responsibilities or

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limited access to technology, leading to a need for more flexible learning schedules.

The second unit analysis relevant to this topic is the unit of space. As orphanage students may not have a permanent home or a stable living environment, access to physical learning spaces can be limited. The pandemic has also made it difficult for students to attend physical classes or study groups, leading to a greater reliance on online learning platforms. However, a lack of reliable internet connectivity or access to technology can make it challenging for students to participate in online learning, creating a significant barrier to their education.

The third unit of analysis is language. Orphanage students may come from diverse cultural backgrounds and may have different proficiency levels in the language of instruction. Language barriers can make it challenging for students to understand the content, ask questions, or express their ideas effectively. Teachers and educators must consider the linguistic needs of their students and provide appropriate support to overcome this barrier.

The fourth unit analysis is the unit of technology. Technology plays a crucial role in enabling online learning. However, it can also create a significant barrier for orphanage students needing access to the necessary devices or internet connectivity. In addition, orphanage students may need to become more familiar with online learning platforms or have limited digital technologies experience. This status can make it challenging for them to navigate online learning environments and effectively engage with the content.

The final unit analysis is the unit of socialization. The Covid-19 pandemic has disrupted social interactions and created a sense of isolation for many students, including orphanage students. The lack of socialization can impact their motivation and engagement in the learning process, leading to a decline in the quality of their education. Teachers and caregivers must consider ways to foster socialization and promote community among orphanage students to overcome this barrier. This case may involve incorporating interactive elements into online classes or providing opportunities for students to connect and collaborate with their peers.

Based on the problems above, effective learning methods and media; that can maximize the learning process are needed to overcome obstacles during the learning process online during the time pandemic. Conducting validity and reliability tests on students at orphanages for people with low incomes in the Bogor area in carrying out PJJ activities can provide an overview to the public about the conditions of students' learning activities during the Covid-19 pandemic.

METHODOLOGY

This research applies a quantitative paradigm in measuring the validity and reliability of the questionnaire on the mental resilience instrument in the learning process of orphans during the pandemic. The questionnaire develops from two indicators: semantic and ecological communication

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barriers. Two indicators developed into 20 items. This questionnaire is validated by experts in their fields and assisted by educators. While the level of reliability of all items is determined based on the analysis results using Winsteps 3.71.0.1 Rasch model (RMA) software. The answer options that students can use are to follow a Likert scale of five points, namely 5 = always; 4 = often; 3 = sometimes; 2 = rarely; 1 = never.

Before conducting this research, the researcher conducted socialization with the participants involved. The researcher conducted a trial with several students to understand the items. The trial results improved the sentence structure that the students did not understand. After improving several questionnaire items, the researchers distributed them to students living in orphanages at the junior high school level (SMP) (N = 380). Students as orphanage residents are from the city and district of Bogor.

RESULTS AND DISCUSSIONS

The analysis's output to determine this study's validity and reliability consists of seven aspects. The existence of communication barriers in students during the learning process can be measured by the instrument made in this study. This instrument was compiled based on the problems in the research results proposed by Emeilia and Muntazah (2021).

The Covid-19 pandemic has presented unique challenges, particularly for vulnerable populations such as orphanage students. The present study sought to investigate the communication barriers faced by orphanage students in their learning process during the pandemic (Burzynska & Contreras, 2020; Fahriani et al., 2021; Kusumaningrum et al., 2022; Lestari et al., 2021; Tsolou et al., 2021); to achieve the study analyzed six aspects in determining the stability of the measuring instrument used: person and item reliability, item difficulty level, item polarity, misfit item, unidimensionality, and person map item.

Person reliability refers to the instrument's consistency in measuring the same construct in the same group of people over time. In the present study, the person reliability coefficient was found to be .73, indicating consistency in the responses provided by the participants. This quality suggests that the instrument used was reliable in measuring the communication barriers faced by orphanage students during the pandemic.

The high person reliability coefficient also implies that the instrument could accurately capture the participants' experiences of communication barriers during the pandemic. This plight is crucial in understanding the challenges orphanage students face in their learning process, as communication is a critical component of effective teaching and learning (Adnan & Anwar, 2020; Anggrayni & Siregar, 2022; Indrawati et al., 2020; Lestari et al., 2021). The high degree of consistency in the responses provided by the participants suggests that the instrument used in the study was an effective tool in assessing communication barriers faced by orphanage students during the pandemic.

On the other hand, item reliability refers to the instrument's consistency in measuring the same construct across different items. The item reliability coefficient was found to be .99, indicating a high degree of consistency in measuring communication barriers across the different items in the instrument.

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The high item reliability coefficient also implies that the different items in the instrument were measuring the same construct: communication barriers faced by orphanage students during the pandemic. This quality is important in ensuring that the instrument measures what it intends to measure. The high degree of consistency in measuring communication barriers across the different items in the instrument suggests that the instrument used in the study was an effective tool in assessing communication barriers faced by orphanage students during the pandemic.

Item difficulty level refers to the difficulty level of the items in the instrument. In the present study, the item difficulty level ranged from easy to difficult, with most items falling within the moderate difficulty range. This case suggests that the instrument used captured a wide range of communication barriers faced by orphanage students during the pandemic.

Item polarity refers to the directionality of the items in the instrument. In the present study, the items were evenly distributed across positive and negative polarity, indicating a balanced assessment of the communication barriers faced by orphanage students during the pandemic.

Misfit item refers to items in the instrument that do not fit the overall measurement model. In the present study, no misfit items were found, indicating that all items in the instrument contributed to the overall measurement of communication barriers faced by orphanage students during the pandemic.

Unidimensionality refers to the extent to which the items in the instrument measure the same construct. In the present study, the variance explained by measures is 36.1%, indicating that the items in the instrument measured the same construct, namely, communication barriers faced by orphanage students during the pandemic.

A person map item is the graphical representation of the distribution of participants' responses to the items in the instrument. In the present study, the person map item showed that most participants faced moderate to high communication barriers during the pandemic, with only a few participants reporting low communication barriers.

The present study analyzed six aspects in determining the stability of the measuring instrument used to assess the communication barriers faced by orphanage students during the Covid-19 pandemic. The findings suggest that the instrument used was reliable, valid, and able to capture a wide range of communication barriers faced by orphanage students. These findings have implications for educators and policymakers in addressing the communication barriers faced by orphanage students during the pandemic and beyond. The seven aspects referred to are described as follows.

3.1. Item and person separation and reliability

Ensuring the suitability and correctness of a study requires a process of instrument validity and reliability (Rosli et al., 2019). The first aspect being analyzed is item and person separation and reliability. Table 1 is an index of item and person separation and reliability. This index indicates the difficulty level of the items and students who answered this research questionnaire. The index recommended by Fox and Jones in determining item and person separation and reliability is more than 2 (Fox & Jones, 1998).

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Based on the analysis in Table 1, the person and item separation indexes are 1.65 and 10.36. The person separation index, which is 1.65, indicates that the study participants (students) are less diverse in this study. While the item separation index is 10.36, the questionnaire can distinguish each student's ability. Each person and item reliability index obtained 0.73 and 0.99. The reliability index suggested by Fox and Jones is between 0 and 1. Therefore, the person and item reliability index obtained is acceptable. The person reliability index is 0.73, meaning that the questionnaire can distinguish students with low and high abilities. In comparison, the item reliability index is 0.99, which means that the questionnaire used in this study is reliable for measuring students' mental resilience during the learning process.

Table 1. Person and item separation and reliability

Criteria	Person	Item
Separation	1.65	10.36
Reliability	0.73	0.99

Source: Processed by the authors

3.2. Item difficulty level

The logit scale value shows the benchmark for determining the questionnaire's difficulty level. Table 2 is the indeks of disability items in this study. The difficulty level of the questionnaire can estimate the level of student proficiency and improve time efficiency

in the process of working on distributed questionnaires.

This section discusses the difficulty level of the questionnaire items through the difficulty indeks value. There are five categories based on the difficulty indeks: Difficult (p 0.30), Average difficult (0.31 0.70), and Easy (p > 0.70) (Henning, 1987).

Based on Table 2, items GG1 (0.85) are categorized as easy questionnaires; items JS1, GG3, JS3, and GG2 (0.43, 0.35, 0.35, and 0.53) in the average difficult category; items KB1, JS2, KS2, JS8, KB2, KB3, GG5, KS1, MV1, JS6, JS4, JS7, GG4, MV2, and JS5 (-0.80, 0.05, -0.45, 0.19, -0.59, -0.69, -0.14, -0.19, -0.52, 0.08, 0.24, 0.14, 0.28, -0.30, and 0.20).

Table 2. Indeks difficulty item

Indeks range	Item	Criteria
0.85	GG1	Easy
-0.80	KB1	Difficult
0.43	JS1	Average difficult
0.35	GG3	Average difficult
0.05	JS2	Difficult
0.35	JS3	Average difficult
-0.45	KS2	Difficult
0.19	JS8	Difficult
-0.59	KB2	Difficult
0.53	GG2	Average difficult
-0.69	KB3	Difficult
-0.14	GG5	Difficult
-0.19	KS1	Difficult
-0.52	MV1	Difficult
0.08	JS6	Difficult
0.24	JS4	Difficult
0.14	JS7	Difficult
0.28	GG4	Difficult
-0.30	MV2	Difficult
0.20	JS5	Difficult

Source: Processed by the authors

3.3. Item fit based on point measure correlation

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The Point Measure Correlation Indeks (PTMEA CORR) is a benchmark to determine the questionnaire's suitability level in measuring students' communication barriers. Indications of item discrepancies can see in the students' difficulties in answering the questionnaire. If there is a discrepancy between the items, the researcher advised repairing or replacing the related item (Wilmskoetter et al., 2019).

There are four categories in determining the PTMEA CORR indeks, namely Very Good (more than 0.40); Good (0.30 – 0.39); Enough (0.20 – 0.29); and Failed (0 – 0.19). If the PTMEA CORR indeks is less than or equal to 0, the researcher advises re-evaluating the items used in the study (Mokshein et al., 2019). Table 3 is the PTMEA CORR indeks. Based on the analysis results in Table 3, the exceptional category items are GG5, JS6, MV1, KS1, JS7, JS5, KB2, GG2, GG4, MV2, JS4, and KB3. The good category items are JS1, KB1, JS2, JS8, GG3, JS3, GG1, and KS2. Therefore, from the PTMEA CORR indeks in Table 3, it can be concluded that all items can be used to measure students' communication barriers during the learning process during the Covid-19 pandemic.

Table 3. PTMEA CORR Index

PTMEA CORR	Item	Category
0.33	JS1	Good
0.32	KB1	Good
0.44	GG5	Extremely good
0.37	JS2	Good
0.39	JS8	Good
0.35	GG3	Good
0.38	JS3	Good
0.45	JS6	Extremely good
0.32	GG1	Good
0.39	KS2	Good
0.45	MV1	Extremely good
0.44	KS1	Extremely good
0.46	JS7	Extremely good
0.52	JS5	Extremely good
0.40	KB2	Extremely good
0.43	GG2	Extremely good
0.49	GG4	Extremely good
0.51	MV2	Extremely good
0.46	JS4	Extremely good
0.43	KB3	Extremely good

Source: Processed by the authors

3.4. Item polarity

The PTMEA CORR index is an aspect that can measure the suitability of the questionnaire to measure students' communication barriers. The PTMEA CORR index, which is positive (+), indicates that the items in the questionnaire can measure constructs. When the PTMEA CORR index is negative (-), it is necessary to re-evaluate the item or, in other words, that the item does not measure the construct used in the study (Bond & Fox, 2015; Linacre, 2018).

Table 4 is an index of research polarity items. Table 4 shows that all PTMEA CORR indices are positive, which is between 0.32 to 0.44. Therefore, it can be concluded that the PTMEA CORR index is feasible to measure students' communication barriers during the learning process during the Covid-19 pandemic.

Table 4. Item polarity

Item	Measure	INFIT		OUTFIT		PTMEA CORR
		MNSQ	ZSTD	MNSQ	ZSTD	

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GG1	0.85	1.03	0.3	0.98	-0.1	0.32
KB1	-0.80	1.25	2.6	1.25	2.2	0.32
JS1	0.43	1.41	5.7	1.38	4.6	0.33
GG3	0.35	1.07	1.2	1.09	1.3	0.35
JS2	0.05	1.14	2.5	1.19	3.0	0.37
JS3	0.35	1.08	1.3	1.06	0.8	0.38
KS2	-0.45	1.01	0.2	1.02	0.2	0.39
JS8	0.19	1.13	2.2	1.14	2.2	0.39
KB2	-0.59	0.86	-1.9	0.84	-1.9	0.40
GG2	0.53	0.86	-2.1	0.81	-2.5	0.43
KB3	-0.69	0.79	-2.8	0.78	-2.4	0.43
GG5	-0.14	1.24	4.0	1.24	3.7	0.44
KS1	-0.19	0.92	-1.4	0.95	-0.7	0.44
MV1	-0.52	1.00	0.0	0.94	-0.6	0.45
JS6	0.08	1.03	0.7	1.06	1.1	0.45
JS4	0.24	0.80	-3.7	0.81	-3.1	0.46
JS7	0.14	0.84	-3.0	0.91	-1.6	0.46
GG4	0.28	0.85	-2.7	0.85	-2.5	0.49
MV2	-0.30	0.83	-2.9	0.82	-2.7	0.51
JS5	0.20	0.90	-1.9	0.89	-1.8	0.52

Source: Processed by the authors

3.6. Unidimensionality

Residual Principal Component Analysis (PCA) measures the unidimensional index on the research instrument used. All instruments used must be unidimensional. If the unidimensional conditions on the research instrument have not matched, the researcher needs to calculate the aggregate total and then compare it with participants and items (Boone et al., 2014). The minimum variance percentage that meets the instrument's unidimensional conditions is 20% (Linacre, 2018).

At the same time, the first contrast cannot explain under conditions that do not exceed 15% (Fisher, 2007). Table 6 is the unidimensional index in the study. Table 6 shows that the variance explained by measures is 36.1%, meaning that the percentage of variance has exceeded the minimum variance condition, which is 20%. The variance rate in the first, second, third, fourth, and fifth situations that do not exceed the determined condition is 15%. Therefore, the instrument used in this study can measure the constructs made, meaning that no percentage of variance comes out of the construct of this study. In other words, the construct can measure students' communication barriers during the learning process during the Covid 19 pandemic.

The researcher must check each item's standardized residual correlation to ensure that there are dependent questionnaire items. An item's category is independent and not single if the standardized residual correlation index is above 0.7 (Linacre, 2018). Table 7 is the standardized residual correlation index in the study. Table 7 shows that the standardized residual correlation index for each item is below the value of 0.7, so the items in this study are independent and single.

Table 5. Misfit item based on infit and outfit

Item	Measure	INFIT		OUTFIT		PTMEA CORR
		MNSQ	ZSTD	MNSQ	ZSTD	
JS1	0.43	1.41	5.7	1.38	4.6	0.33
KB1	-0.80	1.25	2.6	1.25	2.2	0.32
GG5	-0.14	1.24	4.0	1.24	3.7	0.44
JS2	0.05	1.14	2.5	1.19	3.0	0.37
JS8	0.19	1.13	2.2	1.14	2.2	0.39
GG3	0.35	1.07	1.2	1.09	1.3	0.35
JS3	0.35	1.08	1.3	1.06	0.8	0.38
JS6	0.08	1.03	0.7	1.06	1.1	0.45
GG1	0.85	1.03	0.3	0.98	-0.1	0.32
KS2	-0.45	1.01	0.2	1.02	0.2	0.39
MV1	-0.52	1.00	0.0	0.94	-0.6	0.45
KS1	-0.19	0.92	-1.4	0.95	-0.7	0.44
JS7	0.14	0.84	-3.0	0.91	-1.6	0.46
JS5	0.20	0.90	-1.9	0.89	-1.8	0.52
KB2	-0.59	0.86	-1.9	0.84	-1.9	0.40
GG2	0.53	0.86	-2.1	0.81	-2.5	0.43
GG4	0.28	0.85	-2.7	0.85	-2.5	0.49
MV2	-0.30	0.83	-2.9	0.82	-2.7	0.51
JS4	0.24	0.80	-3.7	0.81	-3.1	0.46
KB3	-0.69	0.79	-2.8	0.78	-2.4	0.43

Source: Processed by the authors

Table 6. Standardized residual variance

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	Empirical Eigenvalue units	%	Variance unexplained (%)	Modelled (%)
Total raw variance in observations =	31.3	100.0		100.0
Raw variance explained by measures =	11.3	36.1		36.1
Raw variance explained by persons =	1.9	6.2		6.2
Raw variance explained by items =	9.3	29.8		29.9
Raw unexplained variance (total) =	20.0	63.9	100.0	63.9
Unexplained variance in 1st contrast =	2.8	9.0	14.1	
Unexplained variance in 2nd contrast =	2.5	8.1	12.6	
Unexplained variance in 3rd contrast =	1.9	6.2	9.7	
Unexplained variance in 4th contrast =	1.5	4.8	7.5	
Unexplained variance in 5th contrast =	1.3	4.2	6.6	

Source: Processed by the authors

Table 7. Standardized residual correlation

Correlation	Entry Number	Item	Entry Number	Item
0.55	2	JS2	3	JS3
0.46	18	GG3	19	GG4
0.45	16	GG1	17	GG2
0.42	4	JS4	5	JS5
0.41	5	JS5	6	JS6
0.33	9	MV 1	10	MV 2
0.32	14	KB2	15	KB3
0.31	4	JS4	6	JS6
-0.30	14	KB2	17	GG2
-0.30	5	JS5	18	GG3

Source: Processed by the authors

3.7. Person-item map

The Rasch analysis model (RMA) can measure the relationship between item difficulty and students' abilities through logarithmic functions. The level of item difficulty and student ability are two factors that can determine student achievement outcomes in the learning process (Englehard, 2013; Stelmack et al., 2004). Figure 1 is a Person-Item Map (PIM) in the study. This picture can explain students' ability and difficulty level of the items used in the study. In determining student abilities and levels of item difficulty, PIM refers to a logit scale with scores ranging from 2 to 4.

The top left shows students who have communication barriers in the learning process, while the bottom shows do not have communication barriers in the learning process (Siregar, 2020). The item's difficulty is allowed on the right side of the PIM. The student who answered "seldom" was on item GG1 ("I easily access the internet during the learning process"). The student who answered "often" was on item KB1 ("I am not comfortable communicating through online classes"). Next, the same construct items are GG2, GG3, JS1, JS3, GG4, JS4, JS5, JS8, JS6, JS7, JS2, GG5 KS1, MV2, KS2, MV1, KB2, KB3.

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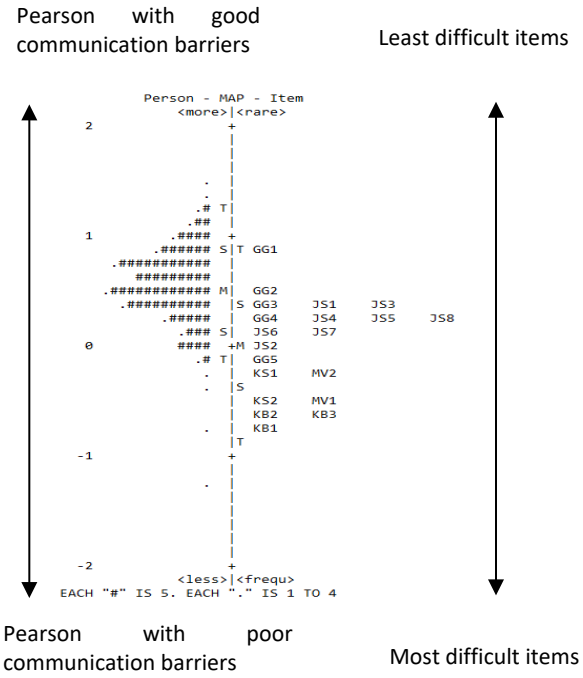
Figure 1. Person-Item Map



Source: Processed by the authors

CONCLUSION

A validity and reliability process having been carried out to determine the usability of the communication barriers instrument in the learning process of the orphanage residents during the pandemic. This reliability process uses RMA with the help of Winstep software. The analysis results found that considering the seven aspects, it can conclude that the instrument used can measure what is to be measured in the study—elements of the (1) item and personal separation and reliability. (2) item difficulty level. (3) item fit based on point measure correlation. (4) item polarity. (5) misfit items. (6) unidimensionality, and (7) the person-item map can be fulfilled to produce a valid and reliable instrument used in actual research.

CREDIT AUTHORSHIP CONTRIBUTION STATEMENT

Dewi Anggrainy: Writing-Conceptual Draft, Collection Data, Reviewing and Editing, Nur Choiro Siregar: Writing, Data curation, Draft Compilation, Investigation, Methodology, Reviewing and Editing,

DECLARATION OF COMPETING INTEREST

We certify that there is no conflict of interest with any financial, personal, or other relationships with other people or organizations related to the material discussed in the manuscript.

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