Teacher Trainees' Competencies in Augmentative and Alternative Communication (AAC) for Autism: Validity and Reliability of Needs Questionnaire

Sook Wei Loi[1], Hasnah Toran[1], Syar Meeze Mohd Rashid[1]

[1] National University of Malaysia, Malaysia

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CORRESPONDING AUTHOR:
Loi Sook Wei;
P121091@siswa.ukm.edu.my

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ABSTRACT:

To enhance communication for autistic people with dysfunctional verbal and nonverbal communication, effective augmentative and alternative communication (AAC) methods must be implemented. However, we found inadequacies among special education teachers regarding the use of AAC when teaching children with special needs. Therefore, this paper aims to establish the validity and reliability of an instrument that assesses the knowledge, skill, and attitude of current special education teacher candidates regarding AAC. Six experts in AAC assessed the questionnaire, which included sections on demographics, educational background, AAC competencies, and learning strategy needs, based on established competency models. The results showed a high Content Validity Index (CVI) (0.83 or higher), meaning all items were highly relevant. We later conducted a reliability test with thirty teacher trainees using Cronbach's alpha, and all constructs showed values greater than 0.87, suggesting excellent internal consistency. The results demonstrate the validity and reliability of this measure's items and constructs, suggesting its potential in assessing teacher candidates' AAC competencies.

Keywords: Augmentative and Alternative Communication, Autism, Competencies, Validity, Reliability

INTRODUCTION

The Augmentative and Alternative Communication System (AAC) is important for supporting individuals with significant communication disorders. Since 1950, AAC has gained recognition and widespread use. In Part 28(3) of the Malaysia Persons with Disability Act 2008 (PWD Act, 2014), AAC is mentioned as a way to enhance communication among disabled children. The same is true in the US, where the Bill of Rights, which was drafted by a group of academics and activists, grants disabled children the right to AAC (Brady et al., 2016).

Beukelman and Light (2020) state that the system consists of a variety of supported and non-assisted methods, such as sign language, communication boards, and devices that produce voices. In Malaysia, the two AACs that are most used in research are Picture Exchange Communication Systems (PECS) and Speech-Generative Devices (SGD). Most studies on the application of AAC in Malaysia concentrate on autistic children because of their difficulties with communication. In earlier research, AAC was found to be beneficial in enhancing communication and reducing negative behavior in people with autism (Walker & Snell, 2013; Gevarter et al., 2013). The outcome in Malaysia was the same. When AAC was used to aid an autistic child, Phoon and Abdullah (2017) and Jusoh and Abd Majid (2017) discovered that the child's speech and capacity to make demands both increased.

Aiding people with communication disorders, especially those with autism and cognitive and psychomotor impairments, by using AAC calls for a collaborative effort (Pereira et al., 2008). This collaboration typically includes a special education teacher, a family member, an occupational therapist, a speech therapist, and an assistive technology specialist, amongst others (Douglas et al., 2020; Ketheeswaran, 2019; Singh et al., 2020). Although speech therapy serves as the primary decision-maker in the use of AAC, there are not enough Speech Language Pathologies (SLPs) to meet the needs of those who struggle with communication (Chu et al., 2019; Singh et al., 2020). In Malaysia, SLP is insufficient to meet the growing demand for autism aid. This issue is exacerbated by the growing number of pupils with autism; the developmental disability ranked the second highest among learning impairments in Malaysia, and the period from 2018 to 2022 saw the highest growth rate of those diagnosed with autism (Ministry of Education Malaysia, 2022). Therefore, it is the responsibility of special education teachers to ensure that students' needs concerning AAC are met (Ketheeswaran, 2019; Singh et al., 2020).

Special education teachers play an important role in assisting children with AAC in the classroom (Singh et al., 2020). The Council of Exceptional Children, the largest organization for special education, has suggested that AAC be acquired by every special educator as an essential skill (CEC, 2015). One of the responsibilities of special education teachers is to make sure that AAC is available in the classroom (Tonsing & Dada, 2016), and to give information to speech therapists so they may make decisions regarding the use of AAC (Binger & Kent-Walsh 2012; Singh et al., 2020), and to create opportunities for communication by using AAC (Singh et al., 2020). However, special education teachers have been reported to lack the relevant knowledge and skills as a result of inadequate teacher training (Douglas et al., 2020).

A key factor in ensuring that teachers graduate with the necessary knowledge and abilities is the teacher preparation program that they undertake. However, early studies have indicated that there is little teacher preparation regarding AAC (Douglas et al., 2020). This has led to many teacher trainees lacking the necessary training and skills to effectively implement AAC strategies, which can adversely affect their ability to support students with their communication needs (Costigan & Light, 2010). In Malaysia, the situation is exacerbated by the lack of validated instruments to assess the AAC competencies of teacher trainees, making it challenging to identify specific training needs or evaluate the effectiveness of existing training programs (Singh et al., 2020). Due to the insufficient reliability and validity of an evaluation tool that can measure teachers' AAC competence in a Malaysian setting, this article aims to develop a comprehensive questionnaire to assess the AAC abilities of teacher trainees, thereby contributing to the improvement of special education training courses in Malaysia.

LITERATURE REVIEW

The Iceberg competency model proposed by Spencer and Spencer (1993) and a review of the competencies studied in earlier studies served as the foundation for the development of the questionnaire. While the knowledge and skill components are assumed to be part of the competency questionnaire, the attitude component is assumed based on previous research, such as that conducted by Patel and Khamis-Dakwar (2005). According to CEC (2015) and Staškeviča (2019), skill is the capacity to act to accomplish a goal, whereas knowledge is the comprehension of a subject. Conversely, attitude is the response to a circum-

stance, person, or idea that is determined by an individual's needs and desires.

Before now, not much research has been conducted on teacher competencies. In 2019, Ketheeswaran conducted a study on in-service special education instructors, utilizing both an interview and a questionnaire. Finding competencies in the areas of knowledge, skills, and attitudes became the instrument's focus, yet the study lacked questions that were designed to address the relevant knowledge and skill areas.

Aldabas (2020) carried out research intending to explore the professional training needs of AAC in Saudi Arabia. Twenty items about the knowledge and skills of special education instructors were included in a questionnaire that was developed based on existing literature reviews. Tests for reliability and validity were conducted in the studies. However, it was discovered that just 13 special educators were involved in the pilot test, despite most experts' recommendations that at least 30 people participate (Conroy, 2015; Yurdugül, 2008).

Da Fonte et al. (2022), on the other hand, researched the current preparations of the USA's special educators regarding AAC. The team created a well-established questionnaire by referring to past literature reviews, which included the CEC's Initial Preparation Set. The knowledge and skills covered in the article, however, were included in the combined section and were mentioned concerning assistive technology.

Research has been conducted in Malaysia to analyze the knowledge and skills of special education teachers working in elementary schools (Ghani & Mohamed, 2019; Mohd Hanafi et al., 2020). However, the report makes no mention of the validity or reliability of the survey. Moreover, the research's competency assessment mostly concentrates on AAC knowledge. Singh et al. (2020) conducted a study to investigate the experiences of Malaysian teachers utilizing AAC with students. A combination of an interview and a questionnaire was used in that study. It was discovered that there are only three questions designed to address participants' judgments of knowledge, abilities, and attitudes regarding AAC, even though the validity of the questionnaire is extensively discussed in the article.

Nearly all papers concerning the proficiency of special education instructors in AAC raise general questions. However, because of the needs of autism in Malaysia, this study specifically refers to AAC utilized by autistic children. To assess the AAC competencies of current teacher candidates, it is crucial to create a questionnaire instrument with excellent validity and reliability that asks questions concerning knowledge, skills, and attitudes.

METHODS

The National University of Malaysia strictly adhered to its ethical guidelines when conducting this study. Before participating, we informed all experts and subjects about the research's purpose and procedures, as well as their rights to voluntary participation. We obtained informed consent from each expert, as well as a sample of the pilot test.

Instrument

The development framework of the questionnaire was first drafted using the Model Competency Iceberg initially proposed by Spencer and Spencer in 1993 and later referred to by Patel and Khamis-Dakwar (2005). Patel and Khamis-Dakwar divided the competency questionnaire into three segments: knowledge, practice, and attitude. In addition to competency, learning strategy and learning activities were also included in the survey to examine the learning patterns that were preferred by teacher trainees. The authors of previous studies, such as Ghani and Mohamed (2019), Aldabas (2020), and Da Fonte and Boesch (2016), have included additional adaptations to the theory. We adopted a total of twelve questions concerning AAC knowledge and skills from Aldabas (2020). We modified a further five questions from Ghani and Mohamed (2019) to assess AAC knowledge competency in the interim. In addition, to better address the AAC knowledge that teacher candidates need, we introduced six new questions from Da Fonte to the knowledge section. The researcher crafted the attitude questions, which the supervisor and experts later reviewed. The research tools from DaFonte and Boesch (2016) are strongly validated, making them suitable references. However, even though the validity and reliability methods are not included in Ghani and Mohamed (2019), the questions were utilized as they are suitable for a Malaysian setting.

The questionnaire is divided into four sections: demographic information, AAC educational background, AAC usage competencies, and learning strategy needs. The demographic session asks for basic information about the sample, including the trainee's practicum and autism teaching experience. This session is important because it will allow researchers to exclude teacher trainees who do not meet the standard criteria. The next section, which is educational background, aims to ascertain the specific AAC-related courses or classes that the teacher trainees have taken.

The competencies section includes three kinds of competencies (knowledge, skill, and attitude) that cover

most of the topics related to AAC and are suitable for a Malaysian setting. There are eleven questions in the knowledge section, twelve in the skill section, and nine in the attitude section.

The final section, dedicated to learning strategies and activities, integrates data analysis from research conducted by Loi et al. (2023). Using ten years of recent research and by referring to the theories of andragogy and constructivism, Loi et al. (2023) analyzed the strategies and activities regarding AAC deemed suitable for the higher institution level.

This comprehensive approach ensures that the questionnaire is a robust tool for assessing the AAC competencies of special education teacher trainees and understanding their needs and preferences in regard to learning strategies and activities.

Sample

The pilot test involved 30 teacher trainees from a local university in Malaysia. We used a number of criteria to select the participants, choosing teacher trainees who a) pursued their studies in the field of learning disabilities, b) had field training experience at a local primary or secondary school, and c) had experience teaching students with autism. We employed purposeful sampling to ensure that the chosen teacher candidates had prior experience utilizing or witnessing AAC in a classroom.

Data Collection

A Google Form containing the questionnaire was given to the teacher trainees for a pilot test. The Google Form was then delivered to teachers through institutional channels. Consent was taken before the questionnaire commenced. Feedback was collected after two weeks.

Validity and reliability assessment

We rigorously assessed the questionnaire's validity and reliability to ensure its effectiveness in measuring AAC competencies among special education teacher trainees.

We carried out content validity to ensure that the questionnaire's elements were well-written to achieve the desired outcome (Cook & Beckman, 2006). The researcher chose to evaluate content validity using the Content Validity Index (CVI), with input from six experts in special education and speech therapy. We chose all five speech therapist experts based on their professional background and we required the experts to have worked with special education children and fostered close relationships with special education teachers. We chose the special education lecturer because of her significant contribution to AAC. The validity process ranged from preparing the content validation form to selecting an expert, conducting the test, reviewing and providing the score, and, lastly, calculating the CVI guided by Yusoff (2019).

The experts evaluated each item's relevance and clarity on a scale of 1 to 4, or not relevant, less relevant, relevant, and highly relevant. Next, we examined the scale to provide context. Scores 1 and 2 had an I-CVI value of 0, and ratings 3 and 4 had an I-CVI value of 1. We then calculated the average I-CVI value and retained the value of 0.83 or above (Polit & Beck, 2006; Polit et al., 2007). We must modify or eliminate an item if its I-CVI score falls below 0.83. This procedure reliably represented the targeted AAC competencies in the questionnaire items.

Three special education teacher candidates evaluated the questionnaire to determine its face validity by assessing its comprehensibility and clarity from the target audience's point of view, using a dichotomous format. Insightful feedback was provided, and one teacher proposed the addition of an introduction video to the Google Form to help future samples grasp the full concept of AAC, as it is still relatively new in Malaysia.

We conducted a reliability test by referring to the work of Sekaran and Bougie (2010). According to Sekaran and Bougie, a Cronbach's Alpha value between 0.80 to 1 is considered excellent. Reliability was assessed to determine internal consistency across the questionnaire's sections on the competencies of knowledge, skills, and attitudes, as well as learning strategies and activities favored by the teacher trainees. This comprehensive approach to validity and reliability testing aimed to produce a robust and trustworthy instrument for assessing AAC competencies among teacher trainees.

RESULTS

The questionnaire was tested with the Content Validity Index (CVI) for content validation (Table 1). The results demonstrate strong content validity across all three aspects: knowledge, skill, and attitude in the use of AAC.

For the Knowledge section, 7 out of 11 items received perfect I-CVI scores of 1.00, while 4 items scored 0.83, resulting in an S-CVI/Ave of 0.93. In the skill section, 5 out of 12 items had perfect I-CVI scores, with the remaining 7 items scoring 0.83, yielding an S-CVI/Ave of 0.90. The attitude section showed the highest content validity, with 8 out of 9 items receiving perfect I-CVI scores and only one item scoring 0.83, resulting in an impressive S-CVI/Ave of 0.98.

Table 1. **I-CVI value for AAC competencies**

Item	Rate 3 or 4	Rate 1 or 2	I-CVI	Interpretation
Knowledge in the use of AAC				
I know how to apply the use of communication boards as a medium of AAC.	6	0	1	Retained
I know how to apply the use of communication books as a medium of AAC.	6	0	1	Retained
I know how to apply the use of the Picture Exchange Communication System (PECS) as a medium of AAC.	6	0	1	Retained
I know how to use pictures/symbols to communicate with students.	5	1	0.83	Revised
I know how to apply the use of speech-generating devices like Go Talk as a medium of AAC.	5	1	0.83	Revised
I know the communication development of individuals with autism.	5	1	0.83	Revised
I know the language development of individuals with autism.	5	1	0.83	Revised
I know that AAC interventions can effectively improve the communication of students with autism.	6	0	1	Retained
I know the suitability of AAC interventions according to individual needs.	6	0	1	Retained
I know how to use AAC for various communication purposes.	6	0	1	Retained
I know that AAC interventions involve collaboration with experts from different fields.	6	0	1	Retained
		S-CVI/Ave	**0.93**	
Item	Rate 3 or 4	Rate 1 or 2	I-CVI	Interpretation
Skill in the use of AAC				
I can identify students with autism who need AAC.	6	0	1	Retained
I can assist speech therapists in determining the appropriate AAC for students' needs.	5	1	0.83	Revised
I can support the use of AAC by students during teaching and learning in school.	5	1	0.83	Revised
I can support the use of AAC by students outside of school.	5	1	0.83	Revised
I can maintain AAC applications and devices.	6	0	1	Retained
I can operate various AAC devices.	6	0	1	Retained
I can assess the communication development of students using AAC.	6	0	1	Retained
I can use strategies to enhance the use of AAC by students.	5	1	0.83	Revised
I can modify the curriculum and teaching materials to support the use of AAC.	5	1	0.83	Revised
I can collaborate with speech therapists during the implementation of AAC.	5	1	0.83	Revised
I can collaborate with the families of AAC users during the implementation of AAC.	5	1	0.83	Revised
I can plan individual teaching plans to develop students' communication skills.	6	0	1	Retained
		S-CVI/Ave	**0.90**	

Item	Rate 3 or 4	Rate 1 or 2	I-CVI	Interpretation
Attitude in the use of alternative and augmentative communication				
I believe that the use of AAC can help improve the communication skills of students with autism.	6	0	1	Retained
I believe that the use of AAC can help improve the interaction skills of students with autism.	6	0	1	Retained
I believe that the use of AAC can reduce behavioral problems in students with autism.	6	0	1	Retained
I believe that the use of AAC will not burden teachers.	6	0	1	Retained
I believe that the use of AAC can help me teach more effectively.	6	0	1	Retained
I believe that the use of AAC can help students learn comfortably and safely.	6	0	1	Retained
I believe that the use of AAC can help students learn more easily.	5	1	0.83	Revised
I believe teachers need to be proactive in collaborating to implement AAC to improve students' communication skills.	6	0	1	Retained
I believe teachers play an important role in ensuring parents are fully involved in AAC interventions.	6	0	1	Retained
		S-CVI/Ave	**0.98**	
Learning Strategies in AAC	6	0	1	Retained
Learning activities in AAC	6	0	1	Retained

Overall, the questionnaire demonstrates excellent content validity, with S-CVI/Ave scores ranging from 0.90 to 0.98 across all sections. We retain items with I-CVI scores ranging from 0.83 to 1.00. However, we are reviewing and rectifying items with a score of 0.83, based on the suggestions provided by the experts. The overall result suggests that the elements in each construct are highly relevant and can testify to the competencies of knowledge, skills, and attitudes related to AAC, with only minor revisions needed for some items to further improve their validity. It is worth mentioning that the 7 questions in learning strategies and 12 learning activities were approved by all 6 experts and have therefore been retained.

Reliability Findings

There were five constructs tested for Cronbach's alpha values. Each construct yielded an excellent result. The result for each construct is shown below in Table 2.

Overall, all evaluated questionnaire constructions show very high Cronbach alpha rates, with all rates exceeding 0.87. This indicates that the questionnaires

Table 2. **Cronbach's Alpha values of each competency construct**

Construct	Number of items	Cronbach's Alpha values	Level
Teacher trainees' knowledge of the use of alternative and augmentative communication	11	0.941	Excellent
Teacher trainees' skills in the use of alternative and augmentative communication	12	0.886	Excellent
Teacher trainees' attitude in the use of alternative and augmentative communication	9	0.955	Excellent
Learning strategies for teacher trainees	7	0.874	Excellent
Learning activities for teacher trainees	14	0.897	Excellent

have excellent internal consistency and are reliable in measuring the competencies of teacher trainees in using AAC.

DISCUSSION

This survey instrument's validity and reliability produced positive results with a CVI value above 0.83, signifying that all the elements within each construct are widely accepted and have strong relationships. Furthermore, the reliability results also demonstrate good internal consistency in those five constructs. This further demonstrates the usefulness of this survey tool for evaluating teacher trainees' proficiency in AAC.

This study succeeds in solving some of the shortcomings of earlier research in this area. This study overcame the limitation of Aldabas's (2020) research, which employed 30 samples as the expert-advised minimal number of participants in a pilot test. Aldabas's research had previously demonstrated strong reliability with the 13 samples used and this study reinforced its position by using its 12 questions for the knowledge aspect to obtain an equally high reliability. This demonstrates the quality of the questions developed in Aldabas (2020).

Furthermore, this study also closed the validity and reliability gap that was present in the research conducted by Ghani and Mohamed (2019) and Mohd Hanafi et al. (2020), which identified the AAC competencies among special educators in Malaysia. Ghani and Mohd Hanafi's publications provided a comprehensive questionnaire, but the absence of information regarding the instruments' sources, validity, and reliability raised questions regarding outcome validity. In this study, three teacher candidates evaluated the face validity to assess if they could understand the questions, six carefully selected subject matter experts completed the validity assessment, and thirty teacher candidates conducted a pilot test to assess the reliability.

Furthermore, this study was successful in creating a questionnaire that Malaysians could use in practice. Robust research and the model's capabilities formed the foundation of this survey, and questions were deliberately chosen to align with the current AAC usage in Malaysia. For a clearer picture, we thoughtfully split the questions into three sections instead of combining them, following Da Fonte's research from 2022. In addition, unlike earlier researchers like Katheeswaran (2019) and Singh et al. (2020), who only used a few questions to cover an entire competency, we included more than eight questions in each section to truly assess each competency.

The instrument only includes those that are common to Malaysians to provide a more accurate representation. For example, the country's current AAC usage is more prone to PECS and speech-generative gadgets like go-talk and graphics or symbols (Phoon & Abdullah 2017; Jusoh & Abd Majid 2017). Nonetheless, it would be advantageous to use more sophisticated AAC methods that have been empirically shown to provide greater insight into the need for teacher training.

The tool was developed to assess teacher candidates' proficiency with AAC for autism. Walker et al. (2022) assert that for children to adjust to the current educational environment, it is critical to develop tailored training that serves every single child. As a result, this competency helps determine the autism competency of teacher-trainees. It is important to note, nevertheless, that all children from a variety of backgrounds must be included in teacher training. Future studies should investigate model curricula that could accommodate children with different needs.

In summary, we have revised this questionnaire to suit the Malaysian context and successfully addressed the limitations of previous studies.

CONCLUSION

The study successfully developed and validated a questionnaire to assess teacher trainees' competencies in augmentative and alternative communication (AAC) for autism. These results suggest that the questionnaire is a reliable and valid tool for evaluating AAC competencies among teacher trainees. We can use the validated questionnaire to identify gaps in teacher trainees' AAC competencies, enabling the development of targeted training programs. This can improve future teachers' preparedness to effectively support students with communication impairments. Educational institutions can use the findings to integrate comprehensive AAC training into their special education curricula, addressing the identified competency gaps and improving overall educational outcomes for students with autism. Future research could explore the instrument's efficacy and adaptability in assessing AAC competencies across different disabilities, and include teacher trainees from different regions and educational backgrounds, to ensure its generalizability.

LIMITATIONS

This study has certain drawbacks. First, only teacher trainees from universities make up the sample for this

study. Future studies can broaden the sample to include people with varying educational backgrounds to create a more diverse sample. Second, the self-reported abilities used in this questionnaire necessitate comprehension and honesty from each respondent. Future research will consider in-person surveys to facilitate immediate explanations and prevent incorrect self-evaluation.

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