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## Teacher Training's Content and Delivery Method Related to Augmentative and Alternative Communication (AAC): A Systematic Literature Review (SLR)

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**Abstract.** Augmentative and Alternative Communication (AAC) is one of the methods used to assist students with communication problems, particularly those in special education who suffer from speech delay and total loss of speech, for example, those with processed autism, cerebral palsy, or intellectual disabilities. The implementation of AAC in Malaysia's schools falls primarily on the shoulders of special education teachers. However, past research has demonstrated that most special education teachers do not undergo enough teacher training to equip themselves with skills and knowledge in the field of AAC. There is scant literature about teacher training related to AAC as there has been a lack of guidelines in terms of AAC training for educators. Therefore, a Systematic Literature Review (SLR) was carried out to identify teacher training in AAC in terms of content and delivery method so that it can be used as a reference for an upcoming teacher training course. By using PRISMA, as a guideline, the Google Scholar and Scopus databases yielded a total of 18 articles. Findings reveal that previous teacher preparation programmes did not go into detail about delivery methods, particularly when it comes to how theory and practical experience are combined to maximise learning for collaborative skills and AAC-related information that was becoming more technologically advanced and online-based. Future studies should examine how each delivery modality impacts teacher learning in AAC and how to enhance in-field training to reduce the gap between theory and practice concerns in teacher preparation.

**Keywords:** Augmentative and Alternative Communication; teacher training; special education; course content; course delivery

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## 1. Introduction

Every child, including those with special needs, deserves a quality education. However, the learning of students in special education is greatly hindered by their communication impairments. With the help of Augmentative and Alternative Communication (AAC), this effect can be reduced. Therefore, for AAC to be used in the classroom, teachers must be knowledgeable in its application. One the seventeen Sustainable Development Goals (SDG) of the United Nations (2015) is targeted to achieve quality education that emphasises education equality for every child by 2030. These children include not only typical-developing children but also children with special needs, which are enacted in the Malaysian Persons with Disabilities Act 2008 (PWD Act, 2014) in Malaysia. It is clearly stated in the PWD Act 2008 (section 28(1)) that special needs for children's right to education should not be exempted. Instead, the way we teach and communicate should be adjusted accordingly to meet special needs requirements. Furthermore, the PWD Act also provided in Section 30(3) that the Malaysian government should prepare special needs children with infrastructure, such as the use of Augmentative and Alternative Communication (AAC) for those who have communication problems in order to ease their learning.

According to the American Speech-Language-Hearing Association (ASHA) (2016), AAC is a method to support users with limited speech or total loss of speech. It also involves using one's body or tools to replace communication *via* speech. Generally, AAC can be grouped into two categories: aided AAC and unaided AAC (Beukelman & Light, 2020). An unaided AAC does not require tools as it involves the use of body language, sign language, facial expression and eye gazing to communicate with each other. An aided AAC, on the other hand, requires the use of tools to support communication with some of the tools commonly used being tablets, iPads, picture boards, board communication, and speech-generative devices (SGD).

Previous studies have shown the benefits of using AAC to support the communication of children with disabilities, particularly those diagnosed with autism, emotional disturbance, cognitive impairment, cerebral palsy, and more, as stated in Brock et al. (2017). Overall, the use of AAC has been found to be able to increase a child's functional communication and decrease their challenging behaviours (Ganz & Simpson, 2018; Walker & Snell, 2013). However, AAC can prove problematic for the service provider, family members, therapists, teachers, peers, and people surrounding AAC users (Da Fonte et al., 2016) due to the complexity of its implementation, which involves several processes, such as carrying out users' assessments (Andzik et al., 2017; Chung & Stoner, 2016), choosing the right device (Andzik et al., 2017), monitoring the AAC users' progress (Andzik et al., 2017; Greene & Esposito, 2023), creating opportunities to communicate (Greene & Esposito, 2023; Tonsing & Dada, 2016), and occasionally solving problems related to the device (Tonsing & Dada, 2016). As a result, previous research has emphasised the importance of supporting AAC users in a team (Greene & Esposito, 2023). Without team support, AAC users might not obtain the optimal development of communication even with the aid of AAC.

At school, the role of supervising and supporting AAC users greatly falls on the shoulders of special education. Prior research has stated that some of the teacher's roles, are to: a) provide the information needed by speech language therapists that would affect the decision to choose a suitable AAC for users; b) create communication opportunities in school; c) help AAC users communicate with peers; d) make sure AAC users can reach their AAC in the classroom; e) make sure AAC users can access existing curriculum by using tools or symbols that are familiar to them; and f) writing goals for an Individualised Education Plan (IEP) related to AAC (Da Fonte et al., 2016; Leatherman & Wegner, 2022; Syar Meeze & Wong, 2023; Tonsing & Dada, 2016).

As such, special education teachers are greatly encouraged to undergo training in AAC to support AAC users at school (Da Fonte et al., 2022). Generally, teacher training is found to be able to increase teachers' knowledge, skills, self-efficacy and self-confidence in supporting users with different communication disabilities (Mollie & Jeeva, 2022; Syar Meeze & Norfatimah, 2023). Nonetheless, prior studies have reported that special education teachers are not competent in providing AAC services (Fields, 2015). This issue is not only mentioned in relation to Malaysia (Mohd Hanafi et al., 2020) but also reported in Brazil (Nunes & Walter, 2020), Saudi Arabia (Rashed Aldabas, 2019), and Sri Lanka (Ketheeswaran, 2019). One of the most common factors reported as leading to this phenomenon is inadequate training for preservice and in-service teachers; it was found that special education teachers have minimum access to teacher professionalism related to AAC (Senner & Baud, 2017; Tonsing & Dada, 2016).

Regarding past teacher training, some researchers found that AAC content was not being focused on (Eliada et al., 2018). Penington et al. (2020) added that focus is especially blurry in terms of content in the aspect of communication. Past studies also showed that, even if a lesson in AAC is conducted, topics in AAC are always taught together with other subjects without a single subject specialised for AAC. On the other hand, Penington et al. (2020) surveyed 51 faculty members in teacher training programmes and reported another issue: that most of the AAC lessons emphasise theory more than practice. As a result, there is a need to study the curriculum in teacher training programmes about AAC for the sake of future professional training (Oihana & Maria, 2020). Douglas et al. (2020) also suggested that AAC content and its delivery format should be focused on AAC training.

This empirical article is considered necessary to fill the knowledge gap about AAC content and its method of delivery in teacher preparation. An article is chosen to be included in an SLR because it enables a systematic review of prior literature. SLR also enables researchers to consistently evaluate the most recent data at the same time (Hayrol et al., 2020). The objective of this SLR is to identify teacher training content and delivery method in AAC. Concurrently, this research sought answers as to what are the content and delivery methods of teacher training in AAC.

## 2. Methodology

This SLR is guided by the *Preferred Reporting Items for Systematic Reviews and Meta-Analyses* (PRISMA). PRISMA has three unique characteristics: a) it can

define research questions clearly for systematic reviews; b) it can identify exclusive and inclusive criteria; and c) it can enable research access from various databases in each timeline (Sierra-Correa & Cantera Kintz, 2015). Therefore, PRISMA is seen as a good guideline for this SLR to identify the content and delivery method of teacher training in AAC for data analysis.

### 2.1 Article Search Strategy

Two databases were used to search for related articles regarding teacher training in AAC: Scopus and Generic Web Searches (Google Scholar). Scopus was chosen as one of the databases as it has good quality control on its articles. Furthermore, Scopus also has more than 13 million articles from 5000 publishers globally, which enables a wide range of articles to be included in the database whereas Google Scholar was chosen to be a supportive database. According to Haddaway et al. (2015), Google Scholar can be used to support systematic review research. In addition to that, Google Scholar also has as many as 165 million articles, which enables researchers to search through related articles from different journal sites.

Joklitschke et al. (2018) stated that keywords used during the process of searching for articles are very important. The keywords in this article were selected based on a) referring to earlier research about AAC and teacher training; b) similar words that bring out the same meaning *via* thesaurus; and c) suggested keywords by databases used. The chosen keywords for this SLR were augmentative and alternative communication, teacher training, special education, course content, and course delivery. During the article search process, the researchers also used full-string techniques, such as Boolean operators and phrase searching, that are available in Scopus and Google Databases. Boolean operator means the use of 'OR', 'AND', and 'NOT' to limit articles found, while phrase searching means finding articles that have the same phrase. Details of the search string are shown in Table 1. Apart from using keywords, researchers also used the 'reference tracking' technique, which is to select related articles found through article references.

**Table 1: Search string for the articles**

| Database              | Keyword   |
|-----------------------|---|
| <b>Scopus</b>         | TITLE-ABS-KEY ("augmentative and alternative communication" AND "teacher" OR "special education" OR "Preservice teacher" OR "in-service teacher" AND "training" OR "course" OR "content" OR "delivery")                 |
| <b>Google Scholar</b> | "Augmentative and alternative teacher training" OR "Augmentative and alternative communication course" OR "Augmentative and alternative communication content" OR "Augmentative and alternative communication delivery" |

### 2.2 Article Selection Criteria

The process of choosing suitable articles was guided by inclusive and exclusive criteria set beforehand. For this SLR, only articles within the last ten years (2013-2023) were included. In addition, the articles chosen were limited to English papers and journal articles only. However, it is worth mentioning that articles were acceptable if training involved teachers as one of the targeted populations. Articles that included literature, findings, or analysis regarding the content and delivery method of teacher training qualified for inclusion. On the other hand,

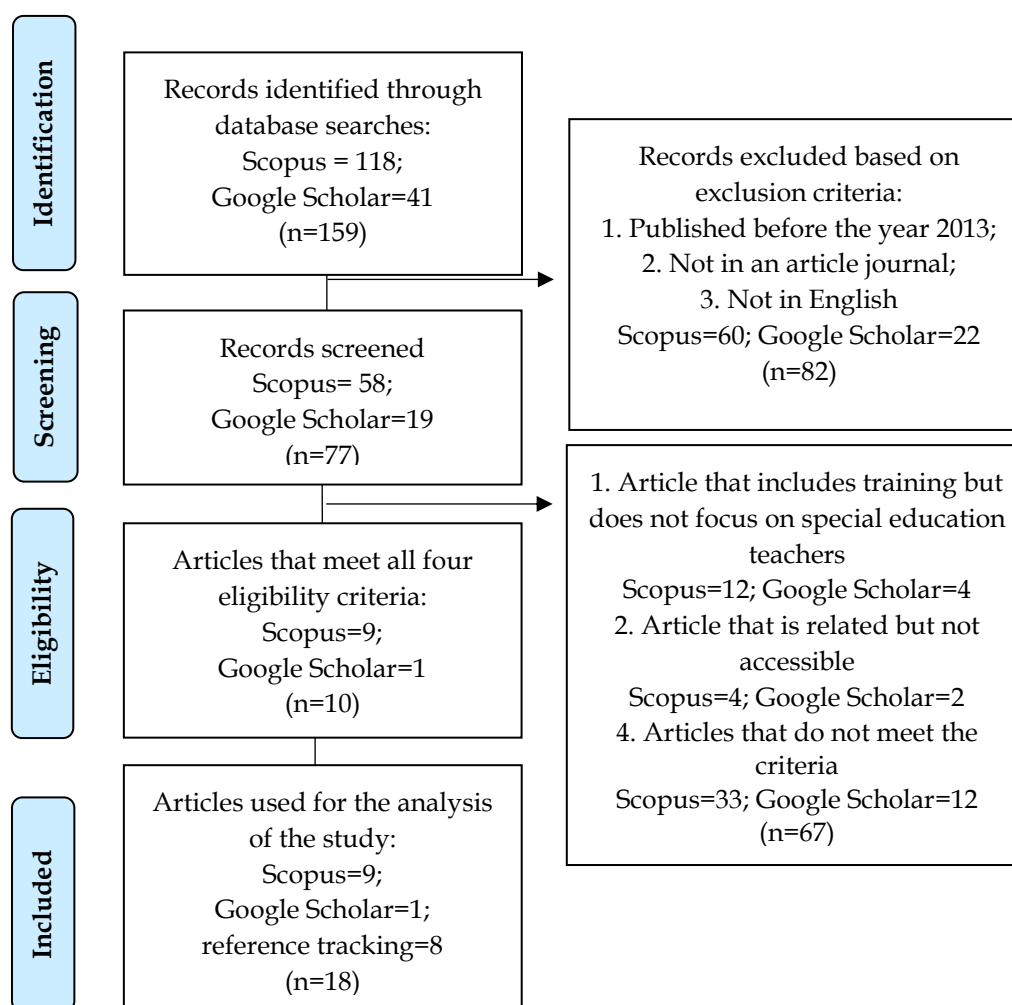
exclusion criteria were reference materials other than journal articles that were not in English and were published before 2013. Furthermore, articles were also excluded if they mentioned training in AAC but did not include special education teachers as one of the targeted populations. Details of inclusive and exclusive criteria are shown in Table 2.

**Table 2: Inclusive and Exclusive Criteria**

| Criterion                    | Inclusive  | Exclusive  |
|------------------------------|--|--|
| Year of publication          | Publication within the last ten years (2013-2023)  | Publication before 2013  |
| Language                     | English  | Language other than English  |
| Types of reference materials | Journal articles   | Theses, conference papers, books, and proceedings                            |
| Focus                        | Articles that included literature, findings, or analyses regarding the content and delivery method of teacher training | Articles that do not discuss teacher training for special education teachers |

### 2.3 Article Selection Process

The article selection process began in July 2023. The article selection process is adapted from Tawfik et al. (2019) and is shown in Figure 1.



**Figure 1: Flowchart of the Article Selection Process**

Based on PRISMA, the collection of articles is divided into four levels: The level of identification of articles, followed by screening articles using exclusion and inclusion criteria set beforehand. Articles that passed the screening process were reviewed in more detail to determine its eligibility for the SLR. Lastly, articles that fulfilled all the criteria were included in the analysis. For this SLR, 159 articles were identified by searching the Scopus and Google Scholar databases. However, after initial screening, the number of remaining articles was 77. Upon checking the title, abstract, and whole text, 67 articles were eliminated as most of the articles did not provide teacher training content and delivery methods as expected. However, after going through reference tracking, the researchers were able to extract a further eight articles that fulfilled the inclusion criteria from different databases, such as the Journal of Augmentative and Alternative Communication, Sage Journal, ASHA, and Journal of International Special Needs Education. Overall, there were 18 articles eligible to be analysed in this SLR. Table 3 shows the selected article titles, author, year, country, journal, and purpose of the study.

#### **2.4 Quality Assessment**

A quality assessment was done by two experts upon the selection of articles. If there was disagreement, a third expert was involved until a consensus was agreed upon. This method is according to Wu et al. (2018).

#### **2.5 Data Analysis**

In total, 18 articles were selected using the PRISMA methods related to teacher training content and delivery methods in AAC. In this SLR, the researcher chose the integrative review method to analyse the articles collected. An integrative review is one of the methods used to analyse research from different methodologies. This is important as the researcher did not include methodology as one of the inclusion or exclusion criteria during the article selection process. Thus, the articles collected are from different methodologies. According to Whitmore and Knafl (2005), an integrative review can be done by using qualitative quantitative data or quantifying qualitative data. In this case, researchers chose to analyse all data qualitatively by using thematic analysis. Flemming et al. (2018) stated that the use of thematic analysis is fit for integrative-based research. The process of thematic analysis was done by detecting similarities among the articles, identifying themes and patterns, creating categories, and identifying relationships that exist between the data (Braun & Clarke, 2006).

**Table 3: List of Selective Articles**

| <b>No</b> | <b>Author(s) and year of publication</b> | <b>Country</b> | <b>Study Title</b>   | <b>Journal Name</b>                                 | <b>Study Purpose</b>   |
|-----------|--|----------------|--|---|--|
| 1         | Muttiah et al. (2015)                    | United States  | Providing instructional support for AAC service delivery in low- and middle-income (LAMI) countries  | International Journal of Speech-Language Pathology  | To investigate the professionals' experiences in augmentative and alternative communication (AAC)  |
| 2         | Da Fonte et al. (2016)                   | United States  | Recommended Augmentative and Alternative Communication Competencies for Special Education Teachers   | Journal of International Special Needs Education    | To outline key training areas and implications regarding the need for future research in AAC   |
| 3         | Chung & Stoner (2016)                    | United States  | A meta-synthesis of team members' voices: what we need and what we do to support students who use AAC  | Augmentative and Alternative Communication          | To review qualitative studies about the perspectives of team members who support students in using AAC   |
| 4         | Tonsing & Dada (2016)                    | Africa         | Teachers' perceptions of the implementation of aided AAC to support expressive communication in South African special schools: a pilot investigation | Augmentative and Alternative Communication          | to explore how aided AAC was implemented to increase students' expressive communication in preschool.  |
| 5         | Andzik et al. (2017)                     | United States  | AAC services in schools: a special educator's perspective  | International Journal of Developmental Disabilities | To investigate the perspectives of special education teachers on supporting students with AAC  |
| 6         | Wallis et al. (2017)                     | United Kingdom | Augmentative and alternative communication (AAC) training provision for professionals in England   | Journal of Enabling Technologies                    | To analyse training of augmentative and alternative communication (AAC) by clinical services in England.   |
| 7         | Andzik et al. (2018a)                    | United States  | Exploring Relationships Between Teacher Training and Support Strategies for Students Utilizing Augmentative and Alternate Communication              | Journal of International Special Needs Education    | 1. To determine factors affecting the use of AAC from the aspects of intervention and supports<br>2. To examine relationships between teacher training and support given in the classroom. |

| No | Author(s) and year of publication | Country       | Study Title   | Journal Name                                    | Study Purpose   |
|----|-----------------------------------|---------------|---|---|---|
|    |                                   |               |   |   | 3. To examine relationships between proficient communication, teacher training, and the quantity of support.  |
| 8  | Andzik et al. (2018b)             | United States | A national survey describing and quantifying students with communication needs  | Developmental Neurorehabilitation               | To study how special education teachers support students with communication needs in the classroom  |
| 9  | Rashed Aldabas (2019)             | Saudi Arabia  | Barriers and facilitators of using augmentative and alternative communication with students with multiple disabilities in inclusive education: special education teachers' perspectives | International Journal of Inclusive Education    | To investigate barriers and facilitators in using AAC from the perspectives of special education teachers   |
| 10 | Douglas et al. (2020)             | United States | The Training Experiences of Augmentative and Alternative Communication Practitioners in One Midwestern State  | American Speech-Language-Hearing Association    | To explore the experiences of AAC practitioners in AAC  |
| 11 | Oihana & Maria (2020)             | Spain         | The use of augmentative and alternative communication in educational settings in the Basque Autonomous Community (Spain)  | The European Journal of Special Needs Education | To gather information about the service of AAC in Spain   |
| 12 | Pennington et al. (2020)          | United States | Teacher Preparation in Communication Instruction for Students with Extensive Support Needs  | Sage Journal                                    | To investigate the teacher's training in communication for students with extensive needs  |
| 13 | McCoy & McNaughton (2021)         | United States | Effects of Online Training on Educators' Knowledge and Use of System of Least Prompts to Support Augmentative and Alternative Communication   | Journal of Behavioral Education                 | To evaluate online training on teacher knowledge and use of the system of least prompts (SLP) for people with autism who use augmentative and alternative communication (AAC) |



| No | Author(s) and year of publication | Country       | Study Title  | Journal Name   | Study Purpose   |
|----|-----------------------------------|---------------|--|--|---|
| 14 | Da Fonte et al. (2022)            | United States | Current preparation status in AAC: perspectives of special education teachers in the United States   | Augmentative and Alternative Communication                 | to examine special education teachers' knowledge and skills in AAC  |
| 15 | Walker et al. (2022)              | United States | Preservice Teachers' Preparation in Communication Instruction for Students with Extensive Support Needs  | Research and Practice for Persons with Severe Disabilities | To explore the readiness of special education teachers to provide communication instruction for students with extensive needs |
| 16 | Leatherman & Wegner (2022)        | United States | Augmentative and Alternative Communication in the Classroom: Teacher Practices and Experiences   | American Speech-Language-Hearing Association               | To explore teacher experience in supporting students who use speech-generating devices (SGDs)                                 |
| 17 | Caron et al. (2022)               | United States | Online Training to Improve Service Provider Implementation of Letter-Sound Correspondence Instruction for Individuals Who Use Augmentative and Alternative Communication | American Speech-Language-Hearing Association               | To teach service providers how to use letter-sound correspondence (LSC) instruction, those who use AAC                        |
| 18 | Greene & Esposito (2023)          | United States | Interprofessional Practice Aligns with New California Teacher Performance Expectations for Students with Complex Communication Needs                                     | The Journal of Special Education Apprenticeship            | To share a collaborative project between a teacher training program and the speech-language pathology division                |

### 3. Findings

The analysis of the articles produced three main themes and 16 subthemes related to teacher training in AAC. Specifically, the main themes created are 1) teacher training course delivery with four sub-themes), 2) teacher training content with 12 sub-themes), and 3) training activities. Details of the theme and sub-themes are shown below.

#### 3.1 Teacher Training Delivery Method

Teacher training delivery method refers to how AAC information is distributed to the participants of AAC training (Douglas et al., 2020). This theme produced four sub-themes: university coursework, self-training, training by SLPs, and other training.

##### 3.1.1 University Coursework

Of 18 articles, five mention training at the university, namely: Andzik et al. (2018a, 2018b), Oihana and Maria (2020), Da Fonte et al. (2022), and Greene and Esposito (2023). Most of the participants reported owning a degree from a university, but only a few of them reported taking courses related to AAC (Oihana & Maria, 2020). The same finding was yielded in Da Fonte et al.'s (2022) research, in which participants who undergo teacher preparation courses process the lowest level of knowledge and skills in AAC. However, Andzik et al. (2018a), in their finding on the relationship between teacher training and support strategies, found that AAC course delivery at the university level is associated with the use of sign language, Voice Output Devices (VOD), and picture-based systems.

##### 3.1.2 Self-Training

Self-training is mentioned in four articles: Andzik et al. (2017, 2018b), Douglas et al. (2020), and Leatherman and Wegner (2022). Participants in the research mostly chose self-training due to the lack of training provided in the workplace and SLP (Andzik et al., 2017); some expressed their interest in AAC and, therefore, took the initiative of searching for more information about AAC themselves (Leatherman & Wegner, 2022). Commonly, self-training methods reported are using online platforms, which are Facebook, Google, Pinterest, Blogs, manufacturer websites and research papers.

##### 3.1.3 Training by SLP

Training by SLPs is mentioned in four articles: Chung and Stoner (2016) and Andzik et al. (2017, 2018a, 2018b). Internal training that involves training from SLPs towards teachers is the most frequent type of training reported by participants in Chung and Stoner (2016). The content of training given by SLPs is reported to be AAC systems, such the eye gaze system, the use of PowerPoint, and Pragmatic Organisation Dynamic Display (PODD), as reported by Andzik et al. (2017). Subsequently, Andzik et al. (2018b) drew out the relationship between learning sign language, VOD, and picture-based systems with SLR training. From the limited literature, it seems that training by SLPs is usually more focused on educating teachers about the use of an AAC system.

##### 3.1.4 Other Training

Other trainings mentioned are a) professional development courses (Andzik et al., 2018a, 2018b); b) conferences (Douglas et al., 2020; Oihana & Maria, 2020; Leatherman & Wegner, 2022); c) seminars (Oihana & Maria, 2020); d) workshops (Chung & Stoner, 2016; Leatherman & Wegner, 2022; Muttiah et al., 2015; Oihana & Maria, 2020); e) academic congresses (Oihana & Maria, 2020); f) training by an AAC special consultant (Andzik et al., 2018a, 2018b; Chung & Stoner, 2016); and g) training by a service provider or parents (Andzik et al., 2018a, 2018b; Chung & Stoner, 2016; Douglas et al., 2020). All these course deliveries are under the section 'other training', as little information can be found via articles to further explain them.

### 3.2 Teacher Training Content

Teacher training content refers to the topics that are relevant to AAC and should be included in the training. This theme produced twelve sub-themes: aided AAC, AAC assessment, collaboration in AAC, arranging the environment to promote communication or facilitate AAC, core or fringe vocabulary within AAC, assistive technology, implementation of AAC, cultural aspects of AAC communication, language development, unaided AAC, and other content. The list of AAC content that can be included in teacher training is shown in Table 4 (infra), whereby the list of content is arranged in descending order according to the frequency of articles mentioned about the same topics.

#### 3.2.1 Aided AAC

Aided AAC was mentioned in 12 articles: namely: Muttiah et al. (2015), Chung and Stoner (2016), Da Fonte et al. (2016), Tonsing & Dada (2016), Andzik et al. (2017), Wallis et al. (2017), Rashed Aldabas (2019), Douglas et al. (2020), Pennington et al. (2020), Walker et al. (2020); Da Fonte et al. (2022), and Leatherman and Esposito (2023). Research has emphasised training that includes AAC from low technology to high technology (Da Fonte et al., 2016; Greene & Esposito, 2023; Rashed Aldabas, 2019). According to Da Fonte et al. (2016), examples of low-tech systems include visual support tools, communication boards, behaviour support boards, token reward systems, schedules, picture boards, and so on. While high tech often refers to devices that have sound, which are speech-generating devices (Douglas et al., 2020), earlier research has shown a preference towards aided AAC over unaided AAC (Tonsing & Dada, 2016). This is due to the benefits of using aided AAC, which is simpler to use (Tonsing & Dada, 2016), offers speech output (Tonsing & Dada, 2016), is versatile, and is customisable (Chung & Stoner, 2016).

#### 3.2.2 AAC Assessment

There are eleven articles mentioning AAC assessment, namely: Muttiah et al. (2015), Da Fonte et al. (2016), Andzik et al. (2017), Wallis et al. (2017), Rashed Aldabas (2019), Douglas et al. (2020), Pennington et al. (2020), Da Fonte et al. (2022), Leatherman and Wegner (2022), Walker et al. (2022), and Greene and Esposito (2023). Pennington et al. (2020) and Walker et al. (2022) whose research discussed the assessment of communication skills and needs, while the other researchers focused on AAC assessment. Previously, participants were found to have the least knowledge and skills in AAC assessment compared to other skills (Da Fonte, 2022). Generally, AAC assessment identifies users who need AAC and finds a suitable device or intervention by observing their physical, cognitive, and sensory needs. Additionally, assessment can also be used to monitor users' progress (Andzik et al., 2017). Research finds the need for teachers to know about AAC assessment as SLPs are often not available (Andzik et al., 2017). Furthermore, teachers should learn how to do communication assessments and choose response forms to carry out the assessment (Peckham-Hardin et al., 2018).

#### 3.2.3 Collaboration in AAC

Eight articles mention the collaboration in AAC, namely: Chung and Stoner (2016), Da Fonte et al. (2016), Andzik et al. (2017), Wallis et al. (2017), Rashed Aldabas (2019), Douglas et al. (2020), Leatherman and Wegner (2022), and Greene and Esposito (2023). Da Fonte et al. (2016) and Douglas et al. (2020) emphasised the importance of working in a team to support AAC users in all aspects. However, prior research has reported a lack of training in collaborative work (Andzik et al., 2017). Past studies stated that teacher training about collaboration should focus on helping teachers gain a) the value of collaboration (Chung & Stoner, 2016); b) respecting all team members (Chung & Stoner, 2016); c) collaboration skills; and d) different team models like multidisciplinary, interdisciplinary, and transdisciplinary

(Da Fonte et al., 2016; Douglas et al., 2020) and writing goals for AAC users (Da Fonte et al., 2016; Douglas et al., 2020).

### 3.2.4 *Arranging an Environment to Promote Communication or Facilitate AAC*

There are eight articles which mentioned about arranging an environment to promote communication, or, in other words, to create opportunities for AAC users to communicate: Muttiah et al. (2015), Da Fonte et al. (2016), Tonsing and Dada (2016), Wallis et al. (2017), Rashed Aldabas (2019), Pennington et al. (2020), Walker et al. (2022), and Greene and Esposito (2023). It is important to create opportunities for communication *via* users' daily life activities so that students can become familiar with their devices and know how and when to communicate (Greene & Esposito, 2023). However, prior study has shown that teachers lack skill and training in creating an environment for communication (McCoy & McNaughton, 2021; Tonsing & Dada, 2016; Wallis et al., 2017). According to Da Fonte (2016), teacher training should focus on how to: a) identify activities in which AAC users may participate; b) prepare tools to communicate; c) show AAC users how to communicate using the system; d) create chances for communication to occur; e) encourage AAC users to communicate without a communication partner; and f) search for opportunities to increase participation. Throughout the process of creating communication opportunities, teachers should also consider applying AAC instructional strategies such as prompting, naturalistic teaching strategies, wait times, and so on to create more communication opportunities (Da Fonte et al., 2016; McCoy & McNaughton et al., 2022).

### 3.2.5 *Core and Fringe Vocabulary Within AAC*

Seven articles mentioned about vocabulary in AAC, namely: Muttiah et al. (2015), Da Fonte et al. (2016), Tonsing and Dada (2016), Wallis et al. (2017), Douglas et al. (2020), Walker et al. (2022), and Greene and Esposito (2023). It is important to learn about the core and functional words, as they are needed to display on the device (Greene & Esposito, 2023). Moreover, choosing suitable and correct vocabularies allows AAC users to use them in different contexts and be able to communicate smoothly (Da Fonte et al., 2016). Tonsing and Dada (2016) added that the involvement of the teacher in selecting vocabulary gives the teacher a sense of ownership in not only implementation but also customisation. Thus, teacher training should focus on teaching how to assess users' vocabulary needs and how to select appropriate vocabulary for each different event and context (Da Fonte et al., 2016).

### 3.2.6 *Assistive Technology*

Six articles mentioned assistive technology: Chung and Stoner (2016), Da Fonte et al. (2016), Tonsing and Dada (2016), Andzik et al. (2017), Wallis et al. (2017), and McCoy and McNaughton (2021). Two countries have mandated the use of assistive technology, also called aided AAC, for children with disabilities: Africa, as reported by Tonsing and Dada (2016), and the United States, as reported by Andzik et al. (2017). There are a few suggestions for what to include in assistive technology training, among them a) learning the differences between assistive technology and AAC (Da Fonte et al., 2016); b) roles and functions of each system (Da Fonte et al., 2016); c) AAC technology preparation, adaptation and implementation (Wallis et al., 2017); and d) management of resources (Wallis et al., 2017). It is worth mentioning that assistive technology is a larger collection of tools, systems, or equipment that is used to improve disabilities in every aspect, including communication. On the contrary, AAC refers to a system used specifically to improve communication. Often, it can be observed that assistive technology and AAC can be combined to make better progress for AAC users. Therefore, teachers need to know every system that exists to better suit students' requirements. At the same time, teachers must gain knowledge on how to operate and solve technical issues such as device programming, troubleshooting, and backing up the AAC system (Douglas et al., 2020; Leatherman & Wegner, 2022).

### 3.2.7 Implementation of AAC

AAC implementation is mentioned in articles by Da Fonte et al. (2016), Tonsing and Dada (2016), Andzik et al. (2017), Wallis et al. (2017), Douglas et al. (2020), and Leatherman and Wegner (2022). Research found common barriers to AAC implementation, which are lack of time to prepare AAC; low team support and collaboration; lack of support from SLPs and paraeducators; and lack of teacher training in this area (Andzik et al., 2017; Tonsing & Dada, 2016). Furthermore, Douglas et al. (2020) stated in their research that funding and district policy were two of the reasons that impeded AAC implementation. The role of a special education teacher in the implementation of AAC is to help the AAC user with the system and monitor and evaluate students' progress from time to time (Da Fonte et al., 2016). The literature strongly expresses the need for teachers to be able to cooperate and receive training from SLPs so that AAC can be implemented successfully in schools (Andzik et al., 2019; Leatherman & Wegner, 2022).

### 3.2.8 Cultural

Past literature has mentioned the need for teachers to learn about cultural competencies (Greene & Esposito, 2023; Muttiah et al., 2015; Pennington et al., 2020; Tonsing & Dada, 2016; Walker et al., 2022; Wallis et al., 2017). Generally, most students are from different backgrounds and may process different cultures; therefore, special education teachers must take into consideration the student's cultural backgrounds before making any decisions regarding AAC (Greene & Esposito, 2023; Pennington, 2020). To do that, teachers must first understand the issue of having different cultures and languages used (Mollie & Jeeva, 2022); second, they need to be taught how culture can affect the choice of intervention and preferences (Bauce, 2014). Later, teachers must be taught how to provide instruction by considering user gender, language, background and age (Muttiah et al., 2015).

### 3.2.9 Language

Six articles mentioned language to be included in AAC training, namely: Wallis et al. (2017), Douglas et al. (2020), Pennington et al. (2020), Caron et al. (2022), Walker et al. (2022), and Greene and Esposito (2023). Specific topics mentioned regarding language are a) aided language stimulation (Pennington, 2020; Walker et al., 2022); b) pre-linguistic features such as joint attention, turn-taking and gesture (Greene & Esposito, 2023); c) forms of non-verbal communication like receptive and expressive language (Greene & Esposito, 2023); language development (Wallis et al., 2017); d) early language development and semantic features (Douglas et al., 2020; Greene & Esposito, 2023) and e) letter sounds corresponding instruction (Caron et al. 2022). Douglas et al. (2020) mentioned that language development is important in doing assessments for AAC users and, at the same time, to understand the usage of a device. After all, it was said that the goal of using a device is to teach language for communication.

### 3.2.10 Communication

Five articles mentioned the need to include communication content in AAC training, namely: Muttiah et al. (2015), Da Fonte et al. (2016), Wallis et al. (2017), Pennington et al. (2020), and Walker et al. (2022). Topics that have been suggested regarding communication are foundation knowledge of communication (Muttiah et al., 2015); communication skill development and milestones (Da Fonte et al., 2016; Greene & Esposito, 2023); identifying appropriate communication systems (Pennington et al., 2020; Walker et al., 2022); functional communication training like teaching how to comment, label, request, start conversation, protest, reject and responding to others (Pennington et al., 2020; Walker et al., 2022; Wallis et al., 2017); communication strategies (Wallis et al., 2017); communication competencies that are divided into linguistic, operational, social and strategic (Da Fonte et al., 2016); and teaching how to communicate with peers (Pennington et al., 2020; Walker et al., 2022). The

teacher needs to be able to recognise a child's communication before introducing a suitable AAC for them. Therefore, communication is listed as the first competency that teachers need to master according to the teacher competency in AAC by Da Fonte et al. (2016).

### 3.2.11 Unaided AAC

Unaided AAC is mentioned by Tonsing and Dada (2016) and Oihana and Maria (2020). Previous investigations showed that the usage of unaided systems is much lower than that of aided communication systems (Oihana & Maria, 2020). Among aided systems, sign language was reported as being used most frequently by AAC users compared to other systems like scanning and eye gazing. Even though unaided AAC is not being focused on in training, it is still knowledge that needs to be known by every teacher so that they can differentiate between aided and unaided AAC. In certain conditions, aided and unaided AAC can be combined to assist in communication (Beukelman & Pat, 2013).

### 3.2.12 Other Content

Other AAC content mentioned is a) system and symbol (Da Fonte et al., 2016; Wallis et al., 2017); b) problem-solving (Andzik et al., 2017; Wallis et al., 2017); and c) research and practice (Wallis et al., 2017). These three topics of AAC are included under 'other content' as there is little elaboration in the articles; however, the topics are mentioned by researchers as having to be considered in teacher training courses.

## 3.3 AAC Training Activities

Six articles mentioned about activities for teacher training. Those activities are: a) reading (Greene & Esposito, 2023; Walker et al., 2022); b) in-class practice, like discussion (Greene & Esposito, 2023; Muttiah et al., 2015; Walker et al., 2022); c) role play (McCoy & McNaughton, 2021; Muttiah et al., 2015; Pennington et al., 2020); d) field practice (Da Fonte et al., 2022; Walker et al., 2022); e) engaging in instructional activities (Greene & Esposito, 2023; Muttiah et al., 2015); f) case studies (Greene & Esposito, 2023; Muttiah et al., 2015; Pennington et al., 2020); g) assignment (Greene & Esposito, 2023); h) video (Pennington et al., 2020; Walker et al., 2022); and i) lectures (Walker et al., 2022). It is suggested that students read articles regarding evidence-based research about AAC (Greene & Esposito, 2023). In addition, it is useful to discuss in groups to share experiences, concerns, and plans. (Greene & Esposito, 2023).

**Table 4: List of Contents**

| No | Suggested content   | Suggested Subtopic   | Number of articles |
|----|---|--|--------------------|
| 1  | Aided AAC   | Low tech<br>High tech  | 12                 |
| 2  | AAC Assessment  | Recognise people who benefited from AAC<br>Communication assessment<br>Selecting response forms  | 11                 |
| 3  | Collaboration in AAC  | Value of collaboration<br>Respecting all team members<br>Collaboration skills<br>Different team models, like multidisciplinary, interdisciplinary, and transdisciplinary.<br>Writing goals for AAC users | 8                  |
| 4  | Arranging an environment to promote communication or facilitate AAC | Identify activities in which AAC users may participate<br>Prepare tools to communicate<br>Show AAC users how to communicate using  | 8                  |

| No | Suggested content                              | Suggested Subtopic   | Number of articles |
|----|--|--|--------------------|
|    |  | the systems  |                    |
|    |  | Create chances for communication to occur and increase participation                       |                    |
|    |  | Encourage AAC users to communicate without a communication partner                         |                    |
|    |  | AAC instructional strategies   |                    |
| 5  | Core and fringe vocabulary within AAC displays | Assessing vocabulary needs   | 7                  |
|    |  | Selection of vocabularies  |                    |
| 6  | Assistive Technology                           | Learning the differences between AT and AAC  | 6                  |
|    |  | Roles and functions of each system   |                    |
|    |  | AAC technology preparation, adaptation, and implementation                                 |                    |
|    |  | Management of resources  |                    |
|    |  | Technical skills within AAC  |                    |
| 7  | AAC implementation                             | Operational knowledge of AAC   | 6                  |
|    |  | Monitor student progress   |                    |
|    |  | Evaluate student progress  |                    |
| 8  | Cultural                                       | Understand the issue of multicultural and multilingual                                     | 6                  |
|    |  | How can culture affect the choice of intervention and preferences?                         |                    |
|    |  | Provide instruction by considering the user's cultural diversity                           |                    |
| 9  | Language development                           | Aided language stimulation   | 6                  |
|    |  | Pre-linguistic features such as joint attention, turn-taking, and gesture                  |                    |
|    |  | Forms of non-verbal communication like receptive and expressive language                   |                    |
|    |  | Language development   |                    |
|    |  | Early language development and semantic features   |                    |
| 10 | Communication                                  | Foundation knowledge of communication  | 5                  |
|    |  | Communication skill development and milestones   |                    |
|    |  | Identify appropriate communication systems   |                    |
|    |  | Functional communication training  |                    |
|    |  | Communication strategies   |                    |
|    |  | Communication competencies are divided into linguistic, operational, social, and strategic |                    |
|    |  | Communication with peers   |                    |
| 11 | Unaided AAC                                    | Sign language  | 2                  |
| 12 | Others   | System and symbol  | 2                  |
|    |  | Problem-solving  | 2                  |
|    |  | Research and practice  | 1                  |

#### 4. Discussion

Past research has reported a lack of teacher training in AAC (Andzik et al., 2017; Douglas et al., 2020). There is a struggle for special education teachers, as most of the student instruction and AAC support at school is dependent on the special education teacher (Andzik et al., 2018a; Barker et al., 2013). Besides lack of training, another main issue reported is the quality of the AAC course, both in terms of teacher preparation and professional development. Some of the issues associated with course quality mentioned by Pennington et al. (2020) are: a) the AAC course offered is on a surface level; b) topics of communication are not being focused on in the course; c) the AAC courses are not connected; and d) theory learning is more focused than practice. The drawback of teacher training reported greatly impacted teachers' service towards children with disabilities who use AAC in school.

A special education teacher greatly needs proper training in AAC to be equipped with the necessary knowledge and skills to tackle a variety of communication issues at school. While looking back to previous studies, it was found that there is a lack of analysis of teacher training components in AAC and the delivery mode of AAC for special education teachers (Douglas et al. 2020; Wallis et al., 2017). These recommendations from the above inputs are crucial for future teacher training advice.

Overall, there are 12 topics successfully covered in this SLR. These include aided AAC, AAC assessment, collaboration in AAC, arranging the environment to promote communication, core, or fringe vocabulary with AAC display, assistive technology, AAC implementation, cultural, communication, language development, unaided AAC, and others. It was found that the content of AAC is about the same as suggested in previous teacher training. When comparing the previous nature of teacher training by McConachie and Pennington (1997), Lebel et al. (2005), and Patel and Khamis-Dakwar (2005), there are similarities in the content suggested, such as implementation of AAC, creating communication opportunities, understanding communication, selecting vocabularies, and others. However, researchers have noticed several matters that led to changes in the content of AAC's focus on teacher training in recent years.

Firstly, it is found that the content focus is switching to technology-based. Aided AAC is highlighted in almost every article, whereas unaided AAC is not. It is also worth mentioning that aided AAC preferences are more towards high-tech tools such as speech-generative devices, communication apps, and software (Oihana & Maria, 2020). This is because a wider variety of mainstream technology is being employed to offer AAC options (Wallis et al., 2017). Therefore, it is not surprising to see teacher training on AAC content pay more attention to assistive technology (Andzik et al., 2017; Chung & Stoner, 2016; Da Fonte et al., 2016; McCoy & McNaughton, 2021; Tonsing & Dada, 2016; Wallis et al., 2017). However, with the rise of high-tech AAC tools, AAC content should also cover the subject of operating tools so that teachers are familiar with the products. Several articles also emphasise that teachers should always be up to date with the newest product and receive specific product training from the service provider to fully understand the product (Wallis et al., 2017). Moreover, special education teachers should also be equipped with technical skills to solve problems that might arise from time to time (Douglas et al., 2020; Leatherman & Wegner, 2022).

Secondly, current teacher training is more focused on collaborative skills, as the words collaboration or team are mentioned many times in the articles. Collaboration, or working in teams, is one of the factors that determine the success of AAC implementation (Da Fonte et al., 2016). Collaboration can happen among a lot of people in a school setting; it can be a



collaboration between teachers and students, administrators, therapists, family members, or any other community member that is related to their service. Upon analysis, it was found that collaboration does not occur as expected due to a lack of skills, a lack of training, and a lack of willingness to collaborate (Tonsing & Dada, 2016). For example, a lack of collaboration between SLP and family was reported by Rashed Aldabas in 2019, and a lack of collaboration between teacher and students was reported by Stoner et al. (2010), Chung and Stoner (2016), and Radici et al. (2018). Collaboration has long been mentioned in the literature, but it has not been fully implemented in the service yet due to a lack of training (Andzik et al., 2017). Previous research has urged teacher training to include more collaborative skills by increasing in-field practice so that teachers' abilities in collaboration can be increased (Greene & Esposito, 2023; Walker et al., 2022). However, there is a need for more research suggesting how teacher training can prepare special education teachers to be ready in this area.

Third, the content of AAC might vary between countries because of differences in culture, environment, education, individual needs and finances (Rashed Aldabas, 2019; Subihi, 2013). Taking a low-income country as an example, aided AAC with high technology is not applicable when resources are scarce (Muttiah et al., 2015). Therefore, the focus on teacher training in those countries will be different compared to other developing countries. Furthermore, for those countries that have multicultural and multilingual issues, such as Malaysia (Joginder Singh et al., 2020), the usage of AAC tools and implementation might vary too. In sum, consideration of courses should be made based on learner needs and wants before planning for teacher training (Muttiah et al. 2015).

As for the teacher training delivery format, it is interesting to note that there is some kind of relationship between the amount of teacher training and the knowledge and skill processes of the teacher. According to Rashed Adabas (2019), participants who have ever attended teacher training show knowledge and skills that are better than those who have not. This is supported by Andzik et al. (2018a), who stated that teachers with a great deal of training use AAC support strategies more than those who received less training. By further analysing the relationship between types of teacher training and modes of communication, it is interesting to note that proficiency in using sign language and voice output devices (VOD) is correlated with SLP and AAC specialist training, while the use of PECS is associated with parental and self-training. Lastly, sign language, VOC and PECS are related to university training. Therefore, it can be said that AAC teacher training delivery modes indirectly affect teacher acquisition, depending on the content and time allocated for each training. In reviewing all 18 articles in this SLR, little elaboration on training has been yielded except for basic information like the type of training ever attended without explaining in detail what is included in each training. Future research should aim at analysing how each training affects teacher learning in terms of content and conduct.

However, there is a trend observed regarding the teacher delivery method: teacher training is becoming more online with AAC training in online mode mentioned in articles by Wallis et al. (2017), Douglas et al. (2020), McCoy and McNaughton (2021), and Walker et al. (2022). Past learners have shown a preference for online delivery methods as being more convenient compared to traditional face-to-face methods (McCoy & McNaughton, 2021) given the progress of technology and the very many self-learning reports at the teacher training level (Andzik et al., 2017, 2018a, 2018b; Douglas et al., 2020; Leatherman & Wegner, 2022). Future teacher training should consider adding in more online elements so that content can be accessible and reachable by more learners (Lebel et al., 2005). However, the flexibility of course delivery should be ready to fulfil the teacher's requirements (Douglas et al., 2020).

Besides getting information about teacher training format, delivery, and content, the researcher also found a few articles that mentioned activities that had been done during teacher training. It is interesting to know that the majority of activities reported are role-play (McCoy & McNaughton, 2021; Muttiah et al., 2015; Pennington et al., 2020), in-class discussions (Greene & Esposito, 2023; Muttiah et al., 2015; Walker et al., 2022), case studies (Greene & Esposito, 2023; Muttiah et al., 2015; Pennington et al., 2020), and reading (Greene & Esposito, 2023; Walker et al., 2022). On the contrary, in-field training is only mentioned in two articles. This finding is correlated with previous research saying that teacher training is more theory-based than practice (Pennington et al., 2020; Walker et al., 2022). This is alarming, as AAC is a complex process that requires a lot of practical time, particularly for collaboration skills, assessment and implementation, which require a lot of practice. Therefore, future teacher training should investigate how to improve in-field training to minimise the gap between theory and practice.

### **5. Limitations of the Study**

There are a few limitations considered in this study. First, these SLR-only study articles ranged from 2013 to 2023. The reason behind this selection of a timeline is that the researcher wanted the latest updated information regarding teacher training. However, it is undeniable that there are many more suitable articles that fulfil the inclusive criteria stated in this SLR but could not be selected due to the timeframe. Future research might include a longer timeframe to be able to extract more related information regarding AAC training content and course delivery.

A second limitation is that some opinions in the articles are voiced by professionals, which include not only special education teachers but also speech-language pathologists, occupational therapists, and many more. Therefore, some of the suggestions for content are being seen for all AAC practitioners but not specifically for the teacher only. Future research should explore more teacher opinions, specifically when more research regarding AAC content and delivery is conducted.

The third limitation is that the articles in this SLR are taken from only two databases, so there is a high probability that a few articles that are relatable to this research were overlooked. However, the researcher scanned through every possible article through reference tracking, trying to reduce the risk of missing articles.

### **6. Conclusion**

This SLR aimed to identify teacher training content and delivery methods in AAC based on earlier research. Eighteen 18 articles in total were identified via careful article searches in two databases, namely Scopus and Google Scholar. Based on the analysis of these 18 articles, the results show that most of the participants in the articles reported having taken an AAC course in university, followed by training by an SLP, self-training, and so on. However, it is interesting to know that AAC teacher training is gradually switching to online mode as more research shows training in web-based courses, webinars, online modules, and so on. In addition, the findings also yielded a total of 12 topics related to AAC that were suggested to be included in teacher training. However, there were certain issues with the training system, including a disconnect between theory and practice, a lack of adequate field experience, and the omission of some courses. To reduce the gap between theory and practice in AAC, future research should focus on analysing the teaching training modality in depth and ways to improve teacher training quality.

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