JURNAL PENDIDKAN BITARA
Volume 17 Special Issue (2024) / eISSN 2821-3173 (66-78)

This article was carefully selected from
5th International Conference on Special Education (ICSE) 2023,
organized by The Southeast Asian Ministers of Education Organization
Regional Centre for Special Educational Needs (SEAMEO SEN)

ASSESSING THE USABILITY OF PERSONALISED-MULTILINGUAL AAC 'MYSUARA' MOBILE APPLICATION

Kalaimathi Rajagopal, Low Hui Min* & Siti Mastura Baharudin

Universiti Sains Malaysia, Malaysia
lowhm@usm.my

Published: 19 June 2024

To cite this article (APA): Rajagopal, K., Low , H. M., & Baharudin, S. M. (2024). Assessing the Usability of Personalised-Multilingual AAC 'Mysuara' Mobile Application. *Jurnal Pendidikan Bitara UPSI*, *17*, 66–78. https://doi.org/10.37134/bitara.vol17.sp.7.2024

To link to this article: https://doi.org/10.37134/bitara.vol17.sp.7.2024

ABSTRACT

The 'MySuara' app is a personalised augmentative and alternative communication (AAC) mobile application designed for Malaysian special education classrooms, offering multilingual support and a unique dual-screen modelling feature to enhance teacher-student communication. Besides, it allows the customisation of symbol sets to meet individual student needs, providing a personalised solution for teachers and caregivers. This study aims to assess the usability of the 'MySuara' mobile app using a developed questionnaire, as usability is quantifiable and crucial for user satisfaction. Conducting such evaluations can unveil flaws in the system and reveal user demands, which is vital for successful app development. Usability testing is essential during development to ensure high user satisfaction and successful app usage. However, limited usability models exist for assessing mobile application features. Therefore, 'MySuara' was evaluated using a questionnaire developed based on the Mobile Learning Application Usability model and the People at the Centre of Mobile Application Development (PACMAD) model. Two questionnaires adapted from Parsazadeh et al. (2018) and Marcial et al. (2018), were combined to create the augmentative and alternative communication usability questionnaire (AACUQ) for 'MySuara' app. The PACMAD was deemed the most suitable for evaluating 'MySuara' due to its tailored focus on mobile application usability, encompassing attributes identified as crucial factors impacting usability. The AACUQ usability questionnaire comprised eight attributes: effectiveness, efficiency, satisfaction, learnability, memorability, error handling, cognitive load, and timeliness. Permissions were secured from the authors before integrating the questionnaires, with adjustments made by removing unsuitable items and modifying others. The AACUQ, comprising 40 items on a five-point Likert scale, was administered via Google Forms, including a consent form, demographic section, and questionnaire for participant response. Fourteen participants, 12 special education teachers and two speech therapists, voluntarily participated in the survey. Data collection occurred after participants tested the 'MySuara' app. Overall, participants expressed satisfaction with the app, with mean values for each attribute above average. The study discusses limitations and implications, concluding 'MySuara' is suitable for its intended purpose.

Keywords: 'MySuara', PACMAD, AACUQ. Usability, AAC

INTRODUCTION

Augmentative and Alternative Communication (AAC) empowers individuals with communication challenges, such as speech or language disorders, to express themselves effectively (Radici et al., 2016). With the rapid advancement of technology, mobile applications have emerged as powerful tools for AAC, allowing individuals to communicate more conveniently and independently. The augmentative and Alternative Communication (AAC) mobile apps are designed to assist individuals with complex communication needs express themselves using mobile devices such as smartphones or tablets by leveraging the device's features, such as touch screens, text-to-speech capabilities, and customisable symbol libraries. A few popular AAC mobile apps include Proloquo2Go, TouchChat HD, Avaz, CoughDrop, and Tobii Dynavox. These apps aim to empower individuals with communication difficulties and facilitate effective communication in various environments, such as schools, homes, or social settings. AAC apps such as Avaz AAC, TouchChat HD, and MyTalk support multiple languages, including Malay language. However, in Malaysian educational settings, AAC practices involving high-tech AAC systems, such as AAC mobile apps, are still in their infancy (Joginder Singh et al., 2017). Therefore, the number of AAC apps designed to fit the Malaysian culture, languages and educational settings is still limited. An AAC app called 'MySuara' that suits the local culture, language and educational context was developed, and usability was assessed in this study.

Personalised-Multilingual 'MYSUARA' App

'MySuara' is an AAC mobile application that caters to the needs of students with complex communication needs in Malaysian special education classroom settings. The 'MySuara' app has been designed to be linguistically and culturally appropriate for the Malaysian context. It offers language support for Malay, Mandarin, Tamil and English, accommodating students from various ethnic backgrounds. Multilingual support ensures inclusivity and accessibility for students, promoting their active participation and engagement in classroom activities.

A noteworthy aspect of the 'MySuara' app is its modelling capability, which empowers teachers to train students to communicate effectively. This feature harnesses a dual-screen interface, facilitating simultaneous interaction between the teacher and student while incorporating scaffolding principles derived from Scaffolding theory. Through this dual-screen setup, teachers can skillfully demonstrate interactions and guide students in actively participating within the classroom. The modelling feature holds particular significance for students with complex communication needs, especially those with limited prior experience with AAC systems in educational settings. During the introduction of the AAC system into the classroom, the modelling feature assumes a critical role in communication training. The students begin with fundamental symbols during Modelling Phase 1 and subsequently progress to more advanced vocabulary as they transition through Modelling Phases 2 and 3. By employing this modelling capability, teachers can provide explicit demonstrations of effective communication strategies, fostering students' comprehension and utilisation of the AAC system. The dual-screen interface enhances the instructional process, allowing for real-time modelling, feedback, and correction, enabling students to acquire and develop essential communication skills.

The 'MySuara' app represents a personalised AAC application that caters to the unique communication requirements of students with complex communication needs. This app enables these students to utilise symbols tailored to their specific preferences and individualised needs. Within the 'MySuara' app, teachers and caregivers are granted the privilege of requesting a distinct set of symbols that aligns with the specific needs of their students.

By default, the 'MySuara' app offers a predefined set of symbols suitable for general usage. However, upon request, these symbol sets can be customised or expanded based on the individual client's needs. The app facilitates the modification of existing symbols or the addition of new symbols to address the specific communication requirements of each student. Once the symbols have been updated within the

app, a personalised version of 'MySuara' is provided to the teachers or caregivers, tailored specifically for their respective students.

LITERATURE REVIEW

Usability

Usability is a measurable quality that can be expressed as a number. This allows us to quickly determine if a website, software, or app is as useful as it should be for specific users performing specific tasks. Conducting usability evaluations helps researchers identify potential issues that may have been missed during development and provides insights into what users want (Weng, 2015). Additionally, organisations conducting usability assessments can learn how users interact with their products, identify areas for improvement, and make informed design decisions. Prioritising usability leads to better user experiences, increased user satisfaction, and business success. However, many usability models designed for desktop applications are not suitable for evaluating mobile applications (Comai et al., 2019; Harrison et al., 2013). This is because mobile devices have unique features that require special consideration compared to computer software (Zhang & Adipat, 2005). For example, mobile devices were designed to be used on the go thus, having different screen sizes may impact how users interact and navigate through their apps, which can make it harder for users to view or navigate through apps (Harrison et al., 2013; Zali & Fadzlah, 2016; Zhang & Adipat, 2005). Therefore, it is crucial to have a usability model tailored to mobile apps' specific needs. As mobile devices become more popular, there is a growing need for usability models explicitly designed for mobile technologies (Hussain et al., 2017).

PACMAD

The usability assessment models developed for traditional computer systems were incompatible with the rapidly evolving mobile computing technologies (Parsazadeh et al., 2018). The risks of user abandonment and high failure rates associated with mobile apps can be significantly reduced by conducting a comprehensive usability evaluation. Harrison et al. (2013) introduced a People At the Centre of Mobile Application Development (PACMAD) usability model to address this gap through a systematic literature review of papers published between 2008 and 2010. The PACMAD model provides a comprehensive framework tailored for evaluating mobile applications.

The People At the Centre of Mobile Application Development (PACMAD) usability model was developed by reviewing and comparing existing usability models, including Nielsen's and ISO models. Nielsen's model consists of five attributes: efficiency, learnability, satisfaction, errors, and memorability, while the ISO model includes three attributes: effectiveness, efficiency, and satisfaction (Alturki & Gay, 2017; Harrison et al., 2013). The PACMAD model combines elements from both models and adds cognitive load as a new attribute specifically for mobile application usability. This results in a comprehensive model with seven attributes: effectiveness, efficiency, satisfaction, learnability, memorability, errors, and cognitive load. These attributes have a significant impact on the usability of mobile applications (Parsazadeh et al., 2018). A systematic literature study by Weichbroth (2020) found that these seven attributes are the most frequently used in mobile application usability assessments. Therefore, the PACMAD usability model was selected as the most suitable model for evaluating the usability of the 'MySuara' mobile application.

The People At the Centre of Mobile Application Development (PACMAD) usability model consists of seven attributes that collectively evaluate the usability of mobile applications. The first three attributes are effectiveness, efficiency, and satisfaction. Effectiveness refers to the user's ability to successfully and accurately accomplish tasks, focusing on goal attainment. Efficiency relates to the user's capacity to complete tasks swiftly and accurately, considering the efficient use of resources. Satisfaction encompasses the level of comfort, pleasure, and fulfilment of user expectations and needs, including positive attitudes towards the product.

The remaining four attributes are learnability, errors, memorability, and cognitive load. Learnability involves the ease with which users can interact with a new system without guidance and their ability to become proficient over time, emphasising easy learning and rapid usability. Errors assess the quantity and nature of errors that occur during task performance and the system's ability to recover from them, with a low error rate and quick recovery being desirable. Memorability evaluates the ease with which users can remember how to effectively utilise the application, even after a period of non-use. Cognitive load refers to the amount of mental activity imposed on the user's working memory during application usage, considering factors such as instruction, task complexity, and mental effort. These attributes provide a comprehensive framework for evaluating the usability of mobile applications, ensuring that they are effective, efficient, and user-friendly.

While the seven attributes of the PACMAD model can evaluate the usability of most mobile applications, it is crucial to consider the specific context in which the application is used. In the case of the 'MySuara' app, which is designed for educational settings, the app's response time is a critical factor in assessing usability. Therefore, to effectively evaluate the usability of the 'MySuara' app, the mobile learning application usability model proposed by Parsazadeh et al. (2018) has been incorporated and deemed relevant.

Mobile Learning Application Usability Model

Parsazadeh et al. (2018) proposed a new attribute of timeliness to the existing PACMAD model for evaluating the usability of mobile learning applications. The researchers employed the Delphi method to develop and validate a usability questionnaire specific to mobile learning applications. Parsazadeh et al. (2018) emphasised that timeliness is a critical aspect of usability, as it significantly impacts the overall usability of mobile learning applications. Timeliness refers to responsiveness, and in an educational context, providing timely responses to students' questions or requests is highly advantageous. When information or questions are delivered promptly, teachers can respond quickly, leading to increased student satisfaction. Addressing timeliness becomes essential, given the importance of student satisfaction in today's competitive environment. While previous usability models have not adequately considered timeliness, incorporating it into the PACMAD model, particularly for mobile applications designed for educational settings, ensures its relevance and usefulness in the context of mobile learning (Parsazadeh et al., 2018). Consequently, these eight attributes, including timeliness, will be included in the usability assessment of the 'MySuara' app.

The main objective of this study is to determine the usability of 'MySuara' app based on eight attributes outlined by the Mobile Learning Application Usability Model that incorporates PACMAD model suggested by Parsazadeh et al. (2018).

METHODOLOGY

Materials and methods

A quantitative approach was adopted to evaluate the usability of 'MySuara' mobile application. A 40-item usability questionnaire was developed using questionnaires adapted from two questionnaires, which will be discussed in the instrument section. For the data collection, a field testing strategy was employed whereby the participants were allowed to test the mobile app before filling in the usability questionnaire. Mobile devices preinstalled with 'MySuara' app were used for the field testing. For this purpose, one unit of Samsung Galaxy Tab A and one more unit of Samsung Galaxy Tab A7 Lite were used. Besides this, Google Forms were used to create the usability questionnaire digitally for easy dissemination. The IBM SPSS version 25 and the Microsoft Excel spreadsheet were used in data analysis.

Participants

Participants were recruited for online and face-to-face field tests between September 2021 and September 2022. Since the participants represent a unique population with strict inclusion criteria, the researcher obtained only 14 participants for this study. The participants were selected using purposive sampling to

ensure that they represented the specific target group. The group comprises twelve special education teachers working in integrated special education programmes (PPKI) in government schools and two speech-language therapists working in private sectors. The inclusion criterion for selecting the participants of the study are: (a) have working experience with children/students with complex communication needs, and (b) have a minimum of five years of working experience in the field of special education. The reason behind implementing these inclusion criteria is that educators or speech therapists with experience in special education and who have interacted with children with complex communication needs would have a profound understanding of the challenges these children encounter daily and would judge 'MySuara' app wisely.

Instrument

The usability assessment questionnaire for 'MySuara' was developed by adapting two different questionnaires. The first questionnaire was adapted from Parsazadeh et al. (2018), and the other from Marcial et al. (2018). Both of these questionnaires were developed based on the PACMAD (People At the Centre of Mobile Application Development) mobile usability model by Harrison et al. (2013). Parsazadeh et al. (2018) developed a reliable questionnaire with a Cronbach's α value of 0.95 that consists of 42 items with a 5-point Likert scale to assess the usability of a mobile-learning application called Cooperative and Interactive Mobile Learning Application (CIMLA). The second questionnaire used in the study consists of 33 items and utilises a 4-point Likert scale to evaluate the usability of a mobile application called 'mClassRecord'. Before incorporating these two questionnaires, the permissions were obtained from the respective authors through email. The questionnaires were then individually analysed to determine their compatibility with the characteristics of the 'MySuara' application. Inappropriate items were removed during the analysis process. The remaining items were evaluated to decide whether they should be accepted as they are or modified. The selection process involved choosing questionnaire items that aligned best with the PACMAD attributes and definitions provided by Harrison et al. (2013) and were most suitable for assessing the usability of the 'MySuara' mobile application. Finally, these chosen items were adapted and combined to create the Augmentative and Alternative Communication Usability Questionnaire (AACUQ) to be used in this study.

The initial version of the adapted AACUQ questionnaire included 41 items, utilising a five-point Likert scale. Babakus and Mangold (1992) advocated the implementation of a five-point Likert scale due to its potential to mitigate respondent frustration, elevate response rates, and enhance the quality of responses. Furthermore, Parsazadeh et al. (2018) adopted a similar scale in their questionnaire, lending additional support to its efficacy. Consequently, a fixed 40-item questionnaire employing a five-point Likert scale was developed to evaluate the usability of the 'MySuara' application.

The AACUQ questionnaire underwent face and content validity evaluations. Face validity, as Johnson (2021) explains, refers to how well a test appears to measure its intended purpose, with strong face validity meaning its items assess the intended skills. Two experts in special education and educational technology reviewed the questionnaire, leading to the deletion of two items and the addition of one measuring overall satisfaction. The revised questionnaire, now consisting of 40 items, was then subjected to content validity assessment.

Content validity is essential in research, ensuring an instrument accurately measures its intended construct (Polit & Beck, 2006). It denotes the degree to which an assessment's elements are relevant to and represent the targeted construct (Mason et al., 2020). Three expert panels rated the relevance and representativeness of each item in the AACUQ questionnaire, scoring all 40 items as 3 or 4. Consequently, the content validity index (CVI) is reported as one, indicating the AACUQ questionnaire is highly valid.

The AACUQ questionnaire was administered using Google Forms, facilitating efficient distribution and data collection. The AACUQ questionnaire form comprises three distinct sections. Firstly, participants were presented with a consent form. Next, a demographic section was included to gather general information about the participants. Lastly, the questionnaire encompassed 40 items, necessitating participants to respond to each of the presented queries.

Ethical Consent

As an integral component of a doctoral thesis, this study underwent a rigorous ethical evaluation process. As a result, ethical approval was sought from the esteemed Universiti Sains Malaysia and subsequently granted under the reference number USM/JEPeM/21080539. The obtained approval ensures that the study adheres to the established ethical guidelines and safeguards the welfare and rights of the participants involved.

Data Analysis Method

Before conducting the field test, explicit consent was obtained from all participants, ensuring adherence to ethical research standards. The researcher provided a comprehensive demonstration of the 'MySuara' app to familiarise participants with its functionalities before they engaged in individual app testing. After 20 minutes of app exploration, participants were given a link to access the AACUQ questionnaire through Google Forms. Remarkably, participants demonstrated efficiency in completing all three questionnaire sections within a time frame of less than 20 minutes.

The responses obtained from the participants were subsequently transferred to a Microsoft Excel spreadsheet for efficient data management. The collected data underwent a meticulous cleaning process to facilitate further analysis using the Statistical Package for Social Sciences (SPSS) software. Statistical measures such as the mean and standard deviation were computed to gain insights from the cleaned data. The outcomes of this analysis are presented in the Results section of this study.

RESULTS AND FINDING

The AACUQ usability questionnaire was employed to answer the research objective of this study using 14 participants. The participants' demographic data are shown in Table 1, while the data collected from all fourteen participants were analysed and reported in Table 2.

Table 1: Demographic data of participants

Occupation	Gender	Working Experience	Experience working with complex communication needs	Experience working with AAC applications (eg. Proloque2Go)
Teacher	Female	11	More than 10 years	Never
Teacher	Female	11	6-10 years	More than 1 year
Teacher	Female	8	6-10 years	Less than 1 year
Teacher	Female	15	6-10 years	Never
Teacher	Female	12	More than 10 years	Never
Teacher	Female	13	Less than 1 year	Never
Teacher	Female	23	More than 10 years	Never
Teacher	Female	14	Never	Never
Teacher	Female	22	6-10 years	Never
Teacher	Female	23	less than 1 year	Less than 1 year
Teacher	Female	23	More than 10 years	Never
Teacher	Male	8	6-10 years	Never
Speech Therapist	Female	7	6-10 years	More than 1 year

continued

Speech Therapist	Female	5	1-5 years	More than 1 year

The usability of the MySuara mobile application was assessed through the evaluation of eight attributes: effectiveness, efficiency, satisfaction, learnability, memorability, error handling, cognitive load, and timeliness. These attributes were examined using the AACUQ questionnaire, which utilised a 5-point Likert scale. A rating of 5 on the Likert scale indicates strong agreement with the usability statements, a rating of 4 represents agreement, and a rating of 3 indicates slight agreement. Conversely, a rating of 2 indicates disagreement and a rating of 1 signifies strong disagreement with the usability statements in the AACUQ questionnaire.

Table 2: Results of descriptive analysis of AACUQ usability questionnaire

Attribute	**Questionnaire Items**	**N**	**Mean**	**Std. Deviation**
Effectiveness	1) I think teachers can interact with their students with complex communication needs using 'MySuara'.	14	4.36	0.633
Effectiveness	2) I think teachers can successfully accomplish the desired communication with their students using 'MySuara'.	14	4.14	0.535
Effectiveness	3) 'MySuara' works as a communication modelling tool.	14	4.50	0.650
Effectiveness	4) 'MySuara' could help improve communication between students and teachers.	14	4.64	0.497
Mean of Effectiveness			4.41	
Efficiency	5) 'MySuara' may allow students to build sentences as modelled by the teacher.	14	4.29	0.914
Efficiency	6) Students with CCN can communicate and progress by phases using 'MySuara' promptly.	14	4.36	0.842
Efficiency	7) Teachers could communicate well with their students without waste of effort and time.	14	4.21	0.802
Mean of Efficiency			4.29	
Satisfaction	8) I think it is comfortable to use 'MySuara'.	14	4.29	0.825
Satisfaction	9) Using 'MySuara' during the teaching and learning process will be a pleasant experience.	14	4.29	0.825
Satisfaction	10) 'MySuara' makes teaching tasks more interesting.	14	4.71	0.611
Satisfaction	11) Teaching with 'MySuara' will be fun.	14	4.79	0.579
Satisfaction	12) Teachers will like teaching with 'MySuara'.	14	4.57	0.646
Mean of Satisfaction			4.53	
Learnability	13) Becoming proficient 'MySuara' user is easy.	14	4.29	0.611
Learnability	14) 'MySuara' is easy to learn.	14	4.50	0.650
Learnability	15) I think 'MySuara' has a user interface that is easy to understand.	14	4.36	0.842
Learnability	16) It is easy for me to become skilful using 'MySuara'.	14	4.36	0.633
Learnability	17) I find 'MySuara' easy to use.	14	4.50	0.855

continued

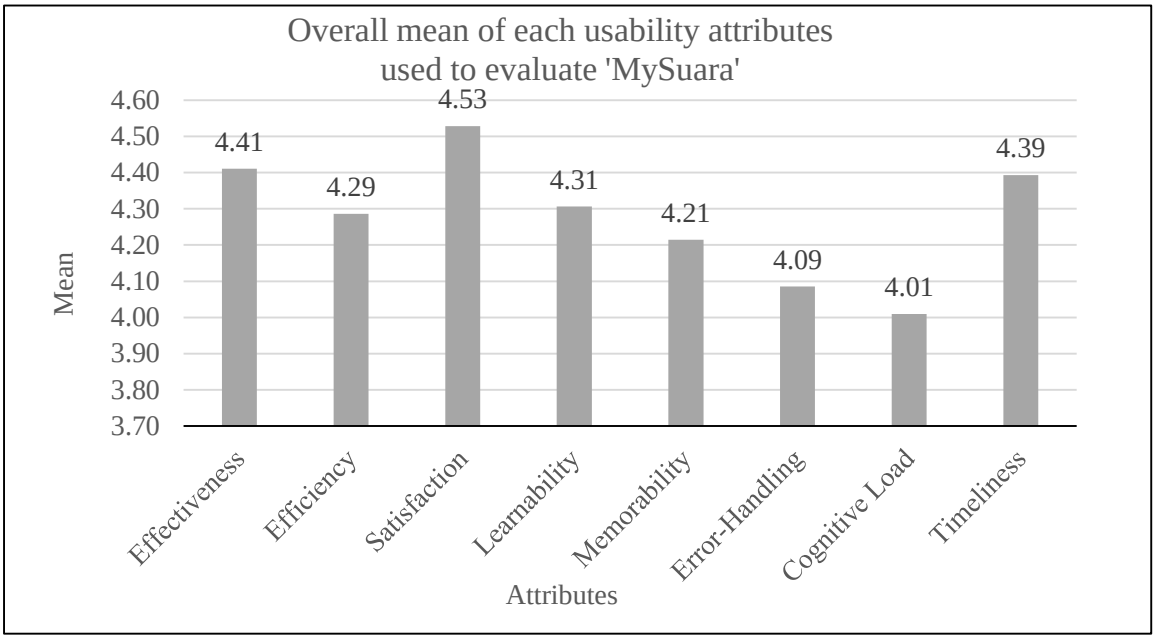
Learnability	18) Learning to operate 'MySuara' is easy for me.	14	4.50	0.650
Learnability	19) I think I may need the technical support to be able to use 'MySuara'.	14	3.64	1.082
Mean of Learnability			4.31	
Memorability	20) It is easy to recall the process of using 'MySuara'.	14	4.21	0.579
Memorability	21) It is easy to remember how to use 'MySuara' without the need to relearn it.	14	4.14	0.535
Memorability	22) I can leave 'MySuara', and when I return to it, I still can remember how to use it.	14	4.29	0.726
Mean of Memorability			4.21	
Error-Handling	23) I am able to recover easily from errors.	14	4.00	0.784
Error-Handling	24) The errors I encountered are manageable.	14	4.00	0.784
Error-Handling	25) Mitigating the errors is easy.	14	4.14	0.663
Error-Handling	26) When I 'log in' using the wrong identification 'MySuara' provides proper feedback.	14	4.14	0.663
Error-Handling	27) When I encounter an error, I can 'logout' of 'MySuara' at any time and easily return to the right level in the application.	14	4.14	0.663
Mean of Error-Handling			4.09	
Cognitive Load	28) The operating process in 'MySuara' is not demanding.	14	3.43	0.852
Cognitive Load	29) 'MySuara' does not give me any stress while working on it.	14	3.86	0.949
Cognitive Load	30) Working with 'MySuara' is very relaxing.	14	4.14	0.535
Cognitive Load	31) The pace of the operation in 'MySuara' is adequate.	14	4.14	0.535
Cognitive Load	32) I am not irritated when I use 'MySuara'.	14	3.93	1.207
Cognitive Load	33) I am not stressed when I use 'MySuara'.	14	4.14	0.864
Cognitive Load	34) 'MySuara' is not annoying.	14	4.29	0.611
Cognitive Load	35) To use 'MySuara', I don't need to utilise much of my mental ability.	14	4.14	0.535
Mean of Cognitive Load			4.01	
Timeliness	36) When the students tap and respond using 'MySuara', teachers could see the responses immediately.	14	4.43	0.646
Timeliness	37) When students respond to the steps that have been modelled using 'MySuara', teachers could see their responses at the appropriate time.	14	4.36	0.633
Timeliness	38) I can correct the wrong responses almost instantaneously in 'MySuara'.	14	4.36	0.633
Timeliness	39) 'MySuara' is accessible at any time in classrooms.	14	4.43	0.646
Mean of Timeliness			4.39	

continued

40) Overall, I am satisfied with the 'MySuara' application.	14	4.43	0.852

Participant feedback on the usability of the MySuara mobile application is measured by the AACUQ questionnaire using the eight usability attributes. Feedback from participants is quantitatively assessed by computing the standard deviation, mean values for each usability question, and overall mean for all questions within each attribute. The findings are discussed in descending order of the overall mean value of each attribute, effectively ranking the attributes from highest to lowest. Figure 1 shows the overall mean value of each attribute used to measure the usability of the 'MySuara' mobile application.

Figure 1: Overall mean of each attribute



Satisfaction

Satisfaction takes the top spot among the eight attributes, with an overall mean score of 4.53 based on five questions (Q8-Q12). Furthermore, the individual mean scores for each question within this attribute range from 4.29 to 4.79, suggesting that a significant number of participants strongly agree with this attribute. The findings imply that users find the 'MySuara' mobile application enjoyable and user-friendly, providing a sense of comfort.

Effectiveness

The effectiveness attribute was evaluated using four questions (Q1-Q4), as indicated in Table 2. The mean scores for these questions vary from 4.14 to 4.64, indicating that a substantial number of participants agree with the effectiveness of the 'MySuara' application. According to the bar chart presented in Figure 1, effectiveness is the second most accepted attribute among participants, with an an overall mean score of 4.4. This suggests that participants hold the belief that the 'MySuara' mobile application effectively enhances teacher-student interaction in the classroom.

Efficiency

The efficiency of the mobile application was evaluated through three questions (Q5-Q7). The average scores for these questions are 4.29, 4.36, and 4.21, resulting in an overall mean score of 4.29. This places the attribute in fifth position. The findings indicate that participants believe the 'MySuara' application allows teachers to guide their students effortlessly using appropriate modeling techniques.

Timeliness
The attribute of timeliness, which evaluates the application's responsiveness, stands out as the third highest-rated aspect. Four questions (Q36-Q39) were posed to assess this attribute, yielding mean scores ranging from 4.36 to 4.43. These scores indicate a general consensus among participants regarding the attribute of timeliness. The overall mean score for this attribute is 4.39, clearly demonstrating that the 'MySuara' mobile application promptly and effectively responds to user input.

Learnability
This attribute evaluated the learnability of the 'MySuara' mobile application using seven questions (Q13-Q19). For six of these questions, the mean scores ranged from 4.29 to 4.50. However, one question specifically focused on technical support, resulting in a mean score of 3.64. This lower score can be attributed to the negative nature of the question. The mean score of 3.64 indicates that teachers do not require much support to learn the operational process of the mobile application. Consequently, it can be inferred that participants can easily grasp the functionality of the 'MySuara' mobile application.

Memorability
To assess the memorability of the mobile application, three questions (Q20-Q22) were utilised. This attribute plays a crucial role in determining the usability of an application, as participants may be reluctant to accept an application that requires strenuous recollection and remembering of steps. According to the data presented in Table 2, the mean scores for each question range from 4.14 to 4.29, with an overall mean of 4.21 for the three questions. These results suggest that the 'MySuara' mobile application is relatively easy to recall and remember, indicating its favorable memorability.

Error-Handling
The attribute of error handling is another aspect of usability evaluated in the study. Five questions (Q23-Q27) were employed to assess this attribute. The mean score for each question falls within the range of 4.00 to 4.14, while the overall mean score for all five questions is 4.09. These findings suggest that participants are capable of effectively managing the errors they encounter while using the 'MySuara' mobile application.

Cognitive Load
The attribute of cognitive load receives the lowest rating, with an average mean score of 4.01 across eight questions. The mean scores for these eight questions range from 3.43 to 4.29. Interpreting these mean values indicates that participants generally perceive that using the 'MySuara' mobile application does not demand significant cognitive effort.

The final question assesses the overall satisfaction with the 'MySuara' application, yielding an average score of 4.4. This result indicates that participants generally express satisfaction with the 'MySuara' application.

DISCUSSIONS, LIMITATIONS AND CONCLUSIONS

The usability of the 'MySuara' app was tested using the mobile learning application usability model, which combines seven PACMAD attributes with timeliness. The eight attributes used to assess ‘MySuara’ include timeliness, effectiveness, efficiency, satisfaction, learnability, memorability, error handling, and cognitive load. The results of this study indicate that the 'MySuara' app has achieved a good level of usability, as evidenced by the participants' mean scores for each attribute being above 4.0. Among these attributes, satisfaction ranked the highest, suggesting a strong likelihood of user acceptance for the 'MySuara' app. The user's attitudes and feelings determine satisfaction, and it refers to the extent to which the user feels comfortable and pleased with the use of an application (Harrison et al., 2013; Weichbroth, 2020). Therefore, it can be concluded that participants were comfortable and pleased with ‘MySuara’ app. The attribute

ranked as the second highest is effectiveness. Effectiveness pertains to the application's ability to accomplish tasks with accuracy and efficiency, enabling users to achieve their goals effectively. By employing four questions to evaluate this usability attribute of the 'MySuara' app, it can be deduced that participants perceive the app as a tool that facilitates effective communication with their students.

The attribute that garnered a third-place ranking is timeliness. It evaluates the app's ability to provide timely and prompt responses or information to users, ensuring that users can accomplish their tasks within the desired time frame. Timeliness Participants unanimously agreed that the 'MySuara' app successfully provided timely responses, meeting their expectations in promptness. Learnability refers to the app's ease of learning and the user's ability to acquire proficiency in its usage (Harrison et al., 2013). Learnability attained the fourth highest ranking among the attributes that participants agreed upon the most. Based on the feedback gathered, it can be conjectured that participants found the 'MySuara' app to be easily understandable and user-friendly, allowing them to learn quickly. Efficiency is another crucial usability attribute that evaluates the app's ability to complete tasks with speed and accuracy. Efficiency received a commendable rank in the assessment. Participants unanimously agreed that the 'MySuara' app demonstrated efficient performance, allowing them to communicate with their students quickly and accurately.

The ranking's sixth, seventh, and final attributes are Memorability, Error-Handling, and Cognitive Load, respectively. The memorability of a usability assessment refers to how easily and effectively users can remember how to use a system or interface after an initial interaction or training. A highly memorable design allows users to quickly recall and understand how to perform tasks or navigate the system without extensive relearning or assistance. It assesses the long-term effectiveness of a design by examining whether users can remember how to use the system after a period of time or absence from the interaction (Harrison et al., 2013). Based on the findings of the usability assessment regarding memorability, it can be concluded that 'MySuara' exhibits a positive tendency towards being easily remembered and retained by users. Error handling plays a crucial role in ensuring the optimal usability of mobile apps. It encompasses the application's ability to effectively manage errors and unforeseen situations that may arise during user interactions. The results of the usability assessment conducted on the error handling attribute of the 'MySuara' app suggest that it has been designed and implemented with a highly effective error-handling mechanism. Cognitive load refers to the cognitive processing required by users to use an application effectively. Regardless of the last ranking, this attribute was rated in the findings; the overall mean score indicates that participants agree that 'MySuara' can reduce the cognitive load while being in use. Cognitive load encompasses the cognitive processing demands placed on users to use an application effectively. Notwithstanding its position in the ranking, the overall mean score suggests that participants concur that 'MySuara' can reduce cognitive load during usage.

CONCLUSION

The usability assessment of the 'MySuara' app using the mobile learning application usability model attributes indices a good level of usability. Participants gave positive evaluations with mean scores above 4.0 for each attribute. Satisfaction ranked the highest, followed by effectiveness, timeliness, learnability, and efficiency, indicating user acceptance and comfort, usefulness, promptness, ease of learning, and task efficiency. Memorability, error handling, and cognitive load received lower rankings but showed positive tendencies. 'MySuara' demonstrated potential for being easily remembered, effective error handling, and reduced cognitive load during usage. Overall, the findings suggest that 'MySuara' is a usable app in various aspects.

Limitations

The study design had certain limitations, including a small sample size of only 14 participants. These limitations arose from the challenge of finding an adequate number of special education-related personnel who met the specific inclusion criteria. As a result, the study's findings may be limited in their ability to

generalise to the broader population. Relying solely on quantitative findings does not offer a comprehensive assessment of the overall usability of the 'MySuara' app. It is crucial to incorporate qualitative reports better to understand the flaws and potential areas for app improvement. Conducting interview sessions with the participants would allow researchers to explore their perceptions, experiences, and insights regarding the 'MySuara' app. A more comprehensive and nuanced evaluation of the app's usability can be achieved by combining quantitative data with qualitative feedback.

Notably, this study did not report the reliability of the instrument used. As the study is part of a doctoral thesis, the primary focus was evaluating the app's efficacy rather than conducting a comprehensive usability assessment. Therefore, only face and content validity assessments were performed, which may not fully ensure the instrument's robustness. Additionally, expert reviews were used to enhance the questionnaire's quality due to the involvement of a hard-to-access population, such as special educators and speech therapists. While these reviews provide valuable insights, they serve as an alternative to pilot testing constrained by limited resources. This limitation might affect the overall reliability and generalizability of the findings.

Implications

The study conducted on 'MySuara' yields valuable insights regarding the app. Users exhibit a general sense of satisfaction and perceive the app as useful, indicating a high likelihood of user acceptance and adoption. Furthermore, the study highlights the app's strengths in terms of effectiveness, timeliness, learnability, and efficiency. Users find the app is beneficial for effective communication with their students and accomplishing tasks promptly and accurately. However, certain areas need improvement, including enhancing the app's memorability and error-handling capabilities and reducing the cognitive load required for its usage. The ‘MySuara’ app can be further enhanced by addressing these areas, providing a smoother and more user-friendly experience. In summary, the study implies that 'MySuara' demonstrates potential, but ongoing development and updates are essential to address usability concerns and optimise the app's appeal and usability.

REFERENCE

Alturki, R., & Gay, V. (2017). Usability testing of fitness mobile application : Methodology and quantitative results. *Computer Science & Information Technology (CS & IT)*, *7*(11), 97–114. https://doi.org/10.5121/csit.2017.71108

Babakus, E., & Mangold, W. G. (1992). Adapting the SERVQUAL scale to hospital services: An empirical investigation. *HSR: Health Services Research*, *26*(6), 767–786. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC1069855/pdf/hsresearch00075-0070.pdf

Comai, S., De Bernardi, E., Salice, F., & Vali, A. (2019). Maps for Easy Paths (MEP): A mobile application for city accessibility. *Mobile Solutions and Their Usefulness in Everyday Life*, 105–125. https://doi.org/10.1007/978-3-319-93491-4_6

Harrison, R., Flood, D., & Duce, D. (2013). Usability of mobile applications: Literature review and rationale for a new usability model. *Journal of Interaction Science*, *1*, 1–16. https://doi.org/10.1186/2194-0827-1-1

Hussain, A., Mkpojiogu, E. O. C., Musa, J., & Mortada, S. (2017). A user experience evaluation of Amazon Kindle mobile application. *In AIP Conference Proceedings*, (Vol 1891, No 1). https://doi.org/10.1063/1.5005393

Joginder Singh, S., Hussein, N. H., Mustaffa Kamal, R., & Hassan, F. H. (2017). Reflections of Malaysian parents of children with developmental disabilities on their experiences with AAC. *Augmentative and Alternative Communication*, *33*(2), 110–120. https://doi.org/10.1080/07434618.2017.1309457

Johnson, E. (2021). Face Validity. In F. R. Volkmar (Ed.), *Encyclopedia of Autism Spectrum Disorders* (p. 1957). Springer International Publishing. https://doi.org/10.1007/978-3-319-91280-6_308

Marcial, D. E., Montenegro, C. S., Ubarre, R. B., Rivera, M. A. C., Yao, M. S., & Katada, F. M. G. (2018). Development of an Android-based class record for teachers. *International Jounal of Scientific Engineering and Science*, *2*(4), 83–90. http://www.davemarcial.net/uploads/1/4/0/1/14014636/usability-mclassrecord_final-after.pdf.

Mason, J., Classen, S., Wersal, J., & Sisiopiku, V. P. (2020). Establishing face and content validity of a survey to assess users' perceptions of automated vehicles. *Transportation Research Record*, *2674*(9), 53–547. https://doi.org/10.1177/0361198120930225

Parsazadeh, N., Ali, R., Rezaei, M., & Tehrani, S. Z. (2018). The construction and validation of a usability evaluation survey for mobile learning environments. *Studies in Educational Evaluation*, *58*, 97–111. https://doi.org/10.1016/j.stueduc.2018.06.002

Polit, D. F., & Beck, C. T. (2006). The Content Validity Index: Are You Sure You Know What's Being Reported? Critique and Recommendations. *Research in Nursing & Health*, *29*(5), 489–497. https://doi.org/10.1002/nur

Radici, E., Bonacina, S., & De Leo, G. (2016). Design and development of an AAC app based on a speech-to-symbol technology. *In 38th Annual International Conference of the IEEE Engineering in Medicine and Biology Society (EMBC)*, 2574–2577. https://doi.org/10.1109/EMBC.2016.7591256

Weichbroth, P. (2020). Usability of mobile applications: a systematic literature study. *IEEE Access*, *8*, 55563–55577. https://doi.org/10.1109/ACCESS.2020.2981892

Weng, P. L. (2015). Developing an app evaluation rubric for practitioners in special education. *Journal of Special Education Technology*, *30*(1), 43–58. https://doi.org/10.1177/016264341503000104

Zali, Z., & Fadzlah, A. F. A. (2016). An Initial Theoretical Usability Evaluation Model for Assessing Defence Mobile E-Based Application System. *International Conference on Information and Communication Technology (ICICTM)*, *May*, 198–202.

Zhang, D., & Adipat, B. (2005). Challenges, methodologies, and issues in the usability testing of mobile applications. *International Journal of Human-Computer Interaction*, *18*(3), 293–308. https://doi.org/10.1207/s15327590ijhc1803