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An Investigation on Learning Performance among Disabled People Using Educational Multimedia Software: A Case Study for Deaf People

Ananthi Krishnasami Masitry[1], Mazlina Abdul Majid[1], M. Zulfahmi Toh[1], Sutarman[1,2] and Tutut Herawan[3]

[1]Faculty of Computer Systems and Software Engineering
Universiti Malaysia Pahang
Lebuhraya Tun Razak, 26300 Kuantan Pahang, Malaysia
[2] Department of Bussiness and Information Technology
Universitas Teknologi Yogyakarta
Jl. Ringroad Utara, Jombor, Sleman, Yogyakarta 55285 Indonesia
[3]Department of Mathematics Education
Universitas Ahmad Dahlan
Jln. Prof Dr Soepomo, Yogyakarta, 55166 Indonesia
ananthi@shahputra.edu.my, {mazlina, zulfahmi}@ump.edu.my, sutarman@uty.ac.id, tutut@uad.ac.id

Abstract

The increasing number of people with hearing-impaired in Malaysia attracts to produce a variety of technologies, which can assist the deaf people in carrying out their tasks in everyday life as normal people. New technology can help to decrease the difficulty that hearing-impaired people faces in daily life to use the information services like normal people. Thus, this paper focuses on: i) developing a new multimedia courseware for pre-school students with hearing problem, and ii) comparing the deaf student's learning performance before and after using the courseware. Four modules were developed for e-MSL courseware consist of alphabets, numbers, words and quizzes with colorful text, animation, sounds, video and pictures using Malaysian Sign Language (MSL). Sekolah Rendah Pendidikan Khas (SRPK) Indera Mahkota II, Kuantan has been chosen as the case study for data collection and for investigating the student learning performance on the courseware. The survey results show that 100% of the respondents have agreed that using e-MSL courseware managed to reduce the student learning time more than 80%. The result has indicated that students have shown better learning performance using e-MSL compared to traditional learning.

Keywords: *Education software; Malaysian Sign Language; Hearing-impaired people; Learning performance*

1. Introduction

The deaf differentiate themselves from hearing-impaired individuals. Deafness is the complete loss of the ability to hear from one or both ears which can be inherited or caused conditions during birth, infectious diseases and medications [1]. The hearing-impaired are likely to wear hearing aids, and are capable of communicating through the spoken language. The growing numbers of a group of people with deafness in Malaysia

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make the researcher focus to produce a variety of technologies, which can help the deaf people to do their job in daily life as regular as public people.

Deaf children still have the difficulties on reading in the adulthood. Moreover, reading levels of deaf children is lower than the reading level of hearing student. In 1996, [2] have confirmed that their learning progress is extremely slow. The reading capability of the deaf children is parallel to the reading likely of 8 to 9 years-old hearing child. As a result, the gain of knowledge collected by deaf children in four years is equivalent to the gain of one year for hearing [2]. The promise to give the best educational method to deaf or hard program for deaf to hearing student guidelines for quality standards is created by the California Department of education in 2000 [3].

There are still deaf people facing complexity when they want to adapt themselves with the new technology especially with computers. The new technology can help to decrease the difficulty that deaf people faces in daily life to use the information services like other ordinary people without any disability [11]. Main reason for this difficulty is because deaf people may have several problems with hearing and seeing

The natural language for the deaf people is sign language. According [4], sign language is a very important language of movement of the hands and eyes which communicate with iconic narration. Children with the learning disabilities often find difficulty and painful in the learning process. Knowledge of learning disability is defined as a specific kind of learning problem. In daily life, the deaf children will face difficulty when they are going through the process of reading, writing and listening. Learning disabilities between deaf children and other type of disability children may not be same; in fact, they might have different kinds of learning problems.

The usage of ICT can develop the classic educational method by new educational learning methods based on multi-media contents. Current problem is how far the helpfulness of the current education multimedia application can be used suitably and attractive for students' disabilities. It supposed to have an example to introduce elements to assist the disability student to feel more attractive to use this educational multimedia application. Interactive multimedia software can develop the knowledge between disabilities students with a purpose to support them to learn and feel enjoyable without stress. With Using the manual system in the special schools for disabilities students the teachers can only introduce the word, number, color and other through the book. This method may not represent this disabilities student's interest to learn more and they will feel difficult to understand. On the other hand, this interactive multimedia application might help these students to capture the words easily, and it is interesting to learn.

The rest of this paper is organized as follows. Section 2 describes the literature review on multimedia technology for deaf people. Section 3 describes the methodology used to develop this project. Section 4 describes the experiment results and discussion. Finally, the conclusion of this work is described in Section 5.

2. Literature Review

2.1. Sign Language

The term sign language is similar to the language term, there are many of both spread in various territories of the world. Just like the language, sign language developed in a long time, has a sign language grammar and vocabulary, so it is considered a real language [10]. The difference between sign language and common language is on the method to communicate/articulate information. Because no sense of hearing is required

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to understand sign language and no voice is required to produce it, it is the common type of language among deaf people [5].

2.2. Malaysian Sign Language

Sign Language is a gesture language which visually transmits sign patterns using hand shapes, orientation and movements of the hands, arms or body, facial expressions and lip-patterns to convey word meanings instead of acoustic sound patterns. Different sign languages exist around the world, each with its own vocabulary and gestures.

At Malaysia, standard sign language is Malaysian Sign Language used as an everyday communication for deaf community. Malaysian Sign language has different dialect based on the state at Malaysia. In Penang, this sign language called as Penang Sign language (PSL) [6], and this was mostly exploited by the elder people. Selangor Sign Language (SSL) [6] as well recognize as Kuala Lumpur Sign language (KLSL). Selangor Sign Language is original from America Sign Language (ASL), where some of the sign symbol from America Sign Language (ASL) use to develop the Malaysian Sign Language (MSL) with the certain sign is different from the American Sign Language because of the cultural and social norms in Malaysia.

2.3. Multimedia technology for Deaf People

The growth of the multimedia technology and network technology, multimedia network education has become an expected development [7]. Multimedia is a good communication tools education society with its own characteristics [3]. Multimedia authoring tools were originally developed more than 20 years ago to help non-programmers develop multimedia presentation, especially in the area of education [8]. According [9], multimedia technology can involve the computer presentation of multiple media format (*e.g.*, text, pictures, sounds, video, *etc.*,). Deafness is the complete loss to hear from one or both ears, which can be inborn or happens by condition during birth, infectious diseases, and medications.

3. Methodology

Waterfall model has five phases has been illustrated as planning and data gathering, analysis, design, implementation, and testing. At the phases planning and data gathering, data collected to study the problems faced by preschool students from SKPK Indera Mahkota II to understand the sign language. Researcher prepares the questionnaire survey to collect the functions and features of the courseware chosen by the users. The data gathered from questionnaire and observation used to develop the features and function of e-MSL courseware. The researcher constructed questioners for the teachers who teach the deaf students and also for deaf students. Based from the collected data, the researcher developed Electronic Malaysia Sign Language software application. The third phase is testing; in this phase the users (deaf students and teachers) will test this application, fine errors, give comments, and give suggestions for further improvement.

3.1. Questionnaire Survey

Questionnaire has been distribute to the users to understand the requirements of the system, questionnaires have been distributed after researcher gets online permission from Educational Research Application System (eRAS). Ministry of Education Malaysia and Ministry of Education Pahang. The users are teachers and preschool deaf students of Sekolah Rendah Pendidikan Khas (SRPK) Indera Mahkota II. Questionnaire more helpful than other methods

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in based collecting necessary data [11]. When hand out the questionnaires survey to the teachers who teaching the hard hearing preschool students, it much more easier to get the data from them and understand their problem and what the necessary function and features need to include into the new courseware. Hand out the questionnaires better then interview the teachers one by one. The questionnaire survey divided into three parts: Part A: get demographic information such as gender, age group, races and professional title, Part B: collect the information for the background knowledge and experience on sign language, Part C: to identify the functions and features that a sign language learning system should present.

3.2. Questionnaire Analysis

Five teachers from this school were responded and collected for analysis and respectively are used for data analysis. All respondents were given hands-on sessions to use e-MSL before developing the system. The table 1 show the age group of the teacher's in the group around 31 to 40 years old (80%) and 1(20%) age group of the teacher's in the group around 21 to 30.

Table 1. Age Group of the Respondent from SRPK Teachers

Age Group	SRPK Kuantan School Teachers	Percentage (%)
1 – 30	1	20
31 – 40	4	80
41 and above	0	0

Table 2 shows the teachers' experienced in learning the sign language in the Sekolah Rendah Pendidikan Khas (SRPK) Indera Mahkota II, Kuantan. Five respondents (100%) said that they used to sign language MSL (Malaysian Sign Language) during teaching. Five respondents (100%) also communicate with the deaf students. Five respondents (100%) learn sign language books. Five respondents (100%) learn sign language using sign language learning software and five respondents (100%) learn sign language based on multimedia design as multimedia design learning package.

Table 2. Experienced in Learning Sign language

	Yes	Percentage (%)	No	Percentage (%)
Using sign language MSL (Malaysian Sign Language)	5	100	0	0
Do you learn sign language based on sign based on sign language books	5	100	0	0
Do you learn sign language using sign language learning software	5	100	0	0
Do you learn sign language based on multimedia design learning language	5	100	0	0

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3.3. Observation

In order to understand the preschool deaf student and their education, an observation of the current teaching method was carried out at the Sekolah Rendah Pendidikan Khas Indera Mahkota II (SKPK) Kunatan. Since preschool deaf students are the target group for this learning language, the observation was conducted during school time. The observation has takes place at their classroom therefore the researcher can identify how the students interact with the courseware.

3.3.1. Analysis: During this phase, the analysts thoroughly study by manual using the flash cards more effective or learning by using the courseware. Researcher has prepared questionnaires for the teacher. The questionnaires survey is prepare to recognize the basic functions and features that must be included to develop this e-MSL courseware. This phase also determine the software and hardware requirements that using to develop the application.

Analyses show that the function and features that must be provided in a Sign Language learning courseware are contents of a sign language learning courseware, function of sign language learning courseware and features of a sign language learning package. These opinions are expressed by 100 (100%) responded respectively, as shown in Table 3.

Table 3. Function and Features of a Sign Language Learning Courseware

	Alphabets	Numbers	My class		
Contents of a sign language courseware	5 (100%)	5 (100%)	5 (100%)		
	Provides instruction in English	Quiz			
What should be the function of a sign language courseware	5 (100%)	5 (100%)			
	Text	Images	Animation	Video clips	Audio
What should be the features of a sign language courseware	5 (100%)	5 (100%)	5 (100%)	5 (100%)	5 (100%)

3.3.2. Comparing E-MSL with the Current Learning Method (Flash Cards): In this section researcher has compare the E-MSL courseware with the current learning method. The data was collected from the questionnaire and the observation survey conducted at Sekolah Rendah Pendidikan Khas (SRPK) Indera Mahkota II, Kuantan. The questionnaire involve are teachers and the observation three students from this preschool involve. The Figure 1: shows the comparing E-MSL with current learning method. The current learning method using by the teachers who teaching this preschool use flash cards to show them the sign symbol. At this section also describe how the students recognize the sign, the learning process, how they provide the exercise and usage of the traditional learning methods and the e-MSL courseware. During design phase section described a screen shoot of educational multimedia software design for deaf people.

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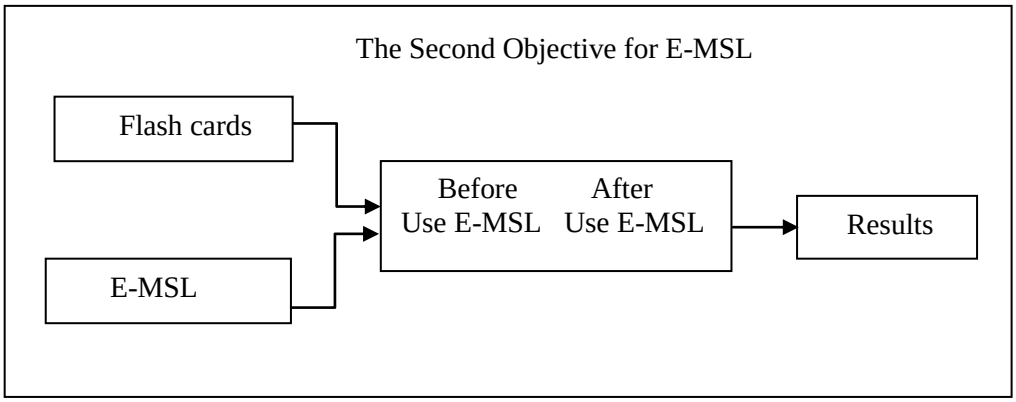

Figure 1. Comparing MSL with the Flash Cards

Figure 2 illustrate the four module of Electronic Malaysian Sign Language (e-MSL). Four Modules at this screen are Alphabets, Numbers, Words and Quiz. User can select any of the modules to enter into.

Figure 2. Display the Main Menu

Figure 3 shows the user interface design of the Alphabets interface. User can select A to Z. When user chooses the Alphabets, it will display the colorful alphabets, MSL sign, picture and the video clips. User can click "home" button to enter into Main Menu interface and click "exit" button to into Home Page.

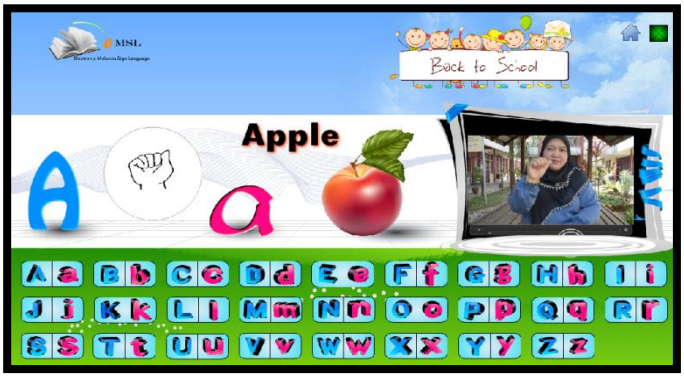

Figure 3. Display the Alphabets Screen

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4. Experimentation Results and Discussion

The e-MSL application is a standalone system application. This courseware can be installed and run in the personal computer or notebook. The first assessment method chosen to collect data in e-MSL is by using a questionnaire survey, mainly because it is the most suitable method to collect information. The second assessment method chosen in e-MSL courseware was by conducting observation. For the observation, three deaf students from Sekolah Rendah Pendidikan Khas Indera Makhota II have been chosen. The testing for the system has been done in a very small iteration for every module.

After their respond from the questionnaires have been analyzed, the courseware was developed. This is the result obtained after the actual courseware development incorporated. A total of ten sets of evaluation forms have been distributed to the school. Only five of the questionnaire forms was collected from the responded was given the assessment on e-MSL that the researcher distributes to the teacher. The questionnaire collected from the teacher who teaching this preschool students at Sekolah Rendah Pendidikan Khas (SRPK) Indera Mahkota II.

The conclusion that can be made from this survey and analysis is from the data collected from the questionnaires, the responses from the teachers about e-MSL courseware showed that they really enjoyed and interested in this courseware. A total of hundred (100%) responded agreed that sign language as correct sign image of word using picture, suitable foreground and background screen color, navigation from one screen to other screen is easy and video function responded. The teachers also responded hundred (100%) that e-MSL (Malaysian Sing Language) can be recommended to other people. There were two responded (40%) and three responded (60%) agreed with the text is clear and easy to read, wording are readable clear and the interface design is attractive. The teachers also responded that courseware would be the best medium to ensure learning for deaf children to be more convenient, interesting and interactive. The respondents also think that alphabets, numbers and simple words should be included in the software. The function of this software is to provide instruction in English, quiz and the features include all the multimedia elements such as text, image, animation and video clips. At last based on the questionnaire results and literature review, it has been confirmed that children are able to learn more from animations compared to static images and it will help to make longer a child's attention distance.

4.1. Observation Results

Through observation, the students' performances were evaluated based on the result before and after they have used the e-MSL courseware. The observation was conducted in Sekolah Rendah Pendidikan Khas Inderah Mahkota II on 8th of May 2013 during preschool class. There were three students in total and they are six years old. The teaching was conducted by the teacher who has teaching experience for 5 years for hearing-impaired students. There are two types of observation that have been done by the researcher: i) teaching deaf student's by traditional learning, ii) using the e-MSL courseware.

This is where teaching deaf student by traditional method. The students learn same like the normal-hearing students, and communicated using the sign language. During the class sessions, the teachers who teaching this preschool student's use flash cards to show them the sign symbol. They start to learn only the sign symbol for alphabets and numbers first two months. The teacher will expose one single sign to the students once a day. The teacher said the deaf students will recognize the word by looking at the finger and facial expressions. The teacher gives an equal attention to every student, individually. During the observation the researcher find out the relationship between the three students, and there are caring each other

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when one of them cannot understand or cannot follow the teacher instruction. This shows the students relationship are close when there are inside the classroom and have the same communication problem this make them assist and interact each other. However the teachers trained the students one-to-one to support them to achieve the knowledge in education. The teachers also have to prepare every lesson before they go to into classroom. With the working experience and the training knowledge given to the teacher helps the teachers to bring the youngster to be independent person in the future where they can service their own. This can bring the deaf people to live as a normal people and can join with normal society.

The second observation starts after deliver the e-MSL courseware to the students. Three students aged six years old were asked to use the e-MSL software to learn alphabets, numbers and words. They were tested using the module quiz the e-MSL application and by showing them the item and asking them to sign the word. It was observed that children were very excited while interacting with the software. According to the teacher it is good to start with alphabets before going other modules. This will be done by having the first module on alphabets and then the second module numbers. All signs in the software will have to be accompanied by a picture and video for users. Lastly, teaching has to be interesting and dynamic for these children. There are some pictures taken during this session survey.

Each modules in the e-MSL courseware was prepare according to teachers guide who teaching the students. When the researcher introduces the courseware to the students they are very happy and they also can understand what the requirement of the each module is. During the observation the researcher find out that the three students has knowledge about computer like keyboard and mouse. With the guide from the teachers help the students to interact with the courseware. When the students open the alphabetical module and it was attached with the video it makes them happy and enjoys watching the sign show by the teacher. Another interesting point with this courseware the researcher identify that when the student using this courseware beside the classroom this students also can use this courseware anywhere and they can feel the real environment in the classroom as they can see their teacher in front and show them each alphabet they select.

4.2. Different between Before and After use e-MSL

The researcher managed to identify the improvement studies by the students after they used e-MSL courseware. Before this, the teacher used the traditional method where they used flash cards to teach all the alphabetical to the students. To the teacher, using flash cards to teach students took more time for the students to learn and memorize the alphabetical. The students only manage to learn only alphabetical in one day. The teachers also provide the exercise manually which also time consuming for them. By using e-MSL, the students can learn more than one alphabetical per day. The students can also watch the video many times they like until they can understand and memorize the alphabetical. E-MSL also included with quizzes which allow the students to check their understanding of the alphabetical that they have learned. Another advantage of e-MSL is that the process of learning by the students not just at the school but, also can be done at their home. So, this will give the students more time to learn and complete their studies. Table 4 explain the different between before and after use e-MSL.

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Table 4. Different between Before and After use e-MSL

No		Before	After
1	Recognize the sign	Flash Cards	E-MSL
2	Learning alphabetical	1 day	Student can select any alphabetical and watch the video clips of sign.
3	Exercise on the sign language learn on that day	1 day	Quiz includes at EMSL and allows the student test their progress.
4	Learning Method	At school	Anytime

4.2.1. Advantage using this System: i) Increase learning performance. By use the courseware, the children able to retain knowledge of the alphabets and the numbers after spending merely one hour on the courseware. This situation is best understood since with inclusion of video, the children are more capable to find the different between the image, sign and meaning of the particular alphabetical. The picture of an item, the children could illustrate the sign of the alphabets, numbers and words correctly. Their attention span and interest to learn the word has increased satisfactorily. According to the children as well the teacher, they like the usage of colors and the design of the alphabets and numbers. The quiz module allow the children answer the sign language on alphabetical. The children felt at ease in navigation the application due to its simplicity and friendliness. ii) Extra features compare to other existing sign language. According to [12], mobile-learning is a type of learning which leverages on the mobile device's portability and affordability. Mobile-learning is considered as a form of teaching and learning that occurs through mobile devices such as mobile phones, Personal Digital Assistants (PDA), and others. Mobile-learning allows learners to access computer-based learning anytime, anywhere and as stated by [13], and mobile-learning overcomes poor internet connectivity, frequent power disruptions and low PC support and availability, especially in remote and rural areas and build up by the power and talent of the mobile phone networks. The extra features compare to other exiting sign language, e-MSL courseware can run on the Mobil application. Currently there is no MSL learning tool on the market that is complete enough to transmit early literacy education for young deaf children on smart phone. This will help the students be able to access on their own progress and used in form of touch screen.

4.2.2. User Exception: The sign embedded in the e-MSL courseware come with pictures and video of the alphabetical, therefore easier for the students to select the alphabet and understand the alphabet with particular picture. By having teaching aids and new information technology to teach the students, this do improve the effectiveness of learning, because only then a fun and interesting satisfying environment can attract students to be interested in studying. In terms of the teaching and learning process, the teachers has used various methods to approach students, simultaneously to help them in fulfilling their needs and overcome the problems they encountered. Still, in the beginning, the teacher is required to supervise the students is independent enough to navigate all the modules provided in the application. The teacher showed high satisfaction level on the performance of the children and the courseware. This has demonstrated a high prospect for the courseware to be utilized at school and home by the children, teacher and parent or even to commercialize for local market. Therefore, this creates a comfortable learning gap for the preschool deaf students to master in the e-MSL application.

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5. Conclusion

This study has successfully identified existing learning tools based on MSL in Malaysia. MSL is the official sign language for the hearing-impaired students in Malaysia and widely being used among them. Currently, there are few MSL learning tool on the markets that are perfect enough to transmit early literacy education for young deaf students. In conclusion, this study has fulfilled the project objectives with the development of e-MSL. It has provided an added courseware for the early literacy development and learning for young hearing-impaired children to achieve MSL language at their own speed. Moreover, with the presence early start as alphabets, numbers and word's modules feature to have increased satisfactorily the children's ability to understand and memorize the alphabets, numbers and words learnt. The add quiz module will help the students to see their progress and the knowledge using this courseware. The teachers agreed this courseware offered to the pre-school students flexible to them, and this show the reality that computers are being friendly in their daily life and also in the future. The students also started to explore the new technology during preschool stage, and this will help them in the future. The result has been analyzed for this project, and it showed the difference between before and after the usage of e-MSL. E-MSL courseware helps to learn sign language better by using multimedia application rather than learn it manually by using flash cards. The system consists of four modules, and input device use to interact with the button is by using keyboards and also touch screen. A module alphabetical provides a picture and video representation of the character. With this courseware, the student can use e-MSL not only in the classroom but also any other places. They can use this courseware anywhere, and they will feel like they are in a real classroom environment as they can see their teacher in front and show them each alphabet they have selected. The teacher satisfied with this courseware because the courseware was design suiting the requirement of the teacher. The teacher wants to start with the alphabetical and numbers and the words for stationary, which have around the preschool class room. The teacher’s happy because the students can make use of this courseware at school and home by the children as exercise.

The future recommended features to produce many comprehensive versions of e-MSL are by including interactive function of user controlled rotational view and add more languages (Malay and English) options. Furthermore, enlarge the database of words, which take into account of dialects or slangs and with multiple stages of exercises. It helps in giving value-added courseware for the children, teachers, parents and Malaysia deaf community as a whole multiple language to incorporate instructions in other languages such as Malay, Chinese and Tamil. Moreover, add more multilevel quiz and exercise and add another module for test bank question. This can make the students to access their own progress. Furthermore, develop a larger database which the children can search for a particular sign to know the word, its meaning, image of the words. The fundamental structure that can be used in the future is in form of touch screen and using in any device support Android application. The learning method can be more interesting, fast and easy. This has demonstrated a high vision for e-MSL to be utilized at school and home by the children and teacher and even can be commercialized for local market. Currently, the case study only focuses on one school in Kuantan but in future the researcher will be focusing on all the pre-schools for deaf students in Pahang state.

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Authors

Mazlina Abdul Majid received a M.Sc. in Computer Science from Universiti Teknologi Malaysia and a Ph.D in Computer Science from *The University of Nottingham* UK in 2010. Currently she is a senior lecturer at Faculty of Computer Systems and Software Engineering, Universiti Malaysia Pahang. She is also the deputy dean of research and postgraduate FCSSE, Universiti Malaysia Pahang. She has published more than 20 research papers in journals and conferences. Her researchinterest includes Discrete Event Simulation and Agent Based Simulation.

Sutarman received a Master degree in Computer Science from Gadjah Mada University, Yogyakarta, Indonesia. He has been a Lecturer in the Department of Business and Information Technology at University Technology of Yogyakarta, Indonesia. Currently he is a Ph.D student in Software Engineering at Universiti Malaysia Pahang.

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Tutut Herawan received a B.Ed degree in year 2002 and M.Sc degree in year 2006 degree in Mathematics from Universitas Ahmad Dahlan and Universitas Gadjah Mada Yogyakarta Indonesia, respectively. He obtained a PhD in Theoretical Data Mining from Universiti Tun Hussein Onn Malaysia in year 2010. Currently, he is a lecturer with Department of Mathematics Education, Universitas Ahmad Dahlan, Indonesia**.** He currently supervises four PhD and had successfully co-supervised two PhD students and published more than 120 papers in various international journals and conference proceedings. He has appointed as an editorial board member for IJDTA, TELKOMNIKA, IJNCAA, IJDCA and IJDIWC. He is also been appointed as a reviewer of several international journals such as Knowledge-Based Systems, Information Sciences, European Journal of Operational Research, Applied Mathematics Letters, and guest editor for several special issues of international journals. He has served as a program committee member and co-organizer for numerous international conferences/workshops including Soft Computing and Data Engineering (SCDE 2010-2011 at Korea, SCDE 2012 at Brazil), ADMTA 2012 Vietnam, DTA 2011-2012 at Korea, DICTAP 2012 at Thailand, ICDIPC 2012 at Lithuania, DEIS 2012 at Czech Republic, NDT 2012 at Bahrain, ICoCSIM 2012 at Indonesia, ICSDE'2013 at Malaysia, ICSECS 2013 at Malaysia, SCKDD 2013 at Vietnam and many more. His research area includes Knowledge Discovery in Databases, Educational Data Mining, Decision Support in Information System, Rough and Soft Set theory.

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