



IDENTIFYING THE CHALLENGES AND BARRIERS HEARING-IMPAIRED LEARNERS FACE WITH USING ICT EDUCATION COURSES

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ABSTRACT

Communication between the hearing-impaired individuals and the normal-hearing individuals can be very difficult. It is often true that in universities or classes scenarios, the hearing-impaired individuals are often involved in project-oriented groups; thus, miscommunication is normal between them and the normal-hearing individuals. This research aims to identify the problems and challenges amongst the hearing-impaired individuals in learning the various ICT-Education (Information and Communication Technology) courses for connecting the ICT courses and the deaf learners for further education. To achieve the aim of this study, analysis was carried out in all schools in Malaysia, including Sabah and Sarawak, which employ the hearing-impaired education program for the secondary level of Form 4 and Form 5. This analysis was done in the forms of survey questionnaires, interview sessions, and observation. Teachers were chosen as respondents mainly because they are the main individuals that interact directly with the hearing-impaired individuals. Therefore, their views and opinions about the suitable ICT courses for the hearing-impaired students were greatly appreciated and needed. According to the problems stated, an e-learning portal offering ICT courses was needed to be developed especially for the hearing-impaired individuals to solve the problems. The hearing-impaired individuals deserve the equal opportunities as the normal-hearing individuals to learn ICT education; hence, they would not be left behind in learning computer courses.

Keywords: *Hearing-Impaired Individuals, Information and Communication Technology (ICT), E-Learning, E-ICT Courses.*

1. INTRODUCTION

Communication between the hearing-impaired individuals and the normal-hearing individuals can be very difficult. It is often true that in universities or classes scenarios, the hearing-impaired individuals are often involved in project-oriented groups; thus, miscommunication is normal between them and the normal-hearing individuals [1]. Although numerous faculties support students and staff including interpreters who are fluent in both signing and speech, miscommunication still exists; Let alone, when the interpreters are rarely available outside a class. Since video is well-suited for a web-based instruction to collaborate, communicate and information disseminate, subtitles and a translation video picture of the spoken text into sign language must be of an appropriate quality. Moreover, with the power of ICT (Information and Communication Technology), new teaching and

learning practices can exist as ICT acts as a medium to modernize the education system [2]. Together with the user-friendly multimedia based, telecommunication and the Internet information services can be used as a standard electronic platform to support the main procedures of distance, lifelong and continuing learning for the Hearing Impaired Individuals. Hence, this research aims to identify the problems and challenges amongst the hearing-impaired individuals in learning the various ICT-Education courses.

2. REVIEW OF LITERATURE

Usually, a successful inclusion occurs when an individual is given all of the supports needed, whether it's physical (assistive technology like hearing-aids) or human (a trained assistant); and when the level of the disability matches appropriately the environment into which the



individual is placed. As it is stated, an individual with disabilities is integrated in as natural an environment as possible; as defined in Education in a fully inclusive model [3]. In another study by Guha et al., involving the special needs inclusion, their paper suggested the children with special needs' involvement in the design process; which starts with the level of child's involvement, followed by the addition influence by the nature and the strictness of the child's disability, and lastly with the child's availability and intensity of support [4]. The same goes for the hearing-impaired individuals needing special attention; when a technology is specifically developed for these individuals, we need to involve and assess them with our design processes models, also known as, 'The Inclusionary Model'. For example, a communication device for the hearing-impaired individuals, an individual could be a full design partner that opens-up to many involvement levels, if given a one-on-one special education supporter, although the deafness will defeat the individual to participate fully, unless provided with a sign language interpreter.

For people who are born deaf, English is often a second language with the first language being the Sign Language. If for a normal-hearing child to begin develop expressive speech and language between 1-2 years old, and by the time the child starts school, he has mastered a major portion of the syntactical structures of his native language, and has several thousand vocabulary words. However for a severe hearing-impairment sustained at an early age, the impact starts upon the education achievement of these hearing-impaired individuals. The only exposure to signing is at school, as they are not often absorbed in language the same way as the normal-hearing children do. Without this absorption, hearing-impaired children may miss the critical period for language acquisition. Moreover, to achieve an effective stage for developing language-related skills throughout childhood and later in life, these hearing-impaired individuals must be directly and repeatedly presented with signs, words and language concepts to avoid language development delays [5]-[6]. Parents who get involved early in the process of learning Sign Language can communicate more effectively with their hearing-impaired child and have more impact on the child's progress throughout early life and development [7]. This can facilitate bonding within the family members, in the learning process. However, this does not hold apply for deaf children born to deaf parents, because their language

acquisition follows a normal development cycle, which is from the child's birth.

3. RESEARCH PROCEDURES

As mentioned earlier, web-accessibility is very crucial for the hearing-impaired individuals. In bridging the access gap, this research concerns to identify the problems and challenges amongst the hearing-impaired individuals in learning the various ICT-education courses for connecting the ICT courses and the deaf learners for further education. There are barriers faced by these individuals in learning ICT courses in higher education physically. For instance, an interpreter is needed in class, learning materials that include more subtitles or visual captions were necessary for the deaf learners to understand better, or the various ICT courses specially designed for the hearing-impaired individuals were scarce.

A need analysis was conducted to identify the problems, issues and challenges amongst the hearing-impaired individuals in learning these ICT courses, like computer graphics, multimedia, 3D-animation, ICT literacy, etc. This need analysis was carried out in all schools in Malaysia, including Sabah and Sarawak, which executes the hearing-impaired education program for the secondary level of Form 4 and Form 5. This analysis was done in the forms of survey questionnaires, interview sessions, and observation (attached in the appendices page). Teachers were chosen as respondents mainly because they are the main individuals that interact directly with the hearing-impaired individuals; therefore their views and opinions about the suitable ICT courses for the hearing-impaired students were greatly appreciated, and needed. Questionnaires were given to the teachers teaching the hearing-impaired students in each school (48 teachers from 24 schools), and questionnaires were also given to the hearing-impaired students of Form 4 and Form 5 throughout the whole of Malaysia (245 students from 24 schools). The interview sessions conducted were with the teachers teaching the hearing-impaired students (24 teachers from 24 schools), and the observation carried out were at the schools that offer computer graphics course for the hearing-impaired students (3 schools).

For the interview sessions conducted, researcher has used the non-probability sampling (not random) to choose the teachers for interview. Through this sampling technique, the samples were chosen based



on their free-time and readiness to be interviewed during the time researcher was in school. Researcher did not ask for the help of the school's manager to provide the names because if this is done, then the research is seen as intended to control the data. Thus, the sampling techniques used are more illustrated, for the reason to get an internal perspective of the teachers involved in the hearing-impaired education program, based on their experience, knowledge and opinion.

4. RESULTS AND FINDINGS

The need analysis conducted was a 100% sampling, meaning all throughout Malaysia including Sabah and Sarawak, a total of 24 schools which execute the hearing-impaired education program for the Form 4 and Form 5 of the secondary level. From these 24 schools, 17 schools do not have ICT courses offered to the hearing-impaired students, and only seven schools do have ICT courses offered to these students. Now, derived from these seven schools having ICT courses for their hearing-impaired students, there are 4 schools offering basic ICTL (ICT Literacy) for their hearing-impaired students, whereas the other 3 schools offer computer graphics course to them. The results of the need analysis from the students and teachers' points of view are as follows:

4.1. The Students

A total of 245 hearing-impaired students participated in this study, which uses survey questionnaires as the research instrument. From that total, 126 are male students (51.4%), while 119 were female students (48.6%). The number of students in this study was from Form 4 which are 126 (51.4%), and Form 5 which are 119 (48.6%) respectively.

For the demographic section of the race category, 145 students (59.2%) were Malay respondents, 57 students (23.3%) were Chinese respondents, 17 students (6.9%) were Indian respondents, and another 26 students (10.6%) were from other ethnic races, like Kadazan, Iban, Bidayuh, Melanau, etc.

For the state category, 38 students (15.5%) were from Johor, 34 students (13.9%) were from Penang, 29 students (11.8%) were from Kuala Lumpur, 24 students (9.8%) were from Sabah, 23 students (9.4%) were from Sarawak, 22 students (9.0%) were from Terengganu, 21 students (8.6%) were from Selangor, 21 students (8.6%) were from Kedah, 15 students (6.1%) were from Negeri

Sembilan, 8 students (3.3%) were from Malacca, 4 students (1.6%) were from Pahang, 3 students (1.2%) were from Perak, 2 students (15.5%) were from Labuan, and only 1 student (0.4%) was from Kelantan.

The questionnaires distributed were piloted beforehand, and there were altogether 5 constructs chosen for the students' questionnaires. These constructs were the interest towards computer (11 items), the computer usage (16 items), the ICT equipment tools (13 items), the computer infrastructure (8 items), and the ICT courses (10 items). Table 1 shows the mean and standard deviation for each constructs.

Table 2 to Table 6 show the reliability statistics of alpha cronbach for each construct which were derived from the SPSS.

4.2. The Teachers

A total of 48 teachers that taught the hearing-impaired students participated in this study. From the total, 13 are male teachers (27.1%), and 35 are female teachers (72.9%). The numbers of teachers in this study were 2 from each school in Malaysia, and there were 24 schools involved.

For the demographic section of the race category, 36 teachers (75%) were Malay, 7 teachers (14.6%) were Chinese, 1 teacher (2.1%) was Indian, and another 4 teachers (8.3%) were from other ethnics, like Kadazan, Iban, Bidayuh, Melanau, etc.

For the state category, 8 teachers (16.7%) were from Johor, 6 teachers (12.5%) were from Kedah, 6 teachers (12.5%) were from Perak, 6 teachers (12.5%) were from Kuala Lumpur, 4 teachers (8.3%) were from Sarawak, and the remaining 18 teachers are from the states of Terengganu, Selangor, Negeri Sembilan, Malacca, Pahang, Labuan, Sabah, Penang and Kelantan, with 4.16% respectively.

The questionnaires distributed were piloted beforehand, and there were 3 constructs chosen for the teacher's questionnaires, which are the computer usage (11 items), the ICT equipment tools (16 items), and the computer infrastructure (8 items). Table 7 shows the mean and standard deviation for each construct.



Table 8 to Table 10 show the reliability statistics of alpha cronbach for each construct which were derived from the SPSS.

The samples were divided into two groups of teachers, which were from schools that offer ICT courses (Group A), and schools that do not offer ICT courses (Group B). Overall, there are 48 teachers for both the questionnaires' and interviews' data collection technique, as 2 teachers represented for each school (24 schools all throughout Malaysia). To breakdown according to schools, a total of 7 schools offer ICT courses, and the other 17 schools do not have any computer courses offered in their schools at all.

5. DISCUSSION

Based on the need analysis conducted, and the findings elaborated, three problems were identified. Thus, this section is divided into three parts, one which consists of the main problem identified, and the other two which consist of other problems identified.

5.1. The Main Problem: The Demand Of ICT Courses (Specifically Designed For The Hearing-Impaired Individuals)

In the need analysis conducted, mentioned earlier from the 24 schools, only 7 schools have ICT courses offered to the hearing-impaired individuals. The other 17 schools that do not have any ICT courses taught to the hearing-impaired individuals, had voiced-out their dissatisfaction and frustration that their students are not exposed to the ICT education, when this course is highly demanded by the students in their school.

To breakdown to number of students, out of the 245 hearing-impaired students, 66 respondents (26.9%) answered 'Yes', on having ICT courses in their school. While the remaining respondents of 179 (73.1%) do not have computer courses offered to them. This is because there are only 7 out of 24 schools that offer ICT courses. Hence, the demand of ICT courses arises. This problem does not only affect the students' interest in learning computer courses, but it also affects the student's comfort, as unavailability of the classrooms and insufficient computer equipment to fit the many interested respondents are among the issues too.

The exposure of ICT education has increasingly become a popular major in higher education, as it is

essential for the hearing-impaired individuals, to prepare them into the world of employment [8]. However, not many hearing-impaired individuals are exposed to the latest ICT tools and technologies today.

In the same need analysis conducted too, most interviewed teachers gave their views, which were analyzed using the Nvivo software for the results obtained. The common theme that were raised by the teachers were ICT courses that were not offered in schools, claiming that these students are very much interested in the latest ICT tools and technology, which consists attractive graphic images, as vision is a dependent sense to them. However, due to the inadequate computer equipment, and the packed time-table, computer classes were not offered to them, although the teachers see great talented skills and knowledge among their hearing-impaired students. Most teachers argued that the students are really interested in computers, but were not given a chance to experience the latest ICT technologies in, as computer classes and courses are not offered in most schools. These ICT technologies include video-conferencing, chatting, emailing, blogging and other means of communication, or even surfing the Internet that has various attractive visual displays in the web-pages.

From the teachers' perspective, based on the 48 samples of teachers throughout Malaysia who were interviewed, 42 teachers (from 21 schools) unanimously answered 'Yes' (87.5%), and 6 teachers (from 3 schools) answered 'Maybe' (12.5%), and nobody answered 'No' (0%) on the question of having ICT education via e-learning for the hearing-impaired students. This shows that almost around 90% of the teachers agree on the fact that the hearing-impaired students should learn ICT courses online, compared to the other around 10% who disagree.

In the observation conducted in the schools offering computer graphics, which are in Negeri Sembilan, Johor, and Terengganu, the hearing-impaired students do show great potential in drawing graphic images, and their interest in learning computers do show positively. A common theme was derived from the analysis of results using the Nvivo software, which was the positive agreement towards ICT courses via E-Learning, when being asked if the students would interest in learning online. Most teachers and students optimistically agree that they would like to have



this course available online, and to help them with tutorials, etc. Visual attractiveness is important as latest ICT technologies such as flash, animation, and graphics are crucial in presenting the information to the individuals. This is because these individuals have to depend more on vision, due to their defect of hearing [9].

And for the schools offering basic computer literature, which are two in Kuala Lumpur, and two in Johor; when being asked on their interests on computer graphics course online, they were very determined and interested to learn them virtually too. This was positively supported by their teachers too, claiming that computer courses that include visual media aids like graphics, charts and tables, are important for the hearing-impaired individuals.

For the open-ended survey questionnaires for teachers on having various ICT computer courses online, the common theme derived using the Nvivo software was the subjects chosen by the teachers. Majority of the answers chosen by the teachers were graphics-courses like computer graphics, 3D animation, multimedia, and web design. This is mainly because the teachers feel that courses that contain attractive graphics, multimedia-supported content, and attractive animation and designs, are more suitable for the hearing-impaired students, as these elements catch the attention of the hearing-impaired individuals' vision, compared to the plain black and white graphic-less courses.

Based on 48 sample of teachers, 46 participants answered 'Yes' (95.8%), and the other 2 answered 'No' (4.2%), on the question of learning computer graphics course via e-learning. This shows that almost 96% of the teachers agree on the hearing-impaired individuals learning computer graphics online, compared to the other 4% who disagree.

From the students' perspective, based on the 245 survey questionnaires for students throughout Malaysia who are involved answering this questionnaire, 171 respondents answered 'Yes' (69.8%), and another 74 respondents answered 'No' (30.2%), on the question of learning computer graphics course via e-learning. This shows that almost 70% of the students agree on learning computer graphics online, compared to the other 30% who disagree.

Computer graphics were the majority chosen by the hearing-impaired individuals, followed by other graphics courses like 3D-animation, web design

and multimedia. However, when being asked whether the respective schools offer any computer subjects, 66 respondents answered 'Yes', and the average responses were courses like Adobe Photoshop, Computer Graphics (3 schools only), Basic Computer Literature, and Desktop Publishing. While, the remaining respondents answered 'No'.

For the questionnaire on various ICT computer courses, the majority of the questions answered by the students were 'Strongly Agree and Agree' on courses like 3D Animation, Multimedia, Web-Design, and Computer Graphics. In contrast, to other non-graphic courses like Database Organization, Programming, and Networking.

This is mainly because courses that contains attractive graphics, multimedia-supported content, and attractive animation designs catch the attention of the hearing-impaired individuals' vision, compared to the plain black and white graphic-less courses.

5.2. The Other Problems: Lack of Web-Portals Developed for the Hearing-Impaired Individuals

One of the additional problems identified was the lack of web-portals developed for the hearing-impaired individuals. Besides learning the ICT courses online, again the need analysis conducted surveyed the teachers' views on existing portals in Malaysia on the hearing-impaired education. Most teachers stated that there is still not one satisfactory portal that has a combination of various aspects regarding these individuals. These aspects given by respondents include issues on having attractive visual graphics with animation and 3D; information on the deaf, Malay Language Hand Code (Kod Tangan Bahasa Melayu), videos showing Sign Language alongside with captions and subtitles, job opportunities for the hearing-impaired, education institution to further studies, blogging, chatting system, download/upload files, and a membership profile to sign-up for the students, teachers and parents. Most teachers highly demanded for a portal that has all these aspects, which would definitely be beneficial to them, crucially to the hearing-impaired individuals as well.

In terms of the development of the E-Learning web portal, it is important to develop a constructive portal, with respect to few criteria such as its ease of use, the feature built-in, customizability, together with the testing of flexibility and extensibility [10].



With huge amount of information stored in the database, it requires a much more attractive and reliable display of platform to get the information across to users. Moreover, in these learning management systems, it is important to ensure scalability of the platform, support for portability and standards as well as content personalization [11]. With the user-friendly multimedia based, telecommunication and the Internet information services can be used as a standard electronic platform to support the main procedures of distance, lifelong and continuing training for the hearing-impaired individuals.

5.3. Other Problems: The Uncertainty of Sign Language Codes (KTBM)

In the need analysis, most teachers also voiced out their concern on some communication problems among the hearing-impaired individuals. Some hearing-impaired individuals still do not know 'signing' certain words; thus, it is difficult to communicate between them, and even with their parents and teachers. A rise concern among the parents and teachers to have a portal that provide Sign Language education in a form of interpreted recording-videos, captions and subtitles to deliver the information to the individuals, hence miscommunication can be avoided. Video material is a very rich medium that is capable of conveying both abstract knowledge and concrete examples, so it is particularly valuable for demonstrating the communication [12]. It also enables quality streaming video of the sign-language interpreter, which can be viewed promptly. Together in the video, the subtitles of the video-picture translation into sign language demo, aims to give users a better perception over the body-language while preserving the courses-information conveyed to be meaningful and understandable. Having the interpreter-video will help users improve their Sign Language communication skills, and enable them to learn more independently. In other words, by having this Sign Language recorded video, tutorials about the ICT education-courses, and information on the hearing-impaired individuals, can easily be perceived, hence everyone can benefit from this.

In addition to this, a high demand on online dictionary (in the portal) too, was suggested to include the words of KTBM (Kod Tangan Bahasa Melayu). Together with this, the uncertainty issue of signing certain words can be overcome. Moreover, these words translated into a video picture of the sign language will help the students,

parents, and even the teachers to improve their signing.

6. CONCLUSION

Based on the previous problem statement, an e-learning portal was needed to educate the hearing-impaired individuals on ICT education. The hearing-impaired individuals deserve the equal rights as the normal-hearing individuals to learn ICT in their education life, as they cannot be neglected or left behind in learning computer courses [13]. To solve the problems stated, an e-learning portal offering ICT courses was needed to be developed especially for the hearing-impaired individuals. Consequently, the development of a web portal is needed to resolve communication problem for the end-users, as it does not only benefit the hearing-impaired individuals, but also for other self-taught users like teachers, parents, and other interested users. Engaging all users in the Sign Language learning process can have practical benefits and can also facilitate bonding within the family, friends and other end-users [5].

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Table 1: The Mean And The Standard Deviation (For Computers' Interest, Usage, Equipment, Infrastructure And Courses)

	Interest (Minat)	Usage (GunaKom)	Equipment (AlatKom)	Infrastructure (Prasarana)	Courses (Kursus)
N Valid	245	245	245	245	245
Mean	39.5633	52.4204	44.8571	26.4245	35.1959
Std Deviation	7.55208	10.73941	9.30891	6.35940	6.91654

Table 2: The Reliability Statistic for 'Interests towards Computer' (Minat)

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.791	.794	11

Table 3: The Reliability Statistic for 'Computer Usage' (Penggunaan Komputer)

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.853	.855	16

Table 4: The Reliability Statistic for 'Computer Equipment' (Peralatan Komputer)

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.866	.867	13

Table 5: The Reliability Statistic for 'Computer Infrastructure' (Prasarana)

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.843	.842	8

Table 6: The Reliability Statistic for 'Computer Equipment' (Peralatan Komputer)

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.832	.834	10

Table 7: The mean and the standard deviation (for computers' usage, equipment and infrastructure)

	Usage (GunaKom)	Equipment (AlatKom)	Infrastructure (Prasarana)
N Valid	47	47	47
Mean	40.5319	53.8511	28.1702
Std Deviation	7.02434	11.52687	5.00139

Table 8: The Reliability Statistic for 'Computer Usage' (Penggunaan Komputer)

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.863	.869	11



Table 9: The Reliability Statistic for 'Computer Equipment' (Peralatan Komputer)

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.940	.943	16

Table 10: The Reliability Statistic For 'Computer Infrastructure' (Prasarana)

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.865	.880	8