Developing Integrated Multimedia Communication for Deaf Students in Higher Education

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Abstract

Having communication with Deaf students is a challenge for some lecturers. Multimedia provides a potential solution for this situation; however, few people know how to develop it ideally. This study uses primary and secondary data to create a strategic model for multimedia-based learning for Deaf students through focus group discussion with the expert, lecturers, parents, and practitioners. At the same time, however, this model recognises that multimedia communication is not sufficient in and of itself for full engagement with them. This article, thus, proposes implementing several activities within universities based on four stages: identify the level of hard hearing, choose the learning style, design multimedia learning, and create engagement. By developing these strategies, Deaf students in higher education can have a comfortable and effective place to learn to minimize the communication barriers between Deaf student and others.

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Melakukan komunikasi dengan mahasiswa Tuli merupakan sebuah tantangan bagi para pengajar di pendidikan tinggi. Multimedia merupakan sebuah potensi sebagai solusi dalam situasi ini, hanya saja tidak semua orang memahami dengan baik cara implementasinya secara ideal. Penelitian ini menggunakan data primer dan sekunder untuk menciptakan model strategi berdasarkan pembelajaran berbasis multimedia untuk mahasiswa Tuli melalui diskusi kelompok dengan pihak yang berpengalaman, dosen, orang tua, dan juga praktisi di bidang ini. Pada saat bersamaan, model ini juga melihat bahwa komunikasi multimedia tidak cukup untuk membangun hubungan kedekatan dengan mahasiswa Tuli. Melalui artikel ini, peneliti mengajukan empat tahap pelaksanaan aktivitas di pendidikan tinggi yakni: identifikasi level Tuli, pemilihan gaya mengajar, desain multimedia, dan pembentukan hubungan. Melalui strategi ini, mahasiswa Tuli merasakan pendidikan tinggi dengan lebih nyaman dan efektif yang mampu mengurangi hambatan komunikasi antara mereka dengan yang lain.

A. Introduction

COVID-19 has posed an enormous challenge for many countries around the world, including Indonesia, since early 2020. Globally, the virus has resulted in more than five million deaths since the beginning of the pandemic as per February 2022 (WHO, 2022). Many compromises have become necessary, especially in the education sector, as the virus' spread has resulted in the closure of many institutions. Scientists have debated whether the closure of schools and other institutions of higher education is truly necessary during the pandemic, as these institutions aim to build the personalities, skills, and cognitive/social abilities of children (Chomadi & Salamah, 2018). Many people fear that without face-to-face interactions in educational institutions, students' intelligence levels will be detrimentally affected (Sari & Paska, 2021).

To deal with the pandemic, the Indonesian government issued Regulation of the Ministry of Education No. 4/2020, which ordered all educational institutions to replace their offline classes with online ones. On the otherhand, the Indonesian government has passed Law No. 8 of 2016 regarding People with Disabilities and Ministry of Education Regulation Number 46 of 2017 regarding Special Education and Special Services in Higher Education to improve the quality of education provided to students with special needs. To create accessible learning, educators around the world have sought to develop innovative technology-based approaches to learning (Sari & Paska, 2021). This article focuses on students with disabilities because they have been disproportionately impacted by online activities due to their particular mental, sensory, communication, physical, and social needs and abilities (Jamila, 2005). During face-to-face learning, they have extra interactions with their friends, which will improve their social abilities. In addition, they might have companions or buddies in the classroom who ensure that they understand the learning materials delivered by their lecturers (Sari & Paska, 2021). Dealing with the Covid-19 pandemic, solving these challenges is necessary.

Several studies have investigated the learning materials provided to students during the COVID-19 pandemic (Saifudin & Suharso, 2020; Sari & Paska, 2021), their challenges (Lintangsari, 2014), their social skills (Rahmi, 2021), the ideal learning environment & facilities (Alasim, 2020; Juwantara, 2019; Munifah & Ardiyansyah, 2021; Sproul et al., 2021), the development of websites (Tarjiah et al., 2020), video material (Janah, 2020), and multimedia platforms and social media (Asuncion et al., 2012; Iswari, 2019; McNamara et al., 2021; Munir, 2015). However, none of these studies has provided an ideal design for multimedia-based learning, one based on primary data and a review of the literature review. This article, therefore, aims to outline a process for designing a multimedia learning approach for Deaf students in higher education. Deaf student in higher education has been chosen as one of the important parts of the study because their number is increasing year after year, while the education system has not ready yet. Based on World Health Organization, there

are total 360 million Deaf people in the world and 34 million of it are children who need education. In addition, half of them is resided in South East Asia and Indonesia sits at the fourth rank with 40,5 million Deaf and hard-hearing people (Wicaksono, 2017).

In general, there are two approaches about Deafness study: medical and social (Lane, 2005; Wahyudin, 2020). First, medical approach understands Deafness as physical challenge which could be solved or healed through medical solution. This approach perceives Deafness as a problem and people – or medical examiner – need to help solving this condition by giving treatment or tools to help them to hear normally, like other persons. Second, social approach which oversee Deafness as social construction which developed through social relationship in the society. Deaf is not a limitation of human body, instead, they are a complete person who has different way to communicate (the world of Deafness). As Shakespeare's said that "there is no qualitative difference between disabled and non-disabled people because we are all impaired in some form, some more than others" (Shakespeare & Watson, 2001).

However, in fact, people who can hear have superiority towards Deaf people (who become an object). Deaf world becomes different world and Deaf people becomes the other. They are considered as a group who has no ability to create culture because they cannot hear nor speak (Lane, 2005). Thus, this article tried to elaborate these two approaches in the discussion aspect to see them as important subject of this study, rather than as people who have disability.

This article, therefore, will discuss how integrated multimedia communication can be developed to facilitate students with disabilities in Indonesia, especially those who need to access learning materials at university. This article will focus on students with hearing loss that could affect their cognitive abilities and performance (Pierangelo & Giuliani, 2006; Supena, 2015). Such students usually have problems understanding verbal information (Natawidjaya, 1996) and communicating properly with others (Jamaris, 2014). Proper media, thus, is required to achieve learning objectives and help students understand lecturers' material (Kustandi & Sutjipto, 2013). At the end of this article, we show how multimedia communication can be used to help Deaf students learn effectively at the tertiary level.

B. Literature Review

1. Communicating with Deaf Students

Lane (2005) mentioned that Deaf-world and hearing-world are different world which needs a bridge to ease the overlap between those two (Lane, 2005). In fact, Deaf education and interpreter services are two of many things which can decrease the

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overlapping condition. Therefore, this article will be developed model to ease the practice of education which is relevant for not only hearing-world but also Deaf-world.

Deaf students are those who have the deafness and hearing loss on the ears which impact their hearing ability (Hidayat et al., 2017). People are categorised as Deaf if they are unable or less able to hear sounds. Deaf students, mainly students with total hearing impairment, are unable to achieve linguistic mastery through hearing, and they thus rely on their vision for language learning. Some have argued that hearing impairment is a general term, one that may indicate anything from mild to severe trouble hearing loss. It may include those who are Deaf and less Deaf (Winarsih, 2007), i.e., those whose residual hearing abilities can be improved using hearing aids. The Table 1 describes the characteristic of Deaf student based on their communication ability.

Table 1.

The communication ability of Deaf student

Category	Ability	Level of communication	Sensory	Ability to hear	Needs
Deaf	Verbal/oral	Enough	Visual	Use or does not use hearing-aid	Note-taker, live-transcript, visual media
	Sign language	Not fluent			Interpreter, written, visual media
	Verbal, sign language, written	Enough		Slightly able to hear, use or does not use hearing-aid	Interpreter, note-taker, live-transcript, visual media
Deaf/speech-impaired	Sign language, written	Unable to speak		Use or does not use hearing-aid	Interpreter, written, visual media
Hard hearing	Verbal	Enough	Hear/visual	Slightly able to hear, use or does not use hearing-aid	Note-taker, live-transcript, visual media

Source: Harahap & Lelo, 2020

Table 1 shows how Deaf students' behavior towards different modes of communication. In bold, their needs and level communication skill will affect the tendency to use their senses. Therefore, it is necessary to know how to apply the concept of Deaf space design to the setting of the communal lecture space for Deaf students (Harahap & Lelo, 2020).

To communicate with Deaf students, various communication media can be used. First, for Deaf students who can speak, people can continue to talk with them while they are reading the meaning (lip-reading). Second, people can use written media (paper, email, chat, etc.). Last, people can use gestures (sign language) to

explain their messages. Even though Deaf students have the same potential intelligence as other students, the effects of Deafness can hinder their ability to develop themselves (Hidayat et al., 2017).

Other perspective argues that to see Deaf student as people who has deafness and hearing loss is not ideal because this is a superiority and hegemony towards those who has different ability. As part of culture which see Deaf student as disable, many organizations do not feel any urgency to provide facilities to support the Deaf (Drion & Buhler, 2016). Instead, linguistic discrimination still happens in many places, especially in education institution which implements type of education which is far from Deaf students needs (Haenudin, 2013). Some people asked Deaf students to learn lip movement, so they can understand other people who are able to speak. Thus, sign language is important tools in education system to fulfil Deaf students' rights at classes as citizen (Emmorey et al., 2009).

Culture approach also argue that culture is not only about geographical location or traditional foods and clothes, but physical abilities could lead to group of different culture (Padden & Humphries, 2006). In the Deaf world, Deaf people could be seen as minority group who also have different ethnicity which leads to difficulties to gain access to understand language. Sign language could be a start to understand multi-cultural and multi-lingual society (McIlroy & Storbeck, 2011), however, learning sign language needs commitment, motivation, and time which is not ideal at a short periode preparation of study model (Gilmore et al., 2019). On the other hand, sign language should be trained to educator and other students to reduce the gap of Deaf-world and hearing-world.

Thus, multimedia-based learning materials are relevant to their needs as a combination tool to see Deaf student as people who has different ability but at the same time help those who cannot understand sign language to express their voices (Hidayat et al., 2017). Using such media, Deaf students will easily understand the main points of a subject, obtain an understanding, identify connections, and finally draw conclusions. These media can be designed to accommodate Deaf students' multiple learning styles, based on their capabilities and characteristics (Djiwosumarto, 1995; Hidayat et al., 2017)

1) Visual learning style: this learning style underlines Deaf students' use of their sense of sight. Making learning materials with many visual components can strengthen students' understandings of concepts and meanings. A Deaf person relies on his visual ability to read the surrounding situation so he needs signs that can help stimulate his sight senses and other sensory abilities (Harahap & Lelo, 2020), in addition, it will make the material more interesting for students (Alasim, 2020).
2) Auditorial learning style: this style is targeted at Deaf students who still have

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residual hearing. This method should be maximised to train their hearing sensitivities. However, it should be noted that Deaf users still require quiet acoustic and quite room to help them to study to make effective use of their hearing wile improve their language and communication skills (Alasim, 2020; Harahap & Lelo, 2020).

3) Sign language learning style: Deaf students without residual hearing can use sign language to communicate with other students and teachers through hand and body gestures. The role of interpreters are important in the media content or in the classroom because they will provide communication access by translating and clarifying lecturers' instructions to the Deaf student (Alasim, 2020).
4) Total communication learning style: this method uses various means of communication to help Deaf students understand and receive information. Using this style, students used a broad range of communication methods, i.e., hearing, seeing, speaking, reading, fingerspelling, and gestures.

Based on this review, a total communication learning style is the most ideal for enabling complete communication and eliminating potential misinterpretations. Even though, there will be some challenges to fulfil this ideal learning style because many researchers have identified: financial and creativity. First, many education institutions do not have budget for create special material for student with disability. In addition, there some funding from Ministry Education but it does not mean every organisation will receive it to support their system software and technology. Second, many lecturers do not have skills or have been trained to create inexpensive yet creative learning materials. The education system still uses and focuses on printed material, such as book and journal, but has not prepare educators to be able to create learning material with modern and interactive touch (Alasim, 2020).

C. Multimedia Strategies for Communication with Deaf Students

Communication between hearing and Deaf or hard-of-hearing populations is often limited or complicated. Human interpreters are often necessary to translate in person. However, this is costly, and sometimes inconvenient or infeasible. The use of the internet, video calls, social media, and email have greatly improved the ability of Deaf users to communicate at a distance with others (Center of Technology and Disability, 2007). Deaf students also seamlessly participate in mainstream online communities (Schirmer & Ingram, 2003). Teachers' and students' ability to create their own interactive instructional and communication materials can be very valuable to students with special needs by making materials immediately relevant, personalised, and grounded in classroom contexts. Involving students in the designing of their own learning materials is a particularly powerful means of improving their reflection on the topic and engagement (Center of Technology and Disability, 2007).

In the classroom, visual tools which is combined with digital learning media become more familiar to be used for educators and students. This is also one of the effect of the technology enhancement in the educational sectors (Sproul et al., 2021). Video is one of the ideal media for supporting visual learning, especially for those who have problem hearing (Janah, 2020; LeBlanc et al., 2003). For example, a story telling video could help students to understand roles and behaviour. The other benefit of using video is the ability to replay the content, thus, student can rewatch the material again if needed. In addition, lecturer could put questions and tasks to make the video more interactive (Brame, 2016). Further, learning videos will support students' individual learning out of class. This video will be linked to the websites and learning management systems of universities. Interactivity is important for managing the learning materials for Deaf or hard-of-hearing students (Asuncion et al., 2012).

Students with different disabilities use information and communication technologies in a variety of ways. For students with hearing impairments, a variety of electronic dictionaries—both general (e.g., spell-check, grammar-check) and specialised writing aids (e.g., word prediction software)—can be helpful. Such students often use subtitles/captions to access video and audio clips, when available (Asuncion et al., 2012). In addition, research also shows that lessons conveyed using visual media will be memorised longer (Munir et al., 2018; Schweppe & Rummer, 2013). However, this is only true when media is interactive and enjoyed by children (Munir, 2015; Munir et al., 2018).

Digital media is a significant platform for creating interactivity. Digital media is understood as "all forms of communication using the internet" (Gurau, 2008). Digital media are important today as they provide places for people to discuss products, issues, and choices. It is able to moderated such faktors like geographic location, socioeconomic status, and device type (Sproul et al., 2021).

Audiences provide information to each other through this media, which could be used to create engagement in this process (Ratriyana, 2020). Social media, which is one of digital media which connected people trough internet network, recently becomes a trend in education environment, especially because education nowadays is more implicit, social, spontaneous (Armour & Yelling, 2007; McNamara et al., 2021). Eventhough social media is considered informal media, however, when the education determines to reach goals, social media becomes one of the important key. Social media has been known as a media to share knowledge, to develop self-identity, motivation, and promotion, to maintain professional network, and to receive support from others (McNamara et al., 2021). Social media network provides opportunities to connect, collaborate, and exchange information between educators and students..

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D. Method

This study is a descriptive one for understanding the ideal design of multimedia learning platforms for Deaf students. The problems associated with online learning and possible solutions were also identified based on the focus group discussion (FGD). Research was conducted between August and December 2021, with data collected through a focus group discussion that consisted of twenty-three participants from various backgrounds, including experts in special needs education, lecturers, parents, and practitioners. This study also uses secondary data for literature review to complete the gap during the discussion. Secondary sources of data included (a) journals, (b) reports, (c) scholarly articles, (e) research papers, and other academic publications.

At this stage, the researchers aimed to develop a media strategy for Deaf student by inviting participants who had expertise and experience in this area, including those who have ever created study model for Deaf students for years. However, the researchers acknowledge that participation from Deaf students are also important, thus, the second stage of this research will cover Deaf students' experiences as part of evaluation study from this model. Their voices will be covered in the next article, including to explore the communication issue faced by student with disabilities because their voices are important for the development of a sustainability study model.

E. Discussion

1. Education for Special Needs

Special education is designed to meet the needs of people with disabilities (Haines & Ruebain, 2011). Education for persons with disabilities has existed for quite a long time, with the hope that they will enjoy equal access to education system services. The educational environment however, is still limited in their human resources and their ability to interact with students with special needs. Learning methods have not been designed to fully accommodate their needs, even as lecturers push students to achieve the same results, which is unfair to students.

> Students do not have to be good at everything; for example, they don't have to get all A's. We don't push them too hard to match regular students. (NA, expert in special needs education)

Inclusive education aims to eliminate the social exclusion that results from the diverse races, social classes, ethnicities, religions, genders, and abilities in the classroom (Vitello & Mithaug, 2016). Ideally, higher education institutions should aim to engage more diverse students, including those with special needs. Without

proper knowledge and awareness, students with disabilities will face bullying from their peers which happens due to long term superiority and hegemony towards Deaf student for years (Drion & Buhler, 2016).

> One of the challenges that arise is discrimination from peers and lecturers, as they do not understand and do not know that this child is different. (H, lecturer in Jakarta)

The spirit of achieving inclusive education with a friendly environment should be strengthened. Several activities could be done to nurture this, i.e., training lecturers to use sign language and creating buddy programmes to improve engagement among students with disabilities. The lecturer, ideally, should be able to use more gestures (sign language) to explain their messages because even though Deaf students have the same potential intelligence as other students, the effects of Deafness can hinder their ability to develop themselves (Hidayat et al., 2017). By adding the gestures during classes, lecturers will help them in some ways because many of them have problems understanding verbal information (Natawidjaya, 1996) and also will decrease the gap between Deaf-people and their lecturers and friends (Emmorey et al., 2009; Haenudin, 2013). This action is part of fulfilling the right of Deaf people.

> The university can design initiatives for students to improve disability awareness, and do the same for lecturers … (NA, expert in special needs education)

Some students with disabilities and their parents refuse to open up to universities about their needs. However, this choice is not ideal, as students may need special treatment from others and universities could help them throughout the process. When universities know about their special situation, they can avoid bad situations.

> [Because other students did not know], while in class he was discriminated against by his friends because he was considered 'weird' (RA, lecturer in Yogyakarta)

It is important for the universities (i.e., lecturer, administrator, classmate) to know their situation in order to help them during learning activity. They will need to have more interaction with their friends to improve not only their cognitive skills but also their social skills (Pierangelo & Giuliani, 2006; Sari & Paska, 2021).

When the awareness programme was conducted, it created a more ideal situation, as some students were willing to join the buddy programme and develop a relationship with students with disabilities. Having student buddies in the classroom will ensure the Deaf student understanding of the class material (Sari & Paska, 2021).

> It is also a typical learning process for friends to learn how to interact and

> communicate with different people [students with disabilities] (H, lecturer in Jakarta)

Furthermore, students' psychological profiles must also be evaluated because they usually experience problems with social adjustment on campus.

> Other accesses must also follow, especially psychological access, namely, the acceptance of individuals with disabilities. (NA, expert in special needs education)

This situation may happen because children with special needs usually have underdeveloped social skills and/or an inability to use social skills (McIntyre & Phaneuf, 2008; Rahmi, 2021). Some people believe that social skills are not essential. However, such skills are necessary for students in higher education to solve problems both as individuals and in groups. Therefore, these skills must be developed effectively to create a comfortable environment for them.

2. Designing Digital Media Usage for Learning in Higher Education

The rapid development of information and communication technology has massively affected the world of education. It started when conventional education became more open, developing a two-way educational process that is more competitive, productive, and multidisciplinary (Iswari, 2019). The learning process should be supported by digital technology. Furthermore, in this digital era, technology and education must be integrated to improve the quality and reach of education (Iswari, 2019).

> We can use multimedia, such as audio, visual, and interactive media. These must be accessible to Deaf students. The instructions must be understandable, the navigation must not be confusing. Instructions should recognise the needs of individuals with disabilities. If you are Deaf, don't use audio but use text. (NA, expert in special needs education)

Learning media is anything that can be used to transmit messages from sender to receiver so that it can stimulate the thoughts, feelings, concerns, and interests of students in the learning process (Sadiman et al., 2018) (Sadiman, 2014). It includes books, tape recorders, cassettes, video cameras, video recorders, films, slides (picture frames), photos, pictures, graphics, television, and computers (Hasnida, 2015).

Multimedia is important as it provides new opportunities and innovative ways to engage with students, promote collaboration, and help build digital literacy (Djiwosumarto, 1995; Hidayat et al., 2017; Rheingold, 2008). It could accommodate various learning style, which become more and more suitable for Deaf students due to their different capabilities and characteristic. Some digital media, including

social media, can engage students in course-specific activities (Asuncion et al., 2012; Center on Technology and Disability, 2007).

> Books can be used for our lecture materials, existing journals or books. We can summarise it in modules that explain words that may be difficult to understand and can be linked with sign language. (NA, expert in special needs education)

Books and journals are significant for developing students' ability to understand lecturers' materials. Lecturers should provide additional learning material, i.e., from PowerPoint presentations or modules, which will help when students need to re-read materials after class. Visual learning material will help the use of Deaf students' senses of sight which will improve their level of understanding of concepts and meanings (Djiwosumarto, 1995; Hidayat et al., 2017).

> PowerPoint [presentations, classroom materials] can make words easier for Deaf individuals. These will include things that are being discussed. For teaching materials, we can add books written by whom, identify difficult concepts, and give their meaning. We must be able to facilitate the learning process, not just the materials." (NA, expert in special needs education)

Lecturers and learning facilitators must remember to position themselves as persons who facilitate classroom learning. Therefore, they should identify students' problems and guide them during the learning process. This is important because many lecturers forget to ask students—especially students with disabilities—about their learning progress. After class, lecturers should give extra time for students with disabilities to ask questions.

> [Lecturers] should give more time for individuals with disabilities to ask questions outside of class hours, but they should also give instructions on how to communicate well. They should emphasise that, if they want to ask, they shouldn't prattle, but get straight to the point. (NA, expert in special needs education)

The interactive instructional and communication style are ideal for students with special needs. Therefore, the lecturers should create relevant and personalised materials to be able to be engaged with the students in class (Center on Technology and Disability, 2007). Thus, lecturer who act as a facilitator is an ideal style to provide interactivity in the class.

When an ideal integrated system, both online and offline, has been developed, universities will offer students a more comfortable environment to engage with each other. Students with disabilities must be able to interact with other students or lecturers without any problems. Although it may start small, it can become a good habit

for higher education in the future.

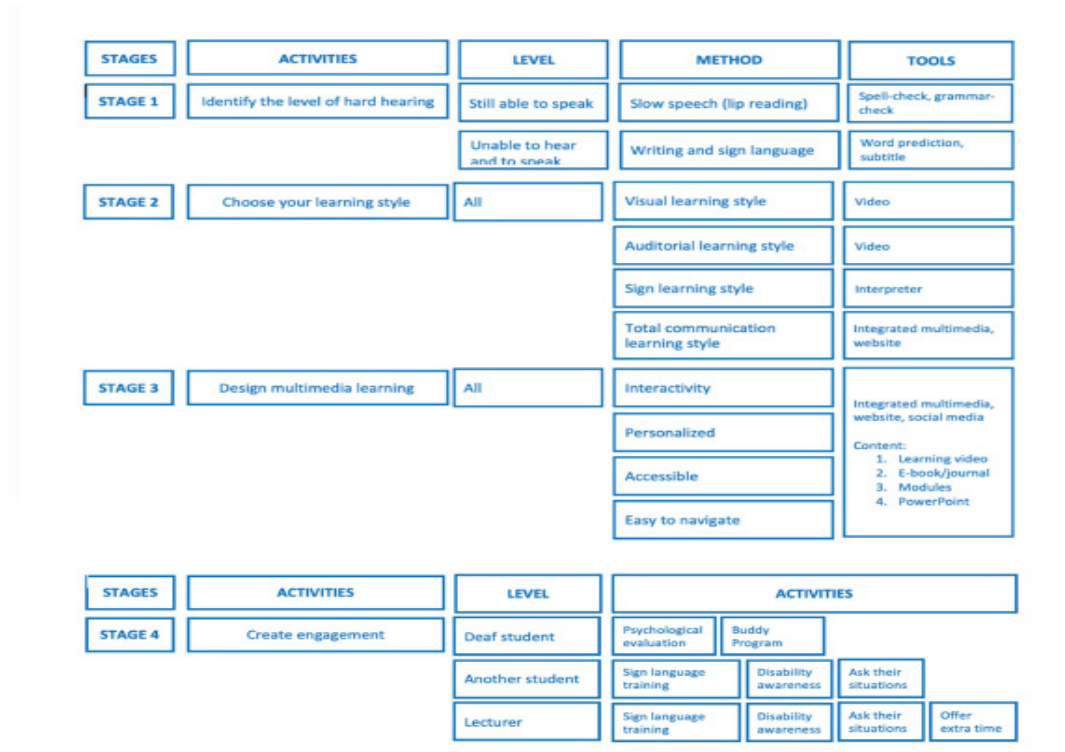
> Our challenge is developing an inclusive culture that is friendly for anyone. If we start by understanding the minorities [disability student], then the majority will be served well. (B, lecturer from Jogja)

By implementing an integrated communication learning style means that students are able to use a broad range of communication methods, i.e., hearing, seeing, speaking, reading, fingerspelling, and gestures. Thus, it will eliminate potential misunderstanding and misinterpretation (Djiwosumarto, 1995; Hidayat et al., 2017).

3. Strategic Multimedia Design and Activities for Deaf Students in Higher Education

The researchers tried to elaborate on data collected through focus group discussions and literature review to develop a consolidated strategic scheme for educators who want to develop multimedia communication for Deaf students using some literature reviews for the strategic multimedia design (Asuncion et al., 2012; Center on Technology and Disability, 2007; Djiwosumarto, 1995; Hidayat et al., 2017). That can be seen on Figure 1.

Figure 1. Strategic multimedia design for Deaf students



This strategic design starts by identifying students' levels of hearing impairment. This stage is very important, as lecturers must understand students' problems before providing them with solutions. If they can hear, even a little, thus, it is possible for lecturers to speak more slowly. Students can thus read their lips. On the other hand, if they cannot hear at all, writing and sign language could be the solution in this situation (Winarsih, 2007). Furthermore, several tools may help them during the learning process, such as spell-check, grammar-check, word prediction, and subtitles.

During the second stage, lecturers should identify students' learning styles and ensure that they are suited to students' hearing abilities. Students with a visual learning style can enjoy materials while being entertained by video content. It is therefore important to create attractive videos for students. An auditorial learning style is appropriate for students who can hear, and thus audio could be integrated, i.e., in slow speech videos. Third, sign language can be targeted at students with extensive hearing loss. Such students are usually more comfortable using sign language than others.

However, to be able to integrate all learning styles, a total communication learning style is proposed for Deaf students in higher education. Total communication is interactive, personalised, and accessible to students. Various media could be implemented in this learning style. For example, to create interactivity, lecturers can use quizzes or whiteboard tools in their offline/online interactions. These tools can be personalised using social media, which also provides a means of creating engagement with students. It should also be accessible, meaning that all learning materials, videos, social media accounts, quizzes, and other items are united in one integrated multimedia platform. Such a platform should: i) be easy to navigate; ii) contain all materials in one single site; iii) create engagement by providing feedback/comments to lecturers/administrators; iv) use text instead of sound; v) not use complicated words.

Lastly, we believe that online activities are insufficient in and of themselves. Students must be engaged through offline activities. Activities should be categorised by target. For example, Deaf students may require psychological assistance to handle emotions, share their feelings/problems, etc. They should also have access to buddy programmes to assist them in their daily activities in the university. Second, students must achieve an awareness of students with disabilities. This is important to cultivate sympathy, respect, and sensitivity. Further, by using this programme, the university can reduce the prevalence of bullying on campus.

Next, sign language training should be compulsory for other students and lecturers. They need to learn to speak with Deaf students by using their language. It may not be easy, but it is important for future communication with students. Students and lecturers should have higher levels of sensitivity. For example, it is important to obtain information on their situation and give them more time to discuss issues.

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We must fully engage with them, hopefully creating a comfortable environment for hearing-impaired students in higher education.

F. Conclusion

Multimedia-based learning with a total communication learning style offers an ideal approach for Deaf students. In addition, lecturer's teaching style should be able to accommodate students' need by creating personalised material and interactive activities throughout the session. They require extra support from many people, i.e., students, lecturers, employees, university directors, parents, etc. This is not easy, as other students and lecturers must change our everyday behaviour and respect others with disabilities. However, this is important if the university want to provide full accommodation for students with special needs.

By adding new style of learning, including lecturer awareness of Deaf people's condition, that means the higher education instution tries to move closer to understand the culture of Deaf world, as they may not seen only has different physical abilities (Lane, 2005). Deaf people have their own world with their own culture, thus, study model and habitual should be developed within the education institution. When an institution realise that they need to learn sign language to improve their ability to communicate with Deaf student, that means a sustainable education has built at least at the earliest stage to understand multi-cultural and multi-lingual society (McIlroy & Storbeck, 2011; Padden & Humphries, 2006).

On the other hand, this article has yet to fully explore the psychological issues faced by students with disabilities. Therefore, another study about psychologi or mental issue will be an additional advantage to develop full understanding about development media for Deaf student. An evaluation study of this learning model also needs to be done after few months to develop more ideal learning media and add some addition features which maybe needed to ease the learning process of Deaf students. Further, offline activities are also interesting for future consideration, as direct engagement has a deeper meaning for students with disabilities. Thus, the study of the face-to-face session will be interesting to be researched in the near future as the next stage of the research project.

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