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The implementation of mobile apps for visually impaired students' mobility in undergraduate programme, Faculty of Education

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Abstract

This study aims to test the results of mobile applications, namely social mobility and communication orientation models that can be used on android mobiles. This application is applied for problem-solving learning in understanding the concept of a campus environment for undergraduate visually impaired students majoring in special education, Universitas Negeri Surabaya. This research was conducted to measure the feasibility of a mobile application implemented through a questionnaire; then it was reviewed by a validation expert. Furthermore, performance test was conducted in order to be tested by the users. The application was deliberately created so that it can be operated via a cell phone. Based on the process of validity testing and practicality evaluation of the mobile application by the validator (electrical engineer) of all assessment items, the score obtained was 3.3 (good results). Meanwhile, the assessment to test application users as practitioners obtained a score of 3.2 (good results). Thus, it can be concluded that the application of the social mobility orientation model and mobile application-based communication to solve the problem of understanding the campus environment concept in the Special Education Department of undergraduate students for visually impaired students proved its worthiness.

Keywords: Social mobility and communication, mobile apps.

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1. Introduction

Visually impaired individuals experience disability of visual sense that disturbs their daily activity. According to Lowenfeld, visual impairment can lead to three forms of limitations: 1) limited concept and diversity of experience, 2) limitations in interacting with the environment and 3) limitations in orientation and mobility (Lydy Reidmiller, 2003). This means that students with visual impairments often experience limited mobility in their environment. The empowerment of learning resources based on information and communication technology is designed for the effective learning for all students at school (Alja'am, J. M., El-Seoud, S. A. & Mwinyi, M. U, 2017; Murugaiyan & Arulsamy, 2013). So that it can also be applied in the learning system for visually impaired students. This happens because visually impaired students are less able to master the concept of building layout to the surrounding environment.

This is in line with the orientation model of social mobility and communication as compensators for visually impaired students in moving activities, social and communication, in both indoor and outdoor environments (Bahri, 2008; Ministry of Social Affairs of the Republic of Indonesia., 2002), especially in understanding the layout of each environment as the second closest part besides the family for the visually impaired. During 8 hours a day or if it is presented more or less as 33%, the time for visually impaired students is spent in a special learning environment on campus. Even those who take part in majoring activities actually consider the environment as a major part of themselves in carrying out various life activities.

On campus, in the use of space for learning, there are various places of learning activities. Then, the arrangement of buildings at different levels, in addition to the place of lectures or rooms during the learning process, requires an understanding of the concepts for blind students (Bahri, 2008). If they do not understand the concept of the building layout properly, it will be difficult to move from one place to another for social learning and communication. Furthermore, the needs of sports education learning activities are required outside the classroom with different places that require time to provide an understanding to the visually impaired about the conditions of the learning environment (DitPLB, 2006; Hosni, 1996). Giving them a good understanding of environmental concepts can make them independent in the orientation of social mobility and communication. Understanding of the indoor–outdoor environment for visually impaired students to find landmarks/clues and signs that can be used as a direction in moving (Nurjannah, 2006). One of the effectiveness in the orientation of social mobility and communication in visually impaired students is developing a model.

Supporting the lectures' observations who taught the 2017 class students said that visually impaired students prefer to be next to hearing-impaired friends, touching each other in speaking using visual sign language and hearing language. A characteristic of the mobility of visually impaired students is that they move slowly and are hesitant in the learning environment. According to a friend, in his learning environment visually impaired students are still less accessible. The room that has been conditioned with a disability-friendly culture cannot be utilised properly. Road access has been equipped with guiding tiles, in fact, minimising obstacles along with road access to various places and rooms on campus that have not been well utilised by blind students. One problem that arises is that it makes them feel hard when carrying out activities in the campus environment.

The complexity of the problems of visually impaired students in mastering the low environmental concepts in the orientation of social mobility and communication about the campus environment that is too broad has made it difficult to understand the surrounding conditions. In addition, information

obtained by students about the campus environment is only verbal in the form of information from their friends. However, the information obtained can be understood incorrectly by the concerned student. The basic facts are found that visually impaired students are still having problems in understanding an object that is too broad, like the campus environment.

To overcome these problems, there are two approaches that need to be carried out, namely 1) to provide the provision of social mobility and communication orientation skills that can be used as a guide for visually impaired students to carry out various activities in the campus environment and 2) to develop a learning media that can provide an overview of the campus environment. Therefore, the development of social mobility and communication orientation models that are packaged through the use of technology based on problem-based learning becomes one of the solutions, i.e., learning technology (instructional technology) in the design, development, utilisation, management and evaluation of processes and resources for learning (Barbara & Richey, 1994; Widjaya, 2013). The utilisation of technology for learning seeks to design, develop and utilise a variety of learning resources, making it easier for someone to learn where, when, by anyone and by any learning resources that are appropriate to their conditions and needs.

Mobile orientation is the ability to understand the relationship between one object and another; it is the creation of a mental pattern of the environment. Mobility training includes the acquisition of skills and techniques that make people with visual impairments travel more easily in their environment. In mobility orientation, the concepts of direction and distance are two important things that must be understood by a visually impaired person (Hosni, 1996; Nurjannah, 2006). By understanding the concepts of direction and distance, the student will be able to move precisely and effectively, exactly in the sense that a visually impaired student can reach the destination in accordance with what he/she wants, while effective means that they can reach the desired destination safely and within a short period of time.

The interconnectedness of social and communication understanding for visually impaired students is an act in which the relationship between two or more individuals interact to express opinions as desired or to be addressed. Besides, understanding the concept of compass direction is very useful to build the independence of visually impaired students in conducting orientations and mobility in the Faculty of Education campus environment. This concept gives and instils understanding in students about the eight cardinal directions and how to determine the angle formed by a particular cardinal direction. The direction of the compass for the visually impaired student is considered very important to be known and understood through direct practice. Mainstreaming these conditions requires an orientation of the social mobility and communication model with the help of audio media for depictions of the social environment that can be directly observed by them through hearing and feeling (Aldridge & Goldman, 2002; Cole & Lorna, 1990).

In the selection of the orientation of social mobility and communication models through the use of appropriate technology for visually impaired students, it is necessary to pay attention to their characteristics and needs. People with visual impairment are individuals who use more feeling and hearing in making observations. So, the use of technology presented must be able to be optimised for the visually impaired through feeling and hearing. Then, the utilisation of the selected technology can be controlled by the visually impaired directly and can create interactions between the visually impaired and other objects and students. Therefore, the right mobile application based on the orientation of the social mobility and communication model is presented for the visually impaired to instil the mastery of the concept of social learning environments with interactive audio programmes. Interactive audio

programmes have been widely used by educators to improve student learning achievement, and the results are very positive. In his research, Jackson (2012) said that the use of instructional materials in audio form supports braille print teaching materials in learning. Learners with visual impairment can interact with these teaching materials to obtain information. Multimedia refers to various combinations of two or more media formats that are integrated into information or programme instructions (Heinich, , 1996). The interactive audio programme is a multimedia that is equipped with a controller that can be operated by the user, so users can choose what they want for the next process. The most important characteristic of an interactive audio programme is that students not only pay attention to the media or objects, but they are also required to interact socially by participating in learning.

This interactive audio programme is designed with a mobile application model to provide guidance for visually impaired students to move to various places in the Faculty of Education campus environment. Furthermore, the design of this interactive audio programme has a route to each building, making it easier for students to recognise each building addressed in the Faculty of Education campus environment. The completeness of the interactive audio programme that is heard by students with visual impairment as a guide to the various places available on the campus environment will be recorded and remembered to be used as knowledge (Hadi, 2005; Hasrul, 2010; Husamah, 2013). Understanding of this knowledge will be confirmed by visually impaired students through an interactive audio programme in a mobile application and using a guidebook with braille writing.

Based on these conditions, it can be seen that visually impaired students have some barriers in mastering the concept of the campus environment, thus impacting the student's weak ability in the orientation of social mobility and communication. A huge learning environment is very difficult to be oriented by visually impaired students perfectly. The complexity of road access and orientation of building positions is perceived wrongly by them and mobility is often hampered by being wrong in getting to the desired place. These problems arise because they lack perfect mapping of the social learning environment. Therefore, the orientation of the social mobility and communication model supported by the audio programme can represent the existence of a social learning environment that can be observed through hearing and feeling Furthermore, the orientation model of social mobility and communication based on mobile applications is assisted by interactive multimedia as an alternative that can instil the mastery of building layout regarding the social learning environment and communication in the visually impaired. Thus, the purpose of this study is to produce orientation models and social mobility based on mobile communication applications for understanding environmental concepts in visually impaired students.

2. Method

This study uses a research and development (R&D) approach from Gall, Gall and Borg (2003). Accordingly, Gall, Gall and Borg (2003, p. 772) stated that educational research and development is a process used to develop and validate educational products. This study produced a mobile application as an educational product, namely social mobility orientation model and communication. It is created for understanding the concept of indoor–outdoor environment in undergraduate students with visual impairment majoring in Special Education, Faculty of Education, Uiversitas Negeri Surabaya. The research procedure can be seen through the following R&D cycles (Figure 1; Gall, Gall and Borg, 2003, p. 775). There are 10 major steps in the R&D cycle. However, only four steps are taken and applied in this study. It is chosen since these steps are required to carry out the data analysis.

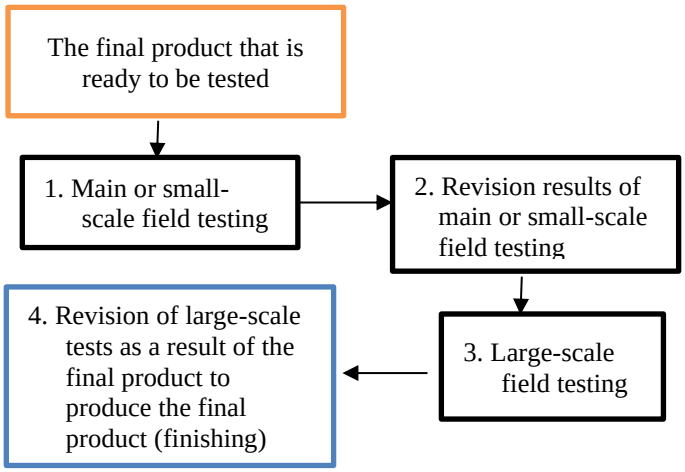


Figure 1. Steps of Data Analysis Gall, Gall and Borg, 2003, p. 775

The first step is conducted on one visually impaired student of class 2016 through the performance test. In the second step, the student of class 2016 provides his comment to be used as the revision. After the revision is completed, the third step is conducted on two visually impaired students of class 2018 through the performance test. Then, the revisions from these students are accepted and revised to be used as the final product as stated in step 4.

2.1. Product testing

Product trials in development research

1. Design of the Validation Test

The orientation model of social mobility and communication based on mobile applications for understanding the indoor–outdoor environment of visually impaired students developed in this study is expected to have a high level of eligibility. Therefore, it is necessary to conduct a series of product validation tests, as well as make revisions based on validation tests. The validation test was carried out through a review of media experts and visual impairment experts.

2. Test Subjects

The product trial subjects go through two stages, namely:

a. The expert review stage

The product trial subjects were assessed by 1) media-specific learning technology experts and 2) Special Education experts for visual impairment.

b. Product trial phase for the subjects

After obtaining input from experts and making improvements, the orientation model of social mobility and communication based on mobile applications for understanding the concept of the campus

environment was tested on visually impaired students of the undergraduate programme of the Faculty of Education, Universitas Negeri Surabaya.

2.2. Data collection techniques

Data collection techniques are stated as follows:

1. The questionnaire was given to one visually impaired student in class 2016 and two of them in class 2018.

2. Interviews were required as a supporting technique in collecting data. They were applied for:

1) Obtaining information about the learning programme of social mobility orientation models and mobile application-based communication, especially the understanding of the learning environment from mobility and orientation lecturers.

2) Obtaining an assessment of learning media products, namely the introduction of the campus environment by using the social mobility orientation models and mobile application-based communication by special education experts and media-specific learning technology experts. The instruments in the form of observation, questionnaires and interviews were used to obtain information about the needs of visually impaired students, learning programmes for social mobility orientation models and communication based on mobile applications for understanding the environmental concepts of the students.

3. Performance test

The performance test was conducted simply to find out the results of the app's performance when it was applied by the visually impaired students.

2.3. Data analysis techniques

The descriptive qualitative data analysis technique was used to process the data from the experts' review. This analysis was carried out by grouping information from qualitative data in the form of inputs, responses, criticisms and suggestions for improvements that were provided through the questionnaire. The results of the analysis were used to revise the product model of social mobility orientation and communication based on mobile applications for the understanding of environmental concepts in undergraduate visually impaired student. The analysis of the data obtained from the questionnaire was processed in the form of a descriptive percentage; the formula used is presented as follows:

$$\text{Percentage} = \frac{X \text{ (Total Score Obtained)}}{n \text{ (maximum number of scores)}} \times 100\%$$

The criteria used for decision-making from product assessment are explained in Table 1 (Arikunto, 2010).

Table 1. Product assessment criteria of the orientation model on social mobility and communication based on problem-based learning for understanding environmental concepts in undergraduate visually impaired students of Special Education, Faculty of Education, Universitas Negeri Surabaya.

Achievement level	Qualification
90%–100%	Excellent

80%–89%	Good
65%–79%	Adequate
55%–64%	Minus
0%–54%	Poor

3. Results and discussion

3.1. Results

1. Process model of social mobility orientation and communication based on problem-based learning for understanding environmental concepts for visually impaired students of Special Education in the Faculty of Education, Universitas Negeri Surabaya

Producing products with an orientation model of social mobility and communication based on mobile applications can be carried out through stages or development processes that require compliance with theoretical rules and field reviews. The development phase requires reference support from both journals and books related to the visually impaired. In addition, this development direction refers to the preparation of manufacturing products as follows:

a. Collecting Research and Information (Preliminary Study and Information Collection)

This stage is the beginning of the implementation for tracking and gathering information developed through:

1) Literature Review

This literature review was conducted to obtain theoretical references in the orientation model of social mobility and communication based on mobile applications for understanding environmental concepts in visually impaired students. Literature review activities were carried out by reference studies from various books and journals on information and communication technology as well as interactive audio programme software.

2) Field studies

It was conducted to determine the place as a starting point for conceptualising a product prototype by choosing a tertiary institution on the representative campus that could accept visually impaired students. In this case, the Department of Undergraduate Special Education as an institution that accommodates students with special needs was chosen as a place to prepare and create a model. Determination of the place for the field study was carried out by non-random sampling and the chosen place was used as an illustration for conceptualising the orientation model of social mobility and communication based on problem-based learning.

Next is to observe, interview and examine the documentation in the form of a landscape of the Faculty of Education. Obtaining information on objective conditions in the chosen field can be asked through the head of the Surabaya State University equipment. The observation process is carried out when the blind student arrives on the campus majoring in PLB S1 until arriving at the lecture building. The results of the data acquisition interviews with visually impaired students (even semester 2017/2018) showed that not all of them had the courage to be oriented towards mobility when they

arrived on campus. This means that they still need assistance to enter the campus to the place of learning.

By confirming the results of the literature review and field study, information is obtained that blind people have three limitations and they are 1) limitations in the environment and various experiences, 2) limitations in interacting with the surrounding environment and 3) limitations in orientation and mobility. Thus, visually impaired people often experience limited mobility in their environment. Weaknesses in the concepts of direction and distance are constraints experienced by the visually impaired. The observation results obtained the fact that students with visual impairment often get lost when moving around in the school environment. They are sometimes misguided in reaching to the desired place. The description of the position or layout of every building in the campus environment is not grounded in their minds. In addition, they lack directional guidance in mobility in the campus environment, although each building has been facilitated with clues and landmarks that can be used as a guide in walking to various places in the campus environment

Then, things related to the mobility of visually impaired students found that they were often hesitant and lacked courage in moving since they were afraid of being bumped, mired and lost during mobility in a new environment. Besides, visually impaired people are less able to translate the direction and asking people around them requires hearing and understanding so that they can reach the intended direction correctly. This mobile application was developed by paying attention to the rules of need for the visually impaired in real terms. This model is in the form of an audio talk back programme designed in the mobile application of each student majoring in Special Education. In the field study, a description of the condition of the building and the direction for the orientation process of social mobility and communication as urgency was introduced to the students as follows:

a) Moving to the Special Education building entrance and going up from the 1st floor to the 4th floor;

b) Getting down from the 4th floor to the 1st floor;

c) Heading to the office of educational staff, Faculty of Education;

d) Returning from the office of educational staff, Faculty of Education;

e) Moving to the faculty's library;

f) Returning from the faculty's library;

g) Heading to the faculty's canteen;

h) Returning from the canteen to the campus' department.

b. Planning

In this study, planning is necessary to describe the initial product prototypes of the orientation model of social mobility and communication based on mobile applications by determining the order of development systematically. This plan consists of several things that are highly necessary, they are:

1. Formulate goals

The objectives formulated in this plan are the initial steps in developing product prototypes that begin with an overview of the landscape and understanding of the environmental conditions in which students with visual impairments learn. Reference for a description of the condition of buildings and

land area owned by Surabaya State University is specifically the environment of the Special Education Department, Faculty of Education.

2. Arrange a budget for purchasing the materials in order to create a prototype product in the form of software programmes on android mobile.

Funding needed in the development of prototypes starts from the design through discussions with information technology experts, learning technology experts and visual impairment experts in Special Education; these are a) practicing mobility orientation road guidance in the faculty environment, canteens, libraries and educational staff office, b) recording voice for audio programmes, c) creating applications that can be downloaded from the Internet and d) transferring applications on android mobile.

3. Experts' Determination

In this development, competent experts are needed in the fields to manufacture initial products, and to revise until the final product. There is a need for experts in electrical engineering and learning technology and Special Education experts. Electrical engineers are needed in producing audio programmes for android mobile applications that contain road tracking guides.

4. Travel time with route planning

The time needed for this route depends on each place the student positions to the destination. Producing orientation models of social mobility and communication based on mobile applications have been determined through the route of activities that are often needed by students with visual impairments in the campus environment through the instructions that are designed on the android application.

5. Product models' quality

Products are developed by requiring the participation of people who are competent in the field of information technology, learning technology and Special Education for the visual impairment.

c. Initial Design or Product Development

This development phase is carried out through the following steps:

1). Determining the product design models of orientation for social mobility and communication.

2). Determining the distance (route) between one place to another from various campus buildings.

3). Creating the manuscript of road access guidance in the campus environment of faculty of education.

4). Creating an android application programme.

2. Results of the product development model orientation for social mobility and communication based on problem-based learning for understanding environmental concepts in blind students

The result of this development is the mainstreaming of the existing building landscape in the campus environment in the Faculty of Education. In this case, it is deliberately programmed to make it easier for visually impaired students to interact with various places in the campus environment. The results or product models of orientation to social mobility and communication based on problem-based learning can be reviewed from two aspects as follows:

The physical aspects of the orientation model of social mobility and communication consist of design, hardware and software manufacturing, audio components, road guides and user manuals.

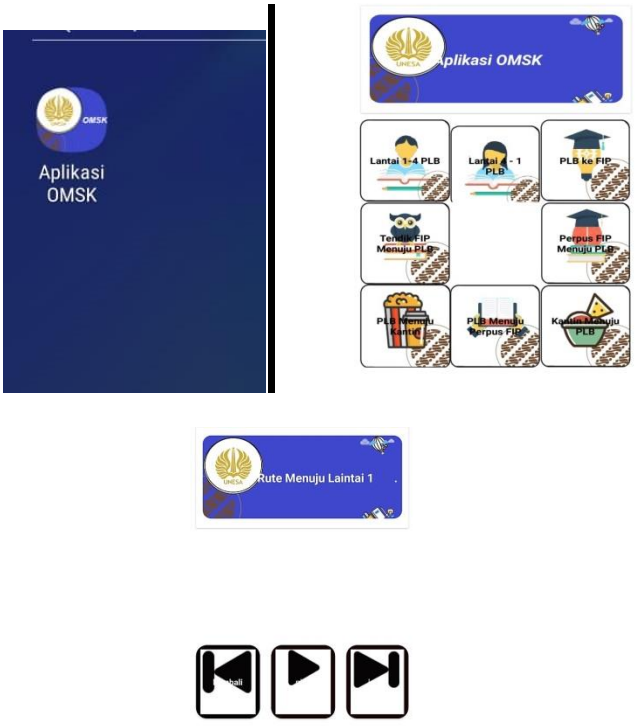
1. Product design model orientation to social mobility and communication based on problem-based learning.

This product is designed for visually impaired students. For this reason, the design is made according to the needs and characteristics of the visually impaired students. The design consists of the following:

a) Audio programme. For easy interaction to be oriented by students with visual impairments, in this programme, the narrator must deliver verses of instruction in a melodious voice in his intonation and pronunciation (Figure 1).

b) Mobile application. Design is one of the priority scales that will be used to position the software programme in each brand of mobile phone, such as store audio programme orientation model for social mobility and communication.

Figure 1. Mobile Apps of the Social Mobility and Communication Orientation Model's Audio Programme



c) A practical guide to braille and caution writing. This is used as a support to help students with visual impairments when the hand phone goes off; the practical shape of the book with A5 size makes it easier to carry. Below is the cover form of the guidebook.

2. Product content aspects, social mobility orientation and communication model based on problem-based learning.

The content aspect in this study is related to the clarity of the route guidance sound, the clarity of the instructions and the clarity of the clue to be directed.

a) Clarity of the narrator's voice on the road route
   The narrator's voice on the road route audio programme is recorded using a computer equipped with special software to record in a soundproof room, so that it produces good quality sound.
b) Clarity of instructions
   In the audio programme, the road route guide uses simple language so that it is easily understood by the students. For directions and instructions, it uses the terms left and right, whereas distance and instruction use the term footstep.
c) Clarity of clue or mark
   The audio programme for the road route guidance is equipped with clues or signs that can be used as a benchmark for visually impaired students during mobility, such as a sign or clue contained in the campus environment for mobility in the department of Special Education, Faculty of Education staff office, faculty's library as well as tangible stairs, the edge of the park and the road surface. Figure 2 shows an illustration of the sign or clue contained within the campus in the Faculty of Education, Universitas Negeri Surabaya.

Figure 2. Campus Environment of the Faculty of Education, Universitas Negeri Surabaya

3. Preliminary field testing

The implementation of the social mobility orientation model and communication based on the android application for solving learning problems in understanding the environmental concept that has been developed has passed a revision from the input of experts in electrical engineering, and the feasibility of users has been declared in terms of validity and practicality. In general, the validator chooses for each of the aspects assessed (between scores 2, 3 and 4) which is highly relevant. The product validity test results from the validator (electrical engineering expert) on all assessment items obtained a score of 3.3, which is a good result. The acquisition of an assessment to test the practicality of the user for the product obtained a score of 3.2, which is a good result. The expert validator in the field of electrical engineering and the user choose the feasible option to use with the existing assessment criteria on the product feasibility instrument with a valid

assessment instrument, and then the results of product quality of the social mobility orientation models and communication based on android applications can be justified.

The obtaining of a valid social mobility and communication orientation model product based on the android application is due to several factors, which are as follows:

1) In general, the validators (electrical engineering experts and users) state whether what is contained in the product components is in accordance with the indicators.
2) This product is in accordance with the aspects of validity measurements related to content validity and construct validity.
3) This product is prepared in accordance with the demands of the characteristics and needs of students in the campus environment of the Department of Special Education, Faculty of Education.
4) The learning media is interactive and developed according to the needs of blind students.
5) The model is structured with attention to the needs of students in accordance with the aspects of social interaction.

3.2. Discussion

In this developmental study, the results produced are based on theoretical studies and field findings about the limitations of students with visual impairments on environmental concepts. The impact of limited understanding of the environment, especially on the ability to orient social mobility and communication possessed, negatively affects the introduction of the surrounding environment. If visually impaired students having some barriers in mastering the concept of campus environment, then the orientation of social mobility and communication can be automatically disrupted. In this case, they tend to be passive in moving because of the fear of getting lost or wretched during walking in the surrounding environment. This is confirmed by stating that visual impairment in a person can result in three forms of limitations: (1) limited concept and diversity of experience, (2) limitations in interacting with the environment and (3) limitations in orientation and mobility (Lydy Reidmiller, L2003).

Based on this reality, the development of mobile applications present as a solution in teaching the understanding of correct and easy road routes from each place can be addressed. This prototype product development refers to the development model with five steps: (1) collecting research and information, (2) planning, (3) developing a preliminary form of product, (4) preliminary field testing and (5) main product revision (Gall, Gall & Borg, 2003). This research develops a product model for orientation of social mobility and communication based on android applications. The process of developing a prototype product model of social mobility orientation and communication based on android applications is supported by theories from product development that are not only in the form of learning media, but also in the form of procedures, instruments and learning processes (Adri, 2007; Ariyani et al., 2010; Arsyad, 2007; Smaldino & Russell, 2005). The following shows a prototype product based on a mobile application for understanding the environmental concepts of visually impaired students produced on target, so that it can overcome the problems faced by students who refer to the cycle steps.

1. Collecting research and information (preliminary studies and information gathering)

This is through the discovery of the fact that blind students are often lost and sometimes wrong in going to the desired place during mobility in the campus environment, majoring in special education

department. In addition, the fear of getting lost and accidents brings about the need of a peer companion, which is something they expect. In addition, weaknesses in the introduction of the concepts of direction and distance are constraints experienced by them.

2. Planning

   This is the first step of development. Therefore, preparing products requires careful planning for the perfection of mobile applications. This mainstreaming begins with exploring the landscape of the campus building majoring in Special Education Programme of the Faculty of Education, Universitas Negeri Surabaya. The results of this search were obtained from the directorate of equipment at the State University of Surabaya, which has stored landscape data of the campus building majoring in special education and faculty of education, such as reference to the condition of buildings and land area as well as the design of campus environmental conditions where visually impaired students and regular students of Universitas Negeri Surabaya study as a basis for developing the orientation model of social mobility and communication products.

3. Develop of the preliminary form of product (design development or initial product)

The stages of developing this mobile application are as follows: a) tracking the campus building landscape data of the Special Education Department, b) determining the distance (route) between one place to another from various campus buildings, c) determining the prototype design of the orientation model of social mobility and communication product and d) creating a road access guide on the campus environment. This is in the form of practical guidance for using the product orientation model for social mobility and communication based on mobile application and instrument validation.

Based on the five stages used in the development research procedure, the results of the prototype product model show the social mobility orientation and communication based on android applications in understanding the concept of campus environment for visually impaired students (Figure 3).

Figure 3. Visual impairment accessibility area in special education department building

Furthermore, the mainstreaming needed in educational services for blind children has special principles (Hosni, I, 1996; Nurjannah, 2006),which include 1) the scale of mental development, 2) the dexterity of orientation of social mobility and communication, 3) rehearsal or performance and 4) repetition in providing learning. Accordingly, educational services for the students with visual

impairment to live independently and move like normal people must be adjusted to the potential and needs of a visually impaired person (Effendi, 2009; Fishcher, Schumaker & Deshler, 1996; Ministry of National Education, 2014).

The realisation of facility practice by competent institutions is carried out in two ways; the first step is to provide a provision of orientation skills in social mobility and communication to blind students. These skills can be used as a guide for visually impaired students to carry out various activities within the campus environment. The second step is developing a learning media that can provide an overview of the campus environment. Therefore, special education services for the visually impaired are much needed in daily activities, such as mainstreaming the principle of product needs for the orientation model of social mobility and communication based on android applications in understanding the concept of the campus environment as one of the media in accordance with the conditions of the undergraduate students with visual impairment majoring in Special Education. This is in line with some studies which stated that the learning environment is created by presenting various situations that can be carried out by students in pairs and small groups, adjusting different completion limits for each student, monitoring and managing student work, managing the learning resources needed to support learning and managing movement and outdoor behaviour (Arend & Ann Kilcher, 2010).

Following-up in the process of learning activities in campus environment for visually impaired students needs to use strategies that are appropriate to their needs and characteristics. This is in line with some studies which stated that there are two ideas of learning strategies in the education of children with visual impairment: (1) efforts to modify the environment to fit visual impairment conditions and (2) efforts to optimally utilise the senses which still serve to compensate the weakness caused by loss of vision function. Utilising the senses that are still functioning optimally is a learning strategy that is appropriate and easy to apply in learning because optimal and integrated utilisation can determine success in learning (Friend, 2005; Kingsley, 1999; Lahav & Mioduser, 2002).

Based on the above explanation, it can be said that the product was deliberately designed to pay attention to the characteristics of students with visual impairments, who are very sensitive in feeling and hearing. Thus, this product was developed by combining tactual and audio programme aspects. It means that the development of a prototype model of orientation of social mobility and communication based on android applications was created based on mobile phones. This is emphasised in instructional technology (instructional technology) in the design, development, utilisation, management and evaluation of processes as well as resources for learning (Barbara & Richey, 1994). Communication and information technology seek to design, develop and utilise various learning resources to make it easier for someone to learn anywhere, anytime, by anyone and by whatever learning resources are appropriate to their conditions and needs.

Mentions orientation is the ability to understand the relationship between one object and another; it is the creation of a mental pattern of the environment. While mobility is the acquisition of skills and techniques that make people with visual impairments travel more easily in their environment. In mobility orientation, the concepts of direction and distance are two important things that must be understood by a visually impaired person. By understanding this, they will be able to move around precisely and effectively, exactly in the sense that students can reach their destination in accordance with what they want, while effective means that they can get to the desired destination safely and within a short period of time (Lahav & Mioduser, 2002).

Understanding the concept of the campus direction is very useful to build the independence of students with visual impairments by conducting the social mobility and communication orientation in the campus environment. This concept provides and instils understanding for them about the eight directions of the compass and how to determine the angle formed by the direction of a particular compass. The direction of the compass for the visually impaired person is considered very important to be known and understood through direct practice. But for students with visual impairment who are still children, the concepts of left, right, front and back are the concepts of direction that need to be introduced first.

The concept of distance must also be well understood. This is important so that students are able to estimate the distance they will travel to get to the place they want. Social mobility and communication-oriented distance measurements generally use meters, fathoms and footsteps. However, to facilitate them with the concept of distance, it is sufficient to use footsteps. Besides the concepts of direction and distance, there is one more important thing that must be understood by them when they want to get to know the school environment well, i.e., the mastery of the concept of the school environment that is imagined in the mind of visually impaired students. To instil the mastery of the concepts in the mind of visually impaired students is not easy. For students who are blind from birth, they are poor in concepts, so it is difficult to describe an object, especially if the object described is only informed through verbal language. Likewise, for visually impaired students who experience blindness after seeing, their concepts have not been able to support the creation of their cognitive mapping towards huge environmental objects. Therefore, it is necessary to have a concrete form of media for the depiction of the school environment that can be directly observed by students through hearing and feeling.

The tactual aspect is realised in the form of building imitations, road access and other physical components contained in model orientation of social mobility and communication. The audio programme contained in the components of the orientation model of social mobility and communication based on problem-based learning is complemented with braille writing information that can be touched by the students. Furthermore, the audio programme can be played in the form of a road route guide contained in the form of building a social mobility orientation model and problem-based learning based communication for understanding the campus environmental concept of the kindergarten in special education. Therefore, the need for facilities that are adapted to the conditions of today's digital era is one of the solutions that can help visually impaired people.

Similarly, some studies have stated that multimedia refers to various combinations of two or more media formats integrated into the form of information or learning programmes (Heinich, 1996). The prototype product intended for blind students is a multimedia model that is equipped with a controller that can be operated by the user, so that the user can choose to move from one place to another for further interaction processes. This is the most important characteristic of the prototype product. These conditions do not only pay attention to the media or objects, but as part of the demand to interact from one place to another during activities in learning in the learning environment of visually impaired students.

Therefore, the ASSURE model used in this development study has resulted in a prototype product model of social mobility orientation and communication based on problem-based learning for understanding the concept of the campus environment of the PLB FIP department which contains the realisation of product design with its characteristics (Smaldino & Russell, 2005), which are as follows:

1. A practical guide to braille writing and being aware of indoor–outdoor environment access and paths to various campus environments.
2. Mobile application programme.
3. Authentic assessment tools for problem-solving learning in understanding the concept of campus environment as a measurement of success in the orientation of social mobility and communication based on mobile applications.
4. Preliminary field testing (carrying out validation tests for major product designs).

In the application of mobility orientation models based on mobile applications that have been developed, it has passed revisions from experts in electrical engineering. Users have been declared as feasible in terms of validity and practicality. The expert validator in electrical engineering and the user chooses the feasible choice to use with the existing assessment criteria on the product feasibility instrument with a valid and practical assessment instrument. Thus, the results of the product quality orientation model for social mobility and communication based on mobile applications can be justified.

The product gaining model orientation of social mobility and communication based on mobile applications is valid due to several factors, as follows:

1) In general, the validators (an electrical engineering expert and the users) stated what is contained in the product components in accordance with the indicator.
2) This product fits the aspects of measurement of validity related to the content and construct validity.
3) This product is arranged in accordance with the demands of the characteristics and needs of students found in the campus environment majoring in Special Education.
4) Learning media are interactive and developed according to the needs of visually impaired students.
5) The model is prepared with regard to the needs of students in accordance with aspects of social interaction.

The practicality of the orientation model of social mobility and communication based on mobile applications for problem-solving learning in understanding environmental concepts has been obtained through several factors (Friend, 2005; Kingsley, 1999; Lahav & Mioduser, 2002) as follows:

a) The model has been developed in accordance with the practical aspects.
b) The model is arranged according to the needs of visually impaired students who can solve the problem of learning to understand the campus environment.
c) The application of the model is equipped with supporting practical guidelines. Thus, students are able to use it anytime to learn and understand the campus environment.
d) The mobile application-based model is interactive.
e) The model is prepared with regard to the needs of students in accordance with aspects of social interaction.

In practicality, the model can be seen through user assessment on the observation sheet of the ease of student learning activities through a mobile application. By obtaining these results, the user

states that the developed model of social mobility orientation and communication based on mobile apps can be applied to help visually impaired students understand the campus learning environment (Kemp, 1994; Knirk, 1986; Mercer & Mercer, 1993).

4. Main product revision

After the mobile application product is tested on experts and users, the product will receive some input. Therefore, the basic input and suggestions need to be revised in the developed product. Revisions to the initial product or draft I are based on ratings, comments and suggestions from validators and users. Based on the revised draft I, it is then reported back to the validator and user to see the results of the improvements made through the discussion. The results of the revision in draft I is then called draft II, which is then analysed by the validator and the user to be corrected again. Based on the revised draft II, input and suggestions are given back by the validator through a reassessment after observing the product orientation model for social mobility and communication based on mobile applications.

The results of the correction from the electrical engineering expert and the user, then as a validator states that draft II is the final product, mean that the product model of orientation of social mobility and communication based on android applications is feasible and ready to be used by blind students in the campus environment of Special Education Department, Faculty of Education. The results of the analysis show that according to the appropriate criteria, the social mobility orientation and communication model based on mobile apps are ready to be used by visually impaired students to solve learning problems in understanding the campus environment. This is in line with the studies which clarified that solving learning problems can train and develop students' abilities to solve authentic problems from their actual lives, so as to stimulate students' higher-order thinking skills. This means that the orientation model of social mobility and communication based on mobile applications has the potential to solve learning problems because it presents an introduction process to the problem-oriented environment as found by students in real life (Aldajani, 2016; Pranata, 2010; Prasnowo, 2011; Sadiman, Haryono & Rahardjito, 2012; Schalfer, 2000; Setyosari, 2001).

4. Conclusion and suggestions

4.1. Conclusion

In applying the social mobility orientation model, mobile application-based communication has been designed based on the collaboration of electrical engineering experts and special education specialists with visual impairments, as well as user advices. However, this study was only conducted for the visually impaired students in the special education department, Universiras Negeri Surabaya. The process of implementing the product orientation model for social mobility and communication based on mobile applications has been conducted through testing the feasibility of the validity and practicality of the product. The validity test results of the product from the validator (electrical engineer) to all assessment items obtain a good result score of 3.3. Obtaining an assessment to test the practicality of users obtained a good result score of 3.2. Dealing with that, it can be concluded that the implementation of the social mobility orientation and communication model based on a mobile application for problem-solving learning in understanding the campus environment concept in the faculty of education department of undergraduate visually impaired students is eligible.

4.2. Suggestions

Based on the conclusion, the suggestions in this research development are directed at the aspect of further development, followed by the effectiveness test of social mobility orientation and communication model based on mobile application for problem-solving learning in understanding the campus environmental concept of the Department of Undergraduate Special Education for visually impaired students.

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