AUGMENTED REALITY APPLICATION FOR TEACHING AND LEARNING BASIC PC MAINTENANCE

Marliza Abdul Malik[1*], Suhaimi Mohd Noor[2], Suziyanti Marjudi[3]

[1]Faculty of Communication, Visual Art and Computing, Universiti Selangor
marliza@unisel.edu.my
[2]Faculty of Communication, Visual Art and Computing, Universiti Selangor
suhaimimn@unisel.edu.my
[3]Faculty of Communication, Visual Art and Computing, Universiti Selangor
suziyanti@unisel.edu.my

Abstract: Augmented reality is hidden content, most commonly hidden behind marker images, that can be included in printed and film media, as long as the marker is displayed for a suitable length of time, in a steady position for an application to identify and analyze it. Depending on the on the content, the marker may have to remain visible. Using a mobile application, a mobile phone's camera identifies and interprets a marker, often a black and white barcode image. The software analyses the marker and creates a virtual image overlay on the mobile phone's screen, tied to the position of the camera. This means the application works with the camera to interpret the angles and distance the mobile phone is away from the marker. Computer maintenance is the practice of keeping computers in a good state of repair. The user need to know how to do the very basic maintenance and repair the hardware. Some of the user not equip with that skill or knowledge and sometimes they just ignore the sign or the problem occur to their computer. The manual usually in hardcopy and not easy to understand all explanation in the manual. The objectives are to investigate different types teaching and learning methodology, to identify the moderating effect of the use of mobile augmented reality application in teaching and learning process and to study the development and the use of mobile augmented reality application for teaching and learning. A research methodology is a process where information and data is collected for the purpose of making decisions towards the project. For this project the ADDIE research method is used. The ADDIE model is the generic process traditionally used by instructional designers and training developers. The five phases: Analysis, Design, Development, Implementation, and Evaluation.The use of augmented reality for teaching and learning: Basic PC maintenance will be the best way to attract and deliver knowledge. The scope of this project will involve staff and students of Universiti Selangor. The cost of print could also be reduced with the use of augmented reality technology for learning and teaching process.

Keywords: mobile application, marker image, virtual image, interprete marker, pc maintainance, augmented reality.

1.   Introduction

Today, the use of digital technology is rapidly growing in importance and in size; the use of online video, social media and digital applications are becoming more and more popular. However, because there are constantly under threat of over-proliferation. In other words, the Internet, which in itself is a medium cluttered with information, is being cluttered with online advertising which still applies marketing technique from more traditional marketing (i.e. "push marketing"). Such techniques are, however, often unsuited for the digital environment (Ylinen, 2012).

Augmented reality has been put to use in a number of fields. The goal of augmented reality is to add information and meaning to a real object or place. According to Azuma (1997), Augmented Reality (AR) is a variation of Virtual Environments (VE), or Virtual Reality as it is more commonly called. VE technologies completely

immerse a user inside a synthetic environment. While immersed, the user cannot see the real world around him.

According to Yin et al (2011), AR allows the user to see the real world, with virtual objects superimposed upon or composited with the real world. Therefore, AR supplements reality, rather than completely replacing it.

Hence, we should look another angle of how to deliver knowledge of basic PC maintenance. The user can learn by using their smartphone or tab through scanning the marker that was created for this AR application. User will learn via video that will display through their smart phone by scan the marker provided for initiate the video.The scope of this project will involve the focus group, which are the students and staff of UNISEL. A research on how augmented reality is used for teaching and learning.

2.   Literature Review

2.1 Technology for Teaching and Learning

There are many positive effects in using technology for teaching and learning. Regarding Costley (2014), technology integration has the following benefits such as increased student motivation, increased student engagement. Other than that, technology in education has let to student collaboration. It also increased hands on learning opportunities.

Meanwhile Damassa (2010) mentioned that simulation technologies are powerful educational tools that are becoming more widely used due to their effectiveness in providing powerful learning experiences. The use of simulations on campus will continue to expand because they are effective pedagogical tools.It will also expand as the trend toward competency-based education and cross-discipline competency development expands.

Media usage for teaching and learning is related to usage of IT application as medium for information and knowledge delivery. Regarding to Gidion et al (2014) there are many students would like to use their mobile devices for formal as well as informal learning Relatedly, recent developments in technology resulting in smartphones and tablets dominating the market in recent years have ensured that these devices have great functionality and enable interactivity, thus fulfilling the desire for both formal learning and informal learning. There is no doubt, however, that the integration of IT media and services in higher education appears to have led to substantial changes in the ways in which students study and learn.

Chen et al (2014) stated that active learning may include collaborative, cooperative, and problem-based learning. Technology can be applied to active learning and may provide interactivity between learners and content knowledge. Technology should support meaningful learning by providing a "context to support learning by doing" or active learning. Technology should no longer be used to transmit knowledge or teach, it should be used to engage students and promote critical thinking.

Multimedia is a field that concern in computer application that integrates element such as text, audio, graphic, animation and video. For Reza et al (2014) multimedia education as a new educational methods is performed by conveying the concepts and educational materials in an easier, more wide and attractive along with text, sound, pictures and video and has a special capacity and potential to convey information for patients and especially those with low literacy. This new education program can facilitate decision-making process by empowering patients for having an active role in selecting health-oriented programs and if it is along with proper design will be highly effective in transferring data.

In 2014, Khairnar mentioned that the advance pedagogy is the way to enhance teaching and learning performance. Teaching with technology engages students with different kinds of stimuli- involve in activity based learning. Any teaching method without destroying the objective could be considered as innovative methods of teaching.

2.2 The important of computer or PC maintainance.

Hunter Business School (2017) mentioned the importance of regular maintenance of the computer to run smoothly. Dust can caused short circuits or viruses and keep the outside of the computer clean. Too much dust on the monitor can give eye strain. Make sure to disinfect the computer, as well, to keep it clean, Proper maintenance keeps the computer running faster. Taking away all the unwanted software, extensions, and applications will free up RAM and make the computer run faster and safer. Backing up data will make sure there is always a copy if something goes wrong. Use antivirus software to keep out viruses and Trojan horses.

According to Big (2017) whether you are a Mac or PC lover, having the right computers and software is important for any successful business. Keeping computers well maintained is key to running a business smoothly. Invest time and money into the latest virus protection and customer information.

2.3 Augmented Reality Overview

Augmented Reality (AR) is an emerging technology that aims to enhance our everyday experiences by layering virtual images and sounds over real ones. One form of AR is experienced by looking at the screen of a smartphone or tablet, with the camera directed at an image target.

Nur and Dayang (2014) stated that, the advancement of mobile computing platforms has created a way for Augmented Reality (AR) technology to be diverse in many domain areas. Currently, research on AR is increasing. It has been used in many sectors such as marketing and advertising, military training, gaming industries and tourism. AR is mainly used for navigation, for example by using Google Maps where it provide route information to destinations by overlaying digital arrows, current traffic, time that can be seen on the mobile display. Furthermore, in tourism industries, user does not have to open their laptop or computer to find information

about historical places. What they can do is, just simply walk around with their smartphone and point at the building or street by using LAYAR application.

Nur and Dayang also added that it is still not able to reach the mass market due to some limitation and challenges that developers and researchers need to solve. Even though current smartphone has equipped with basic components to enable AR function, still it consume a lot of processing power, memory, and storage. (Nur & Dayang, 2014).

Meanwhile Krevelen et al (2010) stated that augmented reality (AR) is a technology to create a "next generation, reality –based interface" and is moving from laboratories around the world into various industries and consumer markets. AR supplements the real world with virtual (computer generated) objects that appear to coexist in the same space as the real world. AR was recognized as an emerging technology, and with today's smart phones and AR browsers we are starting to embrace this very new and exciting kind of human computer interaction.

Nur & Dayang (2014) emphasize that, although mobile AR technology has been introduced for more than 40 years, there are some amazing uses for the technology that cannot be implemented. This is due to its limitation in technical and non-technical issue either from developer views or user perspectives such as in the area of technical limitations (hardware, algorithm and interaction technology) and non-technical limitations (social acceptance, privacy and usefulness).

Nevertheless, if these limitations can be overcome, definitely AR technology can be utilized for the benefits of people. Mobile AR technology will provide opportunities for businesses and developers to spend their money and efforts in fields of AR. It is expected that AR applications revenue will come up to $5155.92 million by 2016 (Nur & Dayang, 2014).

2.4 Advantages of Augmented Reality

The main purpose of using AR has been for explaining a topic of interest as well as providing additional information. AR educational games and AR for lab experiments are also growing fields. The main advantages for AR are: learning gains, motivation, interaction and collaboration. (Jorge et al, 2014)

Referring to Bitter and Corral (2014), AR apps were found to help students that have difficulty conceptualizing complex information. The ability to generate high quality media in real-time in response to learner input allows advanced math concepts to be demonstrated visually.

Likewise, Papagianis (2014) had seen AR in education in the past, primarily in the form of visual 2D and 3D overlays in books and flash cards. These experiences are still a rudimentary form of AR and do not harness the full power and promise of this rapidly emerging technology. The new and true AR is driven by context awareness, creating highly personalized experiences for each individual user. By analyzing and effectively applying data from sensors and devices, highly customized and meaningful information can be delivered – and even anticipated. Education is a prime

area where the power of this technology can be applied with highly meaningful and even life-altering results.

It is clear from Jorge et al (2014) studies that shows the results which it can be seen that the major advantages reported in the studies are: "Learning gains" (43.7%) and "Motivation" (31.2%). On the other hand, very little was found in the literature on advantages of AR in educational settings such as: "Increase capacity of innovation" (6.2%), "creating positive attitudes" (6.2%), "Awareness" (3.1%), "Anticipation" (3.1%), "Authenticity" (3.1%), and "Novelty of the technology" (0%). In this sense, there is a need of more research in order to validate if those factors are advantages of AR in education.

Another category analyzed in this systematic literature review deals with the "Reported Advantages" of AR in educational settings. The studies also shows the results which it can be seen that the major advantages reported in the studies are: "Learning gains" (43.7%) and "Motivation" (31.2%). On the other hand, very little was found in the literature on advantages of AR in educational settings such as: "Increase capacity of innovation" (6.2%), "creating positive attitudes" (6.2%), "Awareness" (3.1%), "Anticipation" (3.1%), "Authenticity" (3.1%), and "Novelty of the technology" (0%). In this sense, there is a need of more research in order to validate if those factors are advantages of AR in education.

Jorge et al (2014) stated that AR has been effective for: a better learning performance, learning motivation, student engagement and positive attitudes. There are AR apps have also been developed for teaching chemistry, biology, physics, languages, English, religious studies, astronomy, geometry, medical practice, musical education, education support, visual art, and library studies. AR Apps are more effective than print, books, and software when teaching spatial subjects, like geometry. AR apps are more effective than textbooks for teaching the meanings of words, and students retain knowledge longer than from text and video. Positive effects also include increased collaboration and motivation. (Bitter & Corral, 2014)

Refered to Gutiérrez et al (2015), AR applications allow that in certain teaching/learning contexts, they can be performed by the student on his own, thus saving teacher's time spent on repeating explanations. The students gladly welcome this technology, so a well-planned AR application will allow them to successfully perform any learning processes. The tools developed in this work have achieved a dual effect as they allow the teacher to improve guidance at the training sessions within the practice laboratory, and to offer attractive and motivational tools to the student during the learning process of contents.

User experience is the most important point in advantages of augmented reality technologies. One of the research on user experience (Lucia et al, 2015) point out that the main advantages presented by the students in applying the AR use in the mechanical engineering education refer to the following: we can see the weld quality; we can make mistakes and start again; we can test different types of welding and we can review a video on the task being performed. Recommending pre-training for the visual accommodation in order that efforts be made to adapt to the new way of viewing part to be welded with the perception of manual movement, which must be

fully synchronized. So it emphasizes the importance of preliminary training for the adaptation of visual acuity and motor synchronization. Have the didactic point of view the use of the AR system in the practice of welding a great advantage, as media tool, is that help commands can be enabled for beginners during the practical exercises, but also after welding. The flexibility of the system allows the student to access the solder analysis module and watch all the practice performed and to verify the percentage of correct answers in each parameter evaluated and, if necessary, repeat the exercise as often as desired. And very positively, the simulated process provides students with greater security in the initial phase of training, not exposing to the fumes generated in the process, the high temperature process (electric arc region that can reach temperatures between 15000º to 20,000 °C).

3   Research Methodology

For this project the ADDIE research method is used. The ADDIE model is the generic process traditionally used by instructional designers and training developers. The five phases: Analysis, Design, Development, Implementation, and Evaluation; represent a dynamic, flexible guideline for building effective training and performance support tools (Culatta, 2013).

The breakdown of ADDIE method for this project is as follows:

- **Analysis**
  The analysis phase for this project include studying the current trends of distributing information (online and offline), the technology used which include the hardware and software requirements and also the marketing style for persuasion of the targeted audience.

- **Design**
  During the design phase, initial flow (or storyboard) of the use of the AR application is being laid out. This is done to identify the easiest and convenient way for user to use the AR application and also to identify any constraints from the project (or application itself).

- **Development**
  At this phase, the development of the AR application is being done. Unity is selected for development the application. Two markers were design for this matter. For the video, a short video demonstrates step by step each process or procedure on maintained the PC.

- **Implementation**
  The implementation of this project is done by two groups of user Unisel's staff and Unisel's Students. A set of questionnaire and testing was given to the user to collect data related to their perspective and experience using AR application.

- **Evaluation**

After the implementation of the project, an evaluation phase was conducted to view performance of the user after the testing. Data from the questionnaire will also be used to evaluate the potential of this application.

3.1 Questionnaire

The questionnaire were given to the user the every user who test the AR application, are given the questionnaire and there are 30 users/respondents from the school. There are five questions (provided in English and Bahasa Melayu) to be answered by the users and the answers are all in the form of likert scale answers, which are strongly disagree, disagree, moderate, agree and strongly agree. Users answer the questionnaire after they have been using the AR application.

The questions are as follows:

1. Application is easy to navigate (Aplikasi mudah untuk dikemudi).

2. Interface is clearly seen (Antaramuka jelas dilihat).

3. Video is clear and understandable (Video adalah jelas dan mudah difahami).

4. Augmented reality can be use as one of the of teaching and learning (Realiti tambahan (AR) boleh digunakan sebagai salah satu alat untuk pengajaran dan pembelajaran)

5. Augmented reality can be considered as a new way to attract viewers/users (Realiti tambahan boleh dianggap sebagai cara baru untuk menarik perhatian penonton/pengguna)

3.2 Testing

The testing were given to the user who try the AR application. There are three questions (provided in English and Bahasa Melayu) to be answered by the users and the answers are to tick the best answer. Users answer the testing questions after they have been using the AR application.

Answer all questions. Tick (☑) ONE answer only.

1. How to remove Heat Sink
   Bagaimana mengeluarkan "Heat Sink"

☐	☐	☐
Remove the a) cover 1. Press the plastic clip and pull the heat-sink cable from the system board. 2. Using a Phillips screwdriver, loosen the captive screws securing the heat-sink assembly to the system board and lift it away from the computer. 3. Lay the assembly with the fan facing downwards, and with the thermal grease facing upwards.	Remove the a) cover 1. Open the plastic clip and pull the heat-sink cable from the system board. 2. Loosen the captive screws securing the heat-sink assembly to the system board and lift it away from the computer.	Remove the a) cover b) PCI slot 1. Press the plastic clip and pull the heat-sink cable from the system board. 2. Using a Phillips screwdriver, loosen the captive screws securing the heat-sink assembly to the system board and lift it away from the computer. Lay the assembly with the fan facing downwards, and with the thermal grease facing upwards.

2. How to remove processor
Bagaimana menukar processor

☐	☐	☐
Remove the a) cover b) heat sink 1. Press the release lever down. 2. Then move it outward to release it from the retention hook that secures it. 3. Lift the processor cover and remove the processor from its socket.	Remove the a) cover 1. Press the plastic clip and pull the heat-sink cable from the system board. 2. Then move it outward to release it from the retention hook that secures it. 3. Lift the processor cover and remove the processor from its socket.	Remove the a) cover b) heat sink 1. Press the release lever up. 2. Then move it outward to release it from the retention hook that secures it. 3. Press the processor cover and remove the processor from its socket.

3. How to remove memory card
Bagaimana menukar kad memory

☐	☐	☐
Remove the a) cover 1. Press down on the memory retaining tabs on each side of the memory modules. 2. Lift the memory modules out of the connectors on the system board.	Remove the a) cover b) heat sink 1. Lift out on the memory retaining tabs on each side of the memory modules. 2. Lift the memory modules out of the connectors on the system board.	Remove the a) cover 1. Lift out on the memory retaining tabs on each side of the memory modules. 2. Press the memory modules out of the connectors on the system board.

4 Design

4.1 Marker

Three markers were designed for this project. the marker was design for full colour and grayscale. The markers was logo, CPU component and Motherboard components.
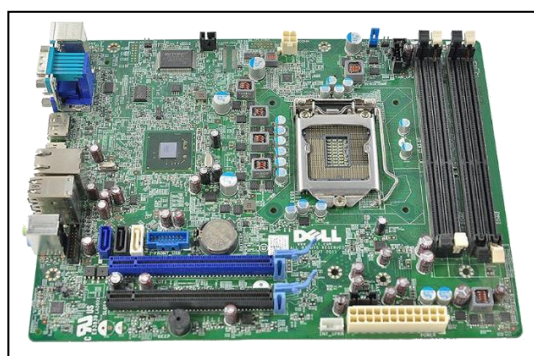

Figure 10 : Logo

Figure 11: CPU's Component

Figure 12: Motherboard's Component

4.2 Application design

The application was developed using Unity. Video related to PC maintenance was incorporated into the interface. User need to download APK file for this application to their smartphones or tablet in order to use this application.
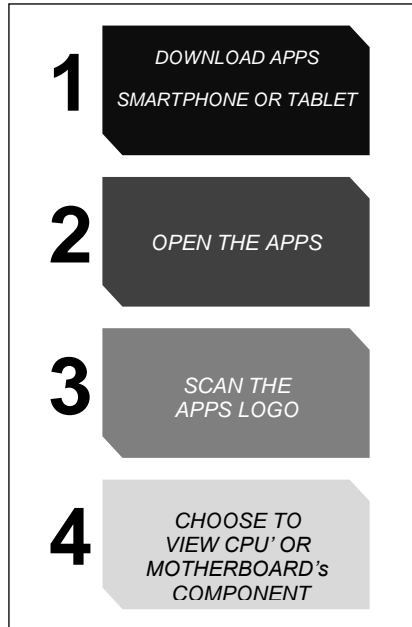

Figure 13: Basic PC Maintenance AR workflow

Basic interface design for the application is done in Adobe Photoshop. The video is designed with the frame size of 320 pixels x 240 pixels. The frame size is enough for a user with a five inch smartphone screen and it can later be enlarge based on the user preferences.
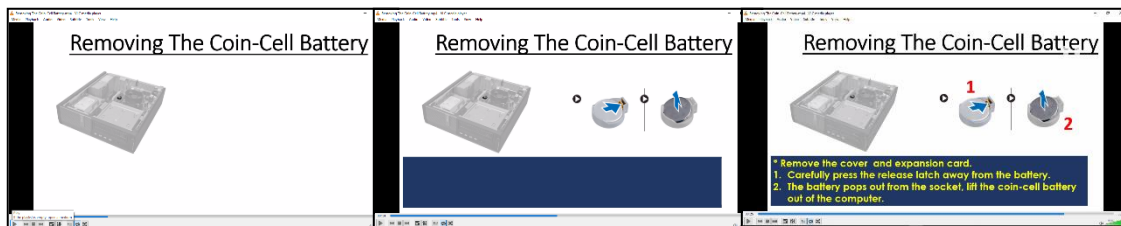
Figure 14: Video screen shots

5   Implementation

The implementation of this project is done with Unisel staffs and students. A set of questionnaire with testing questions was given to the user to collect data related to their perspective and experience using AR application.

5.1 How to use the application
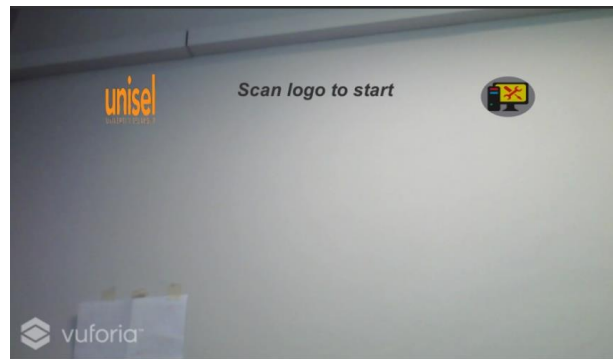
Figure 15: Scanning the Basic PC Maintenance's logo

Figure 16: Selection of menu
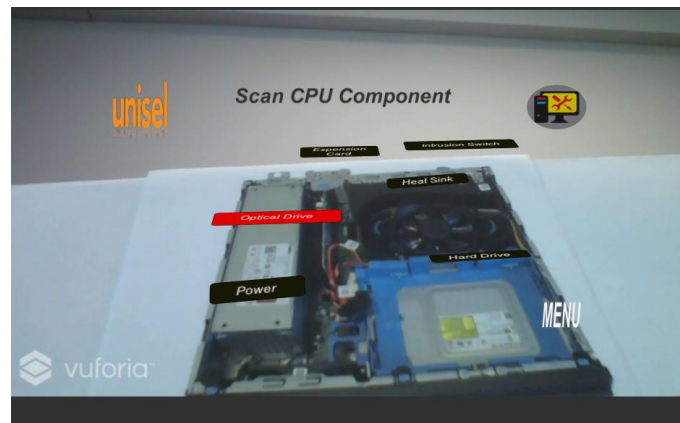

Figure 17: Scan CPU's Component Marker
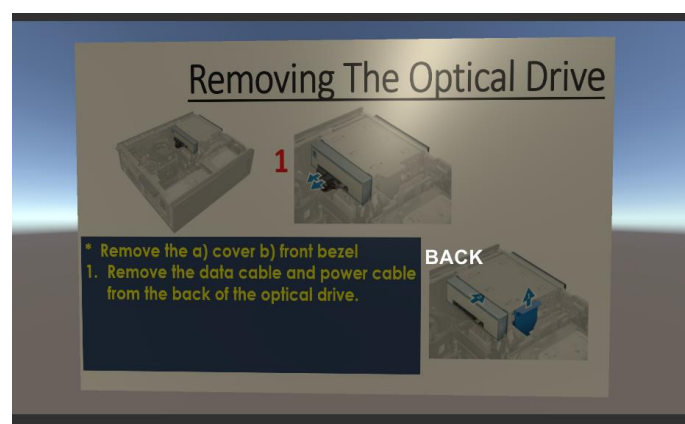
Figure 18: Selection for CPU's Component

Figure 19: Video Screen

6   Findings

The finding for the project is quite inspiring. Majority of the user liked this new way of promotion style and the use of AR is a new of learning for them. Results from the questionnaire are as follows:
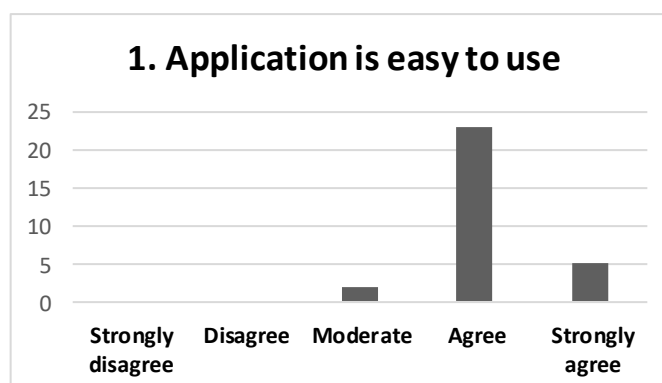

Figure 4: The use of application

Figure 4 shows that 22 users agree and another five user strongly agree that the AR application is easy to use. This shows that the simple instructions provided on the poster are useful and easy enough for the users to follow.
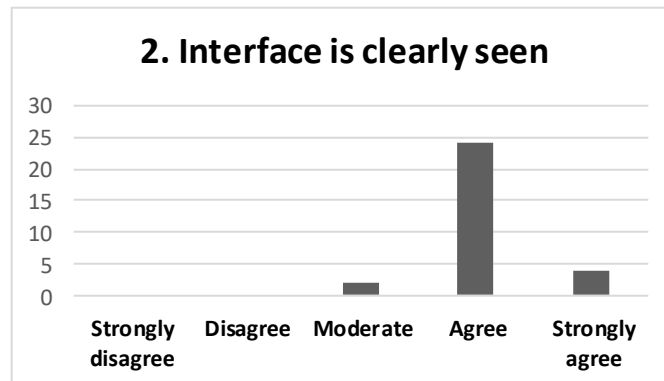

Figure 5: Interface

As shown on Figure 5, the interface design for the application is clearly seen. That is why 24 users agree and four users strongly agree on the design presented to them.
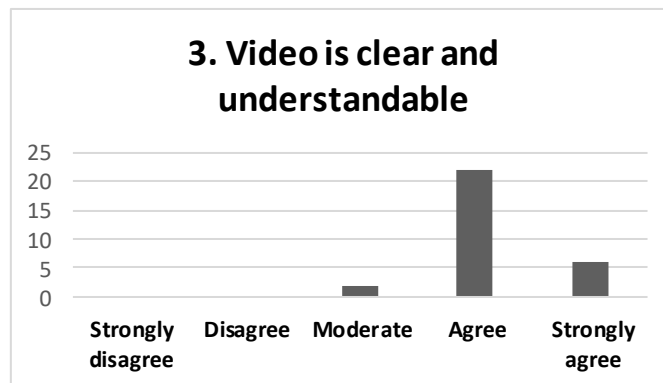

Figure 6: Video

The use of video and website for this project is clear and it is understandable for the user. This is shown in Figure 6 where 22 users agree and six users strongly agree that the video and website is clear and understandable.
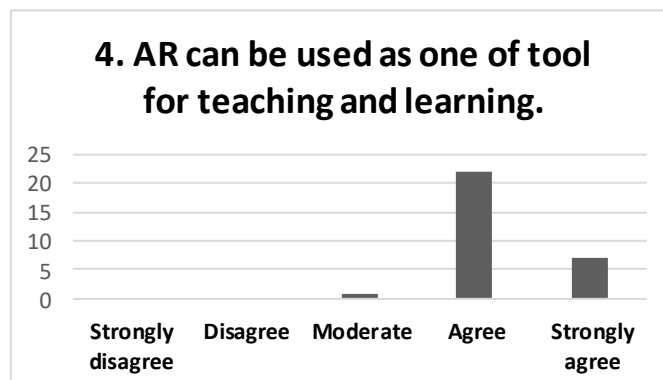

Figure 7: The use of AR

Even though all users are new in using the AR application, 22 users agree and another seven users strongly agree, as shown in Figure 7, that AR can be used as one of the tool to be used for teaching and learning
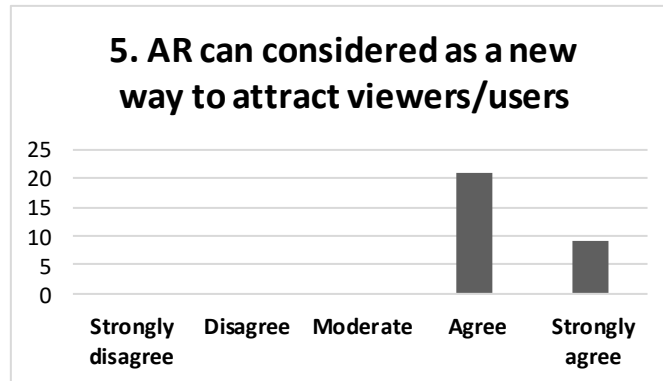

Figure 8: AR as a new way

Figure 8 shows that 21 users agree and nine users strongly agree that AR is a new way or a new technology which can be used to attract viewers or users to (at least) look at the product or services provided by any company or organizations.
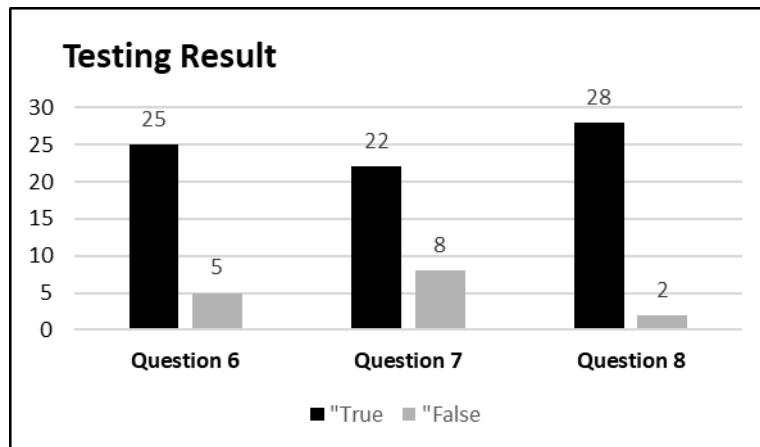

Figure 9: Testing Result

Figure 9 shows result from testing questions in questionnaire set. Question 6 is How to remove Heat Sink, question 7 is How to remove processor and question 8 is How to remove memory card. Each of the question the result was very impressive and the user able to understand knowledge deliver by using AR application, which is for question 6 (25 got true and five false), question 7 (22 true and eight false) and question 8 (28 true and only two false).

7   Conclusion

Most conventional mobile augmented reality applications related to advertisements provide the service of augmenting Point of Interest (POI) based on the positioning system of users and their surroundings (Kim and Kim, 2014).

Gervautz and Schmalstieg (2012) stated that AR has important applications in fields such as video-gaming, interactive marketing and advertising, instructional aids and how-to for use construction and maintenance, and navigation.

As a conclusion,from the findings the use of AR as a tool for learning and teaching has its own benefits, as listed below:

- New method to deliver knowledge or information.
- Fast access to the information or knowledge. As a new way of attracting potential students by viewing AR application.
- Linking video from a poster or any other printed materials.
- AR can be linked to other items such as animation, audio, text and images.

However, there are also a downside to all this. Gervautz and Schmalstieg (2012) added that mobile devices such as tablets and smartphones are rapidly evolving, but they still trail desktop computer adoption and offer only limited capacity for processing and storage. Moreover, mobile devices have ergonomic limitations, such as a small screen size, that make development of satisfactory interfaces difficult.

In this case, there are a few constrain when using AR in this project:

- Need an Internet connection.
- Required sufficient data mobile quota (for user).
- Compatible with certain smartphone/table only.

As a conclusion, the use of AR as teaching and learning tool for learning basic PC maintenance is a new and stimulating way to deliver knowledge.

8   References

Azliza Yacob and Mohd Yazid Md Saman, (2014) "*Assessing Level of Motivation in Learning Programming Among Engineering Students"*. Proceedings of the 3rd International Conference on Computing and Informatics, ICOCI Bandung, Indonesia

Azuma, R. (1997). "*A Survey of Augmented Reality*". Presence: Teleoperators and Virtual Environments, 6, 355-385.

Bitter, G. and Corral, A. (2014). "*The Pedagogical Potential of Augmented Reality Apps*". International Journal of Engineering Science Invention, Volume 3 Issue 10, pp.13-17.

Chen, G. D., Nurkhamid, Wang, C. Y., Yang, S. H. and Chao, P. Y. (2014). "*Self-Observation Model Employing an Instinctive Interface for Classroom Active Learning*". Educational Technology & Society, 17 (3), pp.14–26.

Costley, K. C. (2014). "*The Positive Effects Of Technology On Teaching And Student Learning*". Arkansas Tech University, USA.

Culatta, R. (2013). "*ADDIE Model*" from http://www.instructionaldesign.org/model/addie.html

Damassa, D. A. (2010). "*Simulation Technologies in Higher Education: Uses, Trends and Implications*". Educause Center for Applied Research, USA www.educause.edu/ecar

FitzGerald, E., Adams, A., Ferguson, R., Gaved, M., Mor, Y. and Thomas, R. (2012). "*Augmented Reality And Mobile Learning: The State Of The Art Institute Of Educational Technology/Learning And Teaching Systems*". Open University, Walton Hall, Milton Keynes, MK7 6AA.

Gervautz, M. and Schmalstieg, D. (2012). "*Anywhere Interfaces Using Handheld Augmented Reality Computer*". IEEE Computer Society Vol 45, pp. 26-31

Gidion, G., Capretz, L. F., Mead, K. and Grosch, M. (2014). "*Media Usage in Post-Secondary Education and Implications for Teaching and Learning*". Electrical and Computer Engineering Publications. EAI Endorsed Transactions on e-Learning, Vol 1, Issue 4, e3 from http://ir.lib.uwo.ca/electricalpub/58

Gutiérrez, J. M., Fabiani, P., Benesova, W., Meneses, M. D. and Mora, C. E. (2015). "*Augmented Reality To Promote Collaborative And Autonomous Learning In Higher Education*". Computers in Human Behavior 51 (2015) 752–761

Hunter Business School. (2017). "*Why Maintain Your Computer*" from https://www.hunterbusinessschool.edu/the-importance-of-regular-maintenance-on-your-computer/

Khairnar, C. M. (2014). "*Advance Pedagogy: Innovative Methods of Teaching and Learning*". International Journal of Information and Education Technology, Vol. 5, No. 11, November 2015 pp.869-872

Kim, Y and Kim, W. (2014). "*Implementation of Augmented Reality System for Smartphone Advertisements*". International Journal of Multimedia and Ubiquitous Engineering Vol 9, No. 2, pp. 385-392

Krevelen, van DWF and Poelman, R. (2010). "*A Survey of Augmented Reality*

Technologies, Applications and Limitations". Delft University of Technology, Netherlands. The International Journal of Virtual Reality, 9(2):1-20

Lucia, M., Okimoto, L. R., Okimoto, P. C., Carlos and Goldbach, E. (2015). "*User Experience in Augmented Reality applied to the Welding Education*". Procedia Manufacturing 3 (2015) 6223 – 6227

Moström, J. E. (2011). "*A Study of Student Problems in Learning to Program".* Department of Computing Science ,Ume°a University ,SE-901 87 Ume°a, Sweden.

Nur Intan Adhani Muhamad Nazri and Dayang Rohaya Awang Rambli. (2014). "*Current Limitations and Opportunities in Mobile Augmented Reality Applications*". Universiti Teknologi PETRONAS, Malaysia.

Papagianis, H. (2014). "*Augmented Reality In The Classroom Customized 'Just Right'"* from http://www.wearableworld.co/

Sedeghi, R., Sedaghat, M. and Ahmadi, F. S. (2014). "*Comparison Of The Effect Of Lecture And Blended Teaching Methods On Students' Learning And Satisfaction*". Journal of Advances in Medical Education and Professionalism, Vol 2 No 4, pp.146-150 (Tehran, Iran).

Smith, B. (2017). "*Why Computer Maintenance Is So Important"* from https://myventurepad.com/computer-maintenance-important/

Yin, S. C., Yaoyuneyong, G. and Johnson, E. (2011). "*Augmented Reality: An Overview and Five Direction for AR in Education*". Journal of Educational Technology Development and Exchange, 4(1), 119-140.

Ylinen, S. (2012). "*Consuming Augmented Reality Marketing – A Qualitative Study of User Experience*". Hanken School of Economics, Helsinki.

Zarei, A. R., Jahanpour, F., Alhani, F., Razazan, N. and Ostovar, A. (2014), "*The Impact of Multimedia Education on Knowledge and Self-efficacy Among Parents of Children with Asthma: A Randomized Clinical Tria*". Journal of Caring Sciences, 3(3), 185-192, from http:// journals.tbzmed.ac.ir/ JCS