
University of Glasgow | School of Computing Science

**Human Computer Interaction**
**Assessed Exercise Report**

# KNOW YOUR AED
# (Mobile Application)

**Done By:**

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## Introduction

The purpose of this report is to document the process of developing an interactive mobile application for this Human Computer Interaction Assessed Exercise.

This mobile application is called “Know Your AED”, which goals are to educate the users on how to use the Automated External Defibrillator (AED) and how to perform basic first-aid, in this case the CardioPulmonary Resuscitation (CPR), during emergencies. “Know Your AED‘ comprises of both tutorial and hands-on practice where the users not only able to understand the do’s and don’ts of the AED procedure, they can also try out the in-app real-time simulation. Users of all ages are encouraged to download and use this mobile application. It is of great significance for individuals to equip themselves with valuable first-aid or life-saving skills, as nowadays accidents happen so abruptly without any warnings.

## Design Process

The initial design process of “Know Your AED” was a paper prototype sketched with ideas the team had came up with. In the meantime while gathering as much knowledge on AED usage, the team had also brainstormed on how to possibly make the application an interesting and interactive one. Together with the incorporation of multimodal component in the mobile application, it aims to improve user retention of their gained knowledge and the human centered design.

In comparison to the available mobile and web applications related to the AED which we have tested during the research for this project, most demonstrations were static and not as rewarding to use. For example, the mobile application “Lifeline View AED[1]” which is available on Google Play store, has a very detailed step by step tutorial on how to use the AED and conduct CPR. However, it is not interactive for users as it is purely a video/animation based application.

[1] Lifeline View AED - https://play.google.com/store/apps/details?id=com.defibtech.lifelineaeddemo

Adding on is another example of a web application "AED Challenge[2]", the advantages of this web application is that it is rather engaging for users to follow and try out with tutorials and steps provided by clicking the 'next' steps to continue. However, as it requires an additional dependency (Adobe Flash Player), it is not convenient for users who are accessing it via their mobile phones.

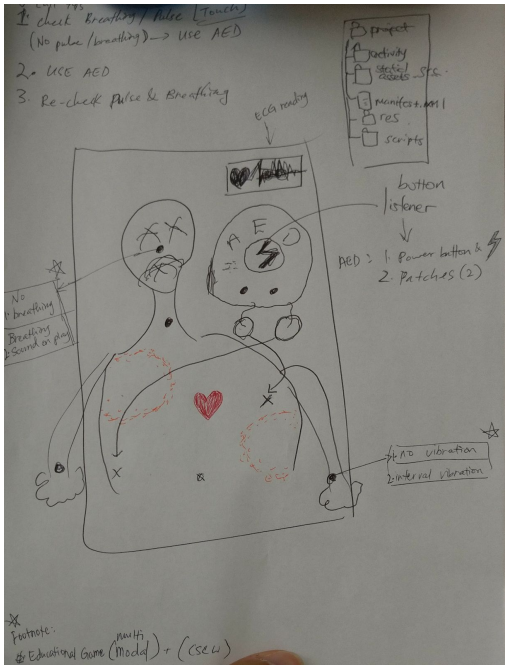
Usually to encourage more users to use an app, they are more concerned of what they would get in return; which is often in the form of monetary or accumulative rewards (such as points redemption system). However, the motivating factor of "Know Your AED" is to reward good effort put in by the users, just like how a teacher would praise its students for a job well done. Such positive inputs is the concept of human needs. This is relatively important that the main idea of learning is not about rewards, but to add value to the people and give back to the society.

In our attempts to increase memory retention of the users, we had incorporated multimodal usability techniques such as haptic feedback and voice prompts to improve the learning experience. A single-flow application helps in reducing decisions to be made by the user. By incorporating the sounds of everyday objects, from clicking a button to peeling a sticker off its backing, will also reduce the usability friction between a physical object and a virtual object (such as a touch-screen).

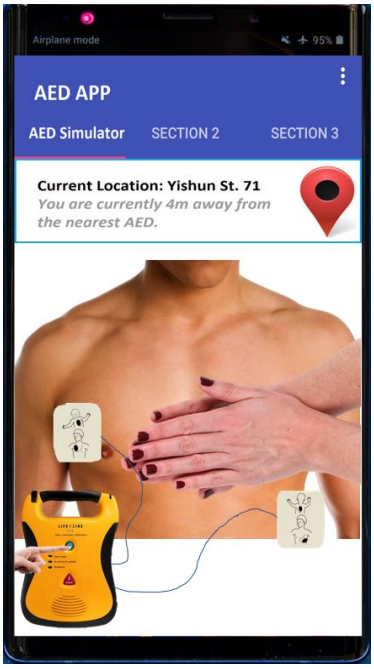
Various multimodal elements were incrementally added to our AED application based on the constant feedback of the users using the app. During our early stages of testing, we use LongClickListeners instead of TouchListeners. Users were confused as to why they would hold for more than three seconds onto the AED pad to drag it instead of just hold and drag on the spot. The user might have thought that the app was unresponsive. This triggered numerous false negatives due to the usability of the app. By conducting such tests under the 'Thinking Aloud' evaluation technique, the team was able to improve the ergonomics of our application which aims to be as user-friendly as possible.

[2] AED Challenge - http://www.aedchallenge.com/

## First Iteration
## Paper Prototype

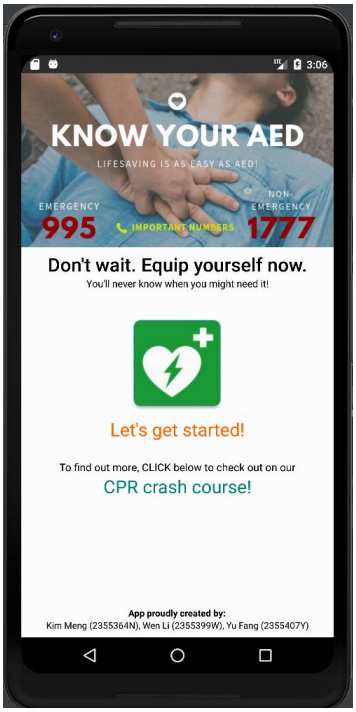



## Second Iteration
## PowerPoint Prototype

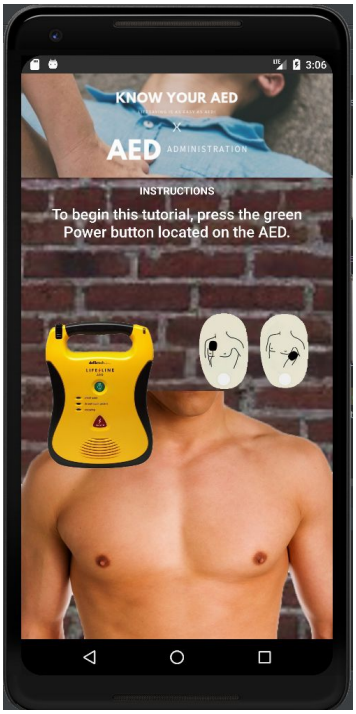



## Final Application

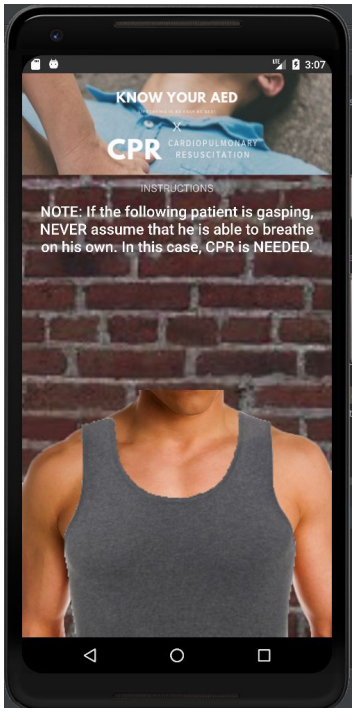
### Main splash screen




### AED Demonstration




### CPR Demonstration



**Stages of Implementation**

In this project, the team has decided to split the development process into 4 iterations.

During the first stage of implementation (first iteration), the team's main focus was to create a user interface (UI) which would allow users to have a sense of great responsibility upon launching the app, as it concerns life and death. Hence the knowledge they would gain from "Know Your AED" is relatively important and it is better to be prepared for an emergency than to actually witness it happen in real-life and be of no help.

Thus to create this effect, the choice of words used were sort of coercive. For example, "Don't wait. Equip yourself now." was placed at a suitable eye level of the screen with bolded font size larger than the rest of the text.

In the second iteration, the team developed the AED and CPR functionality which included readable text to guide the user throughout the tutorial process of using AED and CPR, it would ensure that users are able to follow the steps. For this iteration, voice over commands and haptic feedback functions were not added as the team would like to gather feedback from the users as to how do they think about the usability of the application.

As for the third iteration, the team improved on the feedback from the users by incorporating vibration effect into the application. This effect is used to maintain alertness and allows users to be more aware of crucial steps, such as when the AED had been charged and it is advised that everyone stay away from the casualty. By incorporating repeated haptic feedback, it aims to help to sustain the user's attention and thus, increasing the user's exposure to the content.

Finally, during the last iteration, sound effects were added which closely mimics the actual sounds created by an object. For example, a click of a button, or the peeling a sticker off its back. Such references would help to decrease friction between the app and the actual object (AED machine and pads). On top of the sound effects, subtle vibrations were also included to simulate the clicking of a button or an applause when the user drags the AED pad to the correct part of the body. This is a fairly novel approach in teaching-based apps and that would allow the team to bring the multimodal approach to any mobile device, through trial-and-error and multiple variations of different mobile devices.

This mobile application was coded in Android Studio using the official Android SDK in Java. As a proof-of-concept, it offers excellent access to the device's hardware, such as vibration motor and seamless coordination of audio snippets. As ConstraintLayout was implemented in recent versions of Android, it offers better compatibility of varying resolutions as compared to LinearLayout or RelativeLayout that were used in earlier Android versions. This allows the team to determine the spaces required between margins and the point size of the fonts and images. This is important as not all devices run on the same screen resolution and the vibration intensity might vary from phones to phones. It also offers better control in terms of the internal hardware as well as access to the processor's threads, which is crucial in orchestrating the various components in the app (animation, audio, vibration).

**Evaluations of Application Implementation**

| | Type of Evaluation | Reason |
|---|---|---|
| Evaluation 1 | Heuristic Evaluation<br>1. Visibility of system status - No<br>2. Match between system and the real world - Yes<br>3. User control & freedom - No<br>4. Consistency & standards - No<br>5. Error prevention - Yes<br>6. Recognition rather than recall - Yes<br>7. Flexibility & efficiency - No<br>8. Aesthetic and minimalist design - Yes<br>9. Help users recognize diagnose and recover - No<br>10. Help and Documentation - No | The reason for choosing heuristic evaluation is to identify any issues with the design of the User Interface(UI) of the application gaining from users' feedbacks. |
| Evaluation 2 | Thinking Aloud | For using thinking |

| | | |
|---|---|---|
| | - Upon launching the app there is voice prompt.<br>- The blinking icon caught my attention<br>- Short vibration when pressing something indicated that I pressed the correct thing<br>- Highlighted and blinking colour guide me on where to press, as the green power button / red shock button is not obvious.<br>- Voice instructions at least make the app not so dry as compared to reading only the text instructions.<br>- The tutorial features with voice and text prompt make it very easy to follow.<br>- Vibration is implemented, keeps me alert<br>- The vibrations made me aware of things I should take note of!<br>- The sound effects in both the tutorials are very pleasing and accurate which makes the tutorial quite fun.<br>- Step by step and quite detailed.<br><br>(Summarised from the collected responses) | aloud is to gather data in the usability testing of the mobile application design and development. Users will be asked to feedback or point out anything that comes into their mind as they are using the application. |
| Evaluation 3 | Summative<br>Overall, the survey shows that 96% of the surveyees, of a sample size of 25, felt that the application was easy to use. It also shows that after using the application, user's knowledge about AED had also increased. (refer to Appendix A)<br><br>Majority shows that the application is useful for both the AED and CPR, it shows them clearly the procedure they need to take note of, and the voice over commands is really helpful, as users do not need to read off the text. (Refer to Appendix B)<br><br>There are still a minority of the people who think that they are still not capable of | The summative evaluation takes place at the end of the project iteration. It is based on the outcome of the application.<br><br>In this case, the team went around looking for people to test out the finalised "Know Your AED" and requires them to complete a survey. |

| | | |
|---|---|---|
| | performing CPR as there is still a gap between hands-on tutorial on the dummy and performing CPR using a mobile phone. When a situation occurs, the whole circumstance might differ from the mobile application. (refer to Appendix C) | |

**Future Improvement / Enhancements**

The main development of this mobile application was to focus on delivering out the contents of the AED and CPR tutorial to bring across to users.

Firstly, this application could implement 'swipe views with tabs' (also known as sliding tabs) layout to contain the contents in separate tabs (ViewPage). This would then enable users to navigate easily within different page contents.

Secondly, this application could also add in an AED location tracker function, whereby users are able to locate the AEDs in their vicinity. Adding on to this feature, when nearing an AED location, the mobile application would then notify the user its current location and how far they are away from the AED.

Thirdly, the accelerometer function in mobile devices could also be used to enhance users' experience for the CPR content in "Know Your AED". If this feature was implemented, it will mock the real-life CPR process by instructing users to hold the mobile devices with elbows straight to conduct chest compressions with the voice command prompt and vibration rhythms (30 compressions per CPR cycle).

Furthermore, future "Know Your AED" enhancements as suggested from user's feedback, could also include:

1. an actual AED usage tutorial video/animations and actual CPR process video/animations on a separate ViewPage.
2. Short quizzes which explanation could also be generated to test if the users fully understood the important content the application is trying to deliver.
3. More scenarios for users to test if they are doing it the correct way without the instructions.
4. More tutorials on various life-saving skills

5. Health maintenance information for users to follow/ gain knowledge
6. A better layout with more pages
7. Direct dial linked to Singapore Civil Defence Force (SCDF) in case of emergencies.

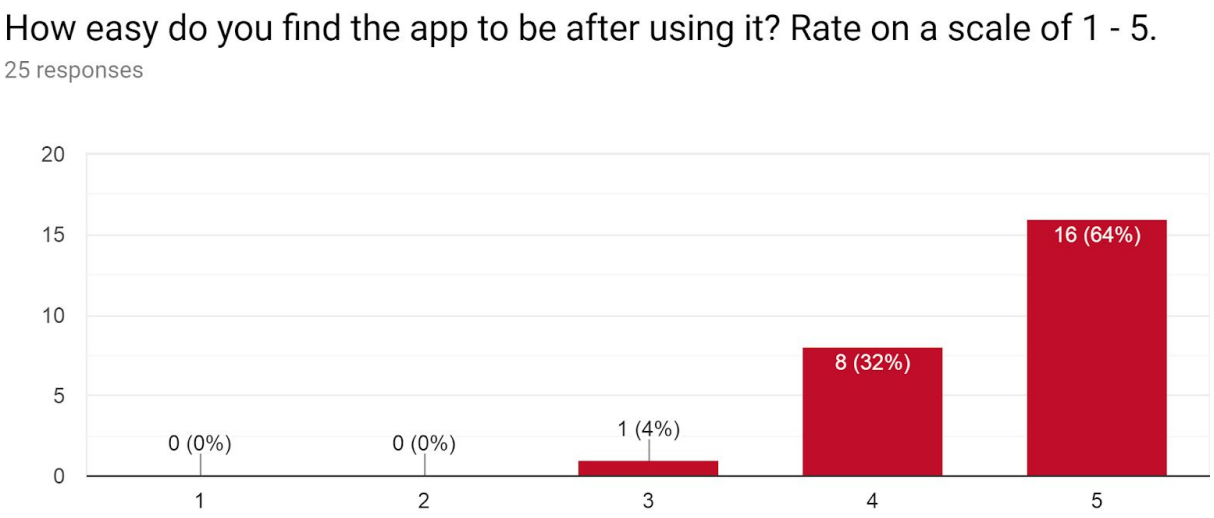
**Conclusion**

In conclusion with the results obtained from all of the 3 evaluations methods, Heuristic, Thinking Aloud, Summative, “Know Your AED” mobile application is proven to be highly feasible, with the suggested improvement that would be implemented.

**Appendices**

Link to dropbox(codes):
https://www.dropbox.com/sh/5anx4v3filqe353/AAAqSSJkgRpHaj976Av6hOsNa?dl=0

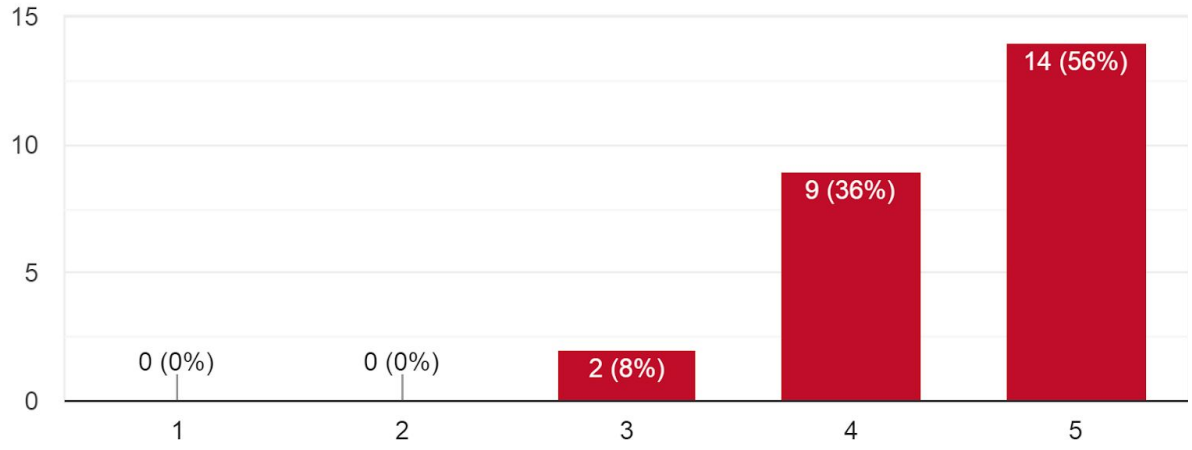
Appendix A



Appendix B

On a scale of 1 - 5, rate your knowledge of the use of AED after using this app.

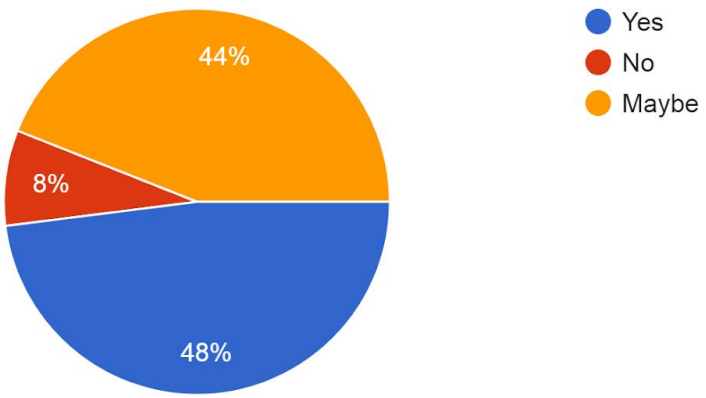
25 responses



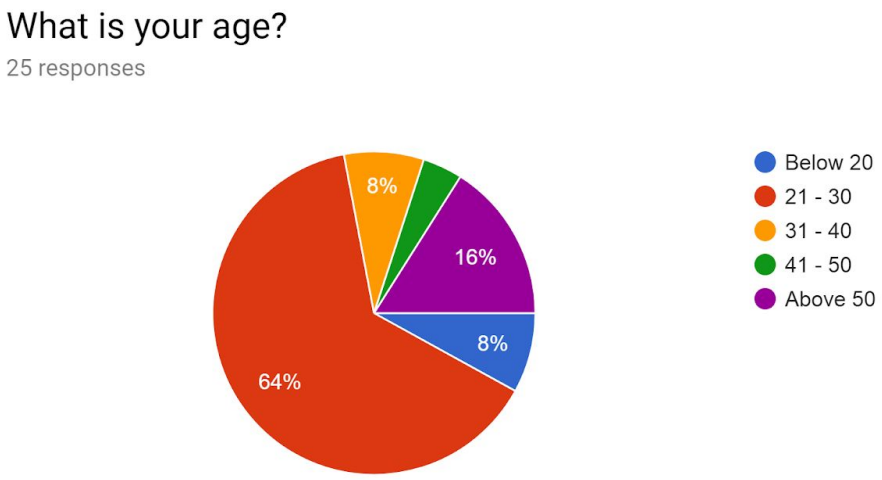

Appendix C

Do you think you will be capable of performing first-aid with the use of Automated-External Defibr...tor (AED) in case of accidents?

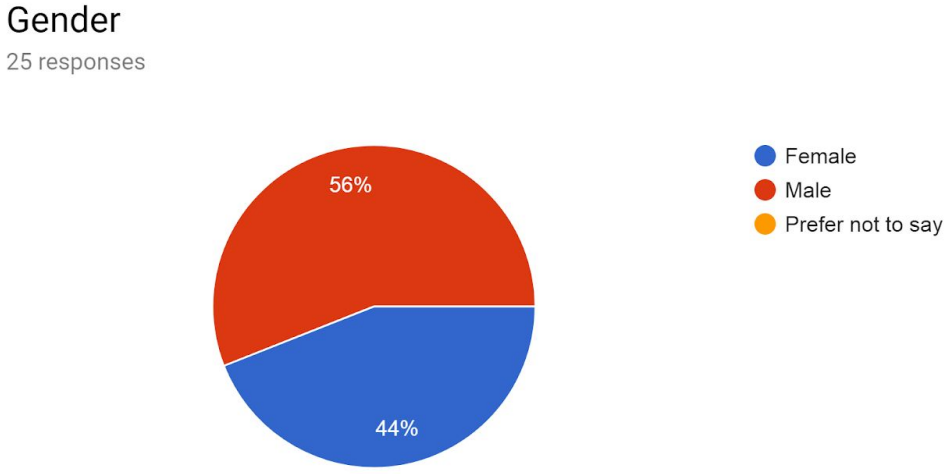
25 responses



**CHARTS**
**SAMPLE SIZE & GENDER**

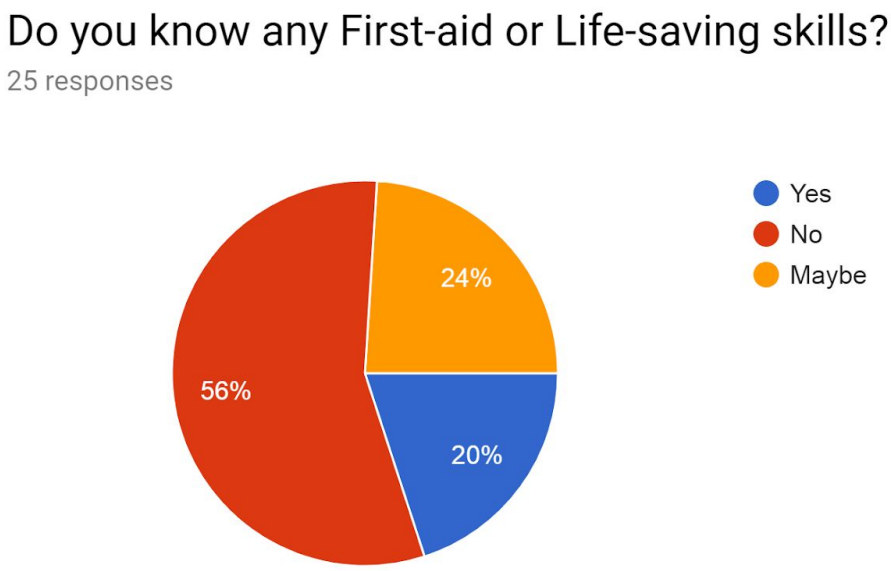



**BELOW 20 - 2 PEOPLE**
**21 - 30 - 16**
**31 - 40 - 2**
**41 - 50 - 1**
**ABOVE 50 - 4**

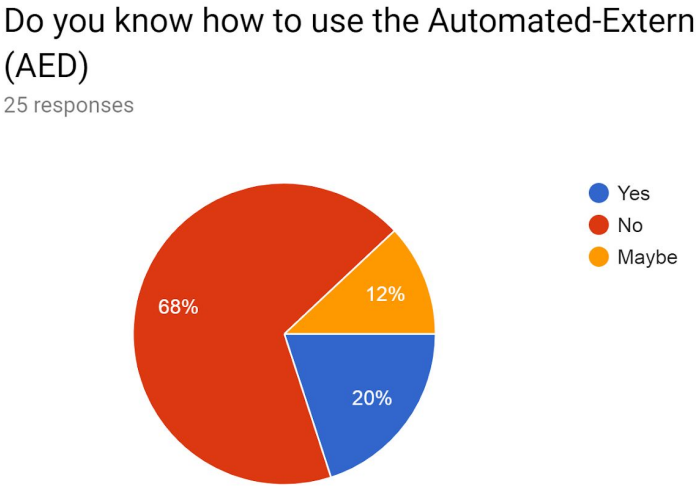



**Male - 14**
**Female - 11**

**Before testing out the app**



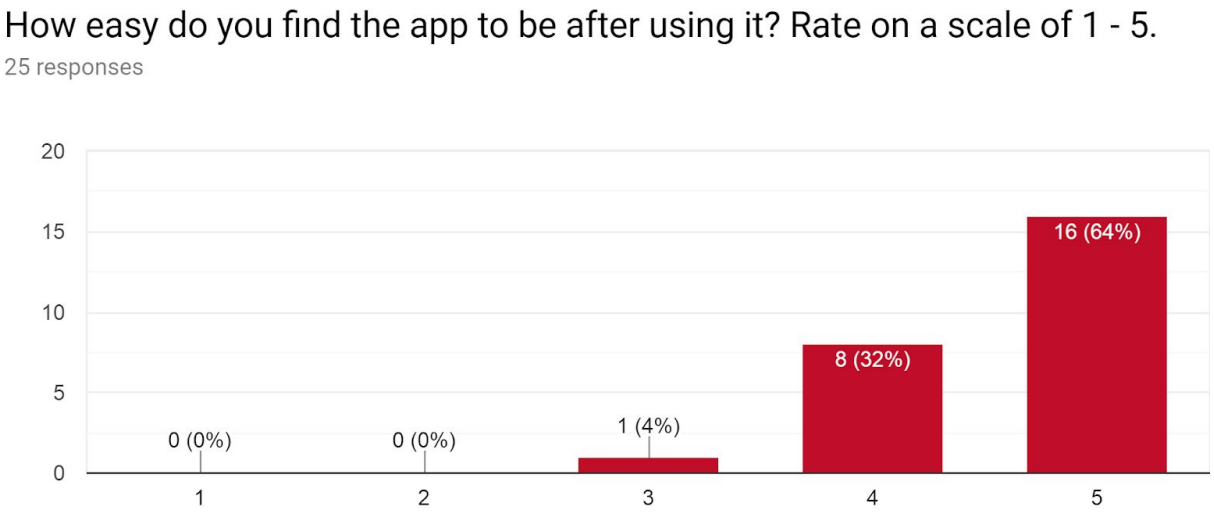

**Yes - 14 people**
**No - 5**
**Maybe - 6**

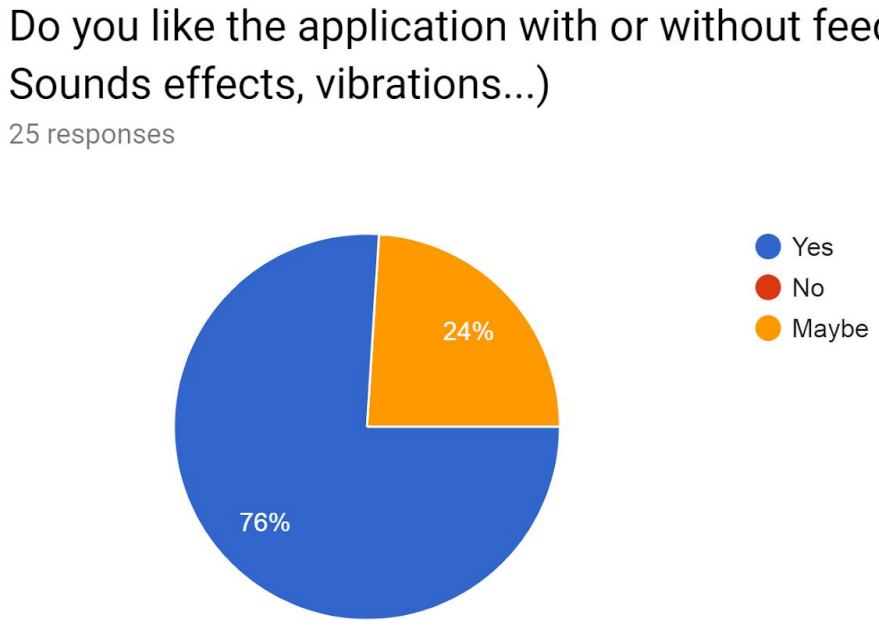



**Yes - 5**
**No - 17**

**Maybe -  3**

**After testing out the app**

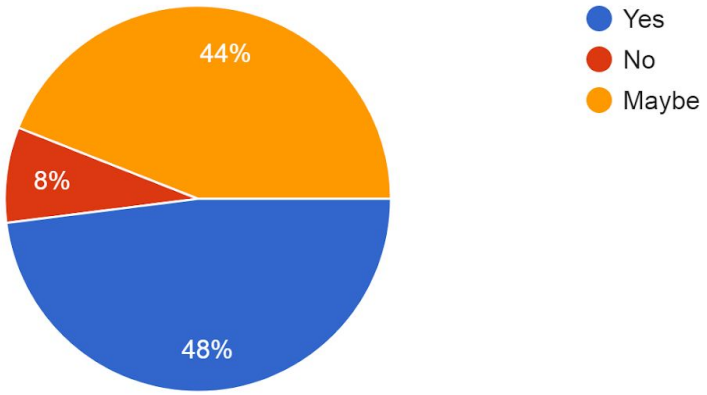



**Yes -  19 people**
**No -  6**

Do you think you will be capable of performing first-aid with the use of Automated-External Defibr...tor (AED) in case of accidents?

25 responses



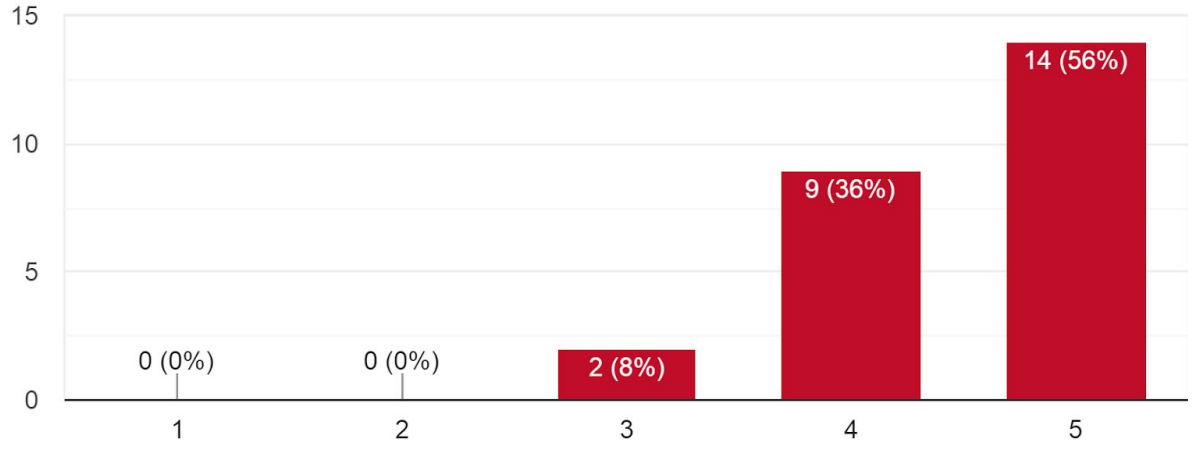

**Yes -** **12 people**
**No -** **2**
**Maybe -** **11**

**Capable of performing CPR? If no, why?**

1. **if real life case is very scary...**
2. **I am not certified is it OK?**
3. **Better leave it to the trained personnel. What if something bad happens, how to bear the consequence?**

## On a scale of 1 - 5, rate your knowledge of the use of AED after using this app.

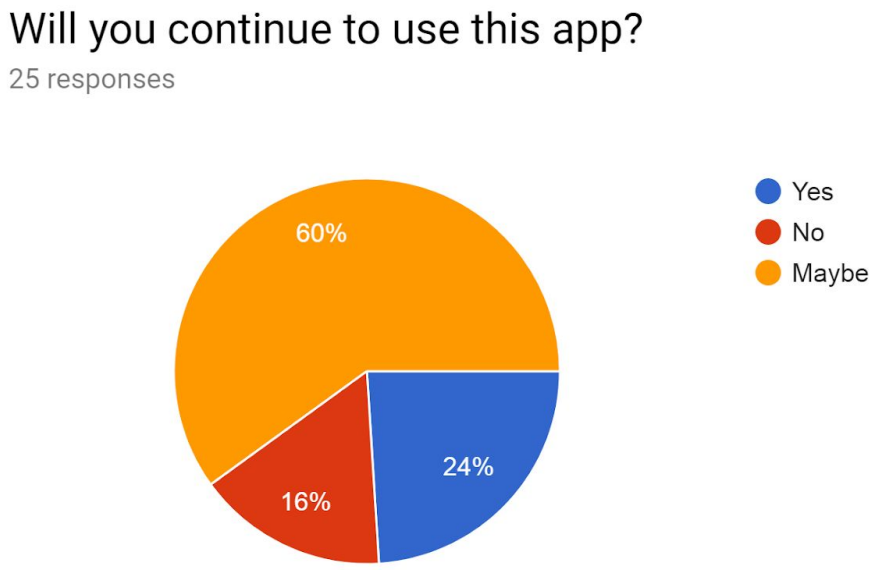
25 responses




**Which feature is most useful?**

1. **For me i think it is the CPR part because im not very sure about CPR. At least i learn something from this app.**
2. **should be the AED tutorial cos i dont dare to do CPR... can do AED at least**
3. **hands-on feature in the AED part as i can know where to put the AED pads and know what to do after that.**
4. **The AED tutorial is the most useful to me because i have never used an AED before and this app allows me to sort of let me use it!**
5. **Both the aed and cpr info is very useful... before this i dont know what aed is for.....**
6. **all the features are very useful, the aed tutorial is quite engaging but cpr cannot be conducted anyhow.**
7. **aed and cpr as i gained knowledge**
8. **This app in overall is useful especially the AED tutorial is easy to understand.**
9. **All the 2 tutorials are very useful!!!**
10. **The tutorial features are quite elaborated. at least i know what and what not to do when the other people is carrying out life saving.**
11. **I have never learned any life saving before, so this app with the tutorial features with voice and text prompts make it very easy to follow.**
12. **the vibrations made me aware of things i should take note of!**

13. **the removing of aed pads feature made it clear that which sides to place is very important..**
14. **all the features are useful because not everyone would touch on life saving tutorials.**
15. **The voice commands really helps when following the tutorial as it would be so boring just to read off the text.**
16. **Tutorials with feedback and voice over is useful for me when im trying to follow. making it less dry.**
17. **This app in general is useful for basic learning which has not much difference from real life cpr courses just that the app do not need a dummy.**
18. **The sound effects in both the tutorials are very pleasing and accurate which makes the tutorial quite interesting.**
19. **This application is not very useful to me as I already know how to use the AED. however it would be useful for people who have zero experience on AED or CPR.**
20. **All the tutorials are easy to follow through, and there are vibrations to alert me!**
21. **I have experience in AED and CPR before. But if I were to try this app as someone without any knowledge on this, I would say the transitions and the voice instructions are very useful for me as a learner.**
22. **I think the most useful feature would be the AED portion. As AED are quite reachable, if someone is in need, I can be of support. But for the CPR portion, it is still better to leave to health professionals to perform it.**
23. **Not exactly very useful but I get to learn something**
24. **The tutorial is the most useful to me, as it guided me through one step at a time and cleared my doubts i had previously.**
25. **NIL**




**Yes -** **6 people**
**No -** **4**
**Maybe -** **15**

## Any suggestion for areas of improvement.

1. **NIL**
2. **Maybe can put more information and make it more nice**
3. **can have more scenarios!**
4. **the app is a bit naggy... when the tutorial ended.**
5. **This app can have more interesting features not only AED & CPR**
6. **can have some games for this aed**
7. **if this app continues to develop, i hope it will be like an emergency app which will be linked to the scdf etc...**
8. **maybe can make the app more visually appealing**
9. **A quiz or simple test would be good to test other users out.**
10. **Can add some videos too**
11. **make the layout nicer**
12. **This app can be made more games or quiz or other related info to attract more young users like me.**

13. **Fix the back button... once i accidentally press the back button on my phone, it just closed the entire app.**
14. **have like more pictures or animations**
15. **Maybe develop a location tracking for the available aeds.**
16. **more pictures can be used for the tutorials to make it story like., instead of just a man lying there.**
17. **for now there are only 2 main features in the app. i suggest that you could maybe have a better app design layout to house more pages and have more related content for future users. like maybe where can i enroll for the professional life saving courses.**
18. **it is good to have a better layout.**
19. **Set up more scenario or make a game on this.**
20. **Have a more detailed tutorial for CPR. You can include on how to administer the CPR's 2 breaths**
21. **you can make more tutorials on life saving skills**
22. **The vibration intensity is uneven. (maybe it is just my phone)**
23. **Perhaps add in some health maintaining information?**
24. **Please add more pages, because only the startup page is too boring**
25. **NIL**

### Links for Application Resources

AED: https://americanaed.com/wp-content/uploads/lifeline-aed.jpg

AED patch: https://www.cpr-savers.com/American-Red-Cross-AED-Trainer-Replacement-Pads-Adult_p_7818.html

AED logo: https://commons.wikimedia.org/wiki/File:Automated_External_Defibrillator_(symbol).svg

AED header: http://topdailytrends.com/2018/10/14/immortals-movie-trailer-2-official-hd/

Casualty model: https://www.drbehar.com/procedures/male-breast-reduction/

Red brick : https://www.amazon.co.uk/Embossed-Brick-Effect-wallpaper-Full-x/dp/B0081U1UXW

Voice over (Joanna): https://aws.amazon.com/polly/