Public Awareness through game-based learning

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Declaration

I declare that this is my own work and this proposal does not incorporate without acknowledgement any material previously submitted for a degree or diploma in any other university or Institute of higher learning and to the best of my knowledge and belief it does not contain any material previously published or written by another person except where the acknowledgement is made in the text.

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The above candidate is carrying out research for the undergraduate Dissertation under my supervision.

Signature of the supervisor: Date

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Dr. Windhya Rankothge

Abstract

With the quick progression of web-based communication channels, more youthful populace is the principal gathering to grasp different new innovations. Online media is turning into the most adopted communication tool by the younger generation. There were 6.40 million social media users in Sri Lanka in January 2020.The number of social media users in Sri Lanka increased by 491 thousand (+8.3%) between April 2019 and January 2020.By 2020 august the most used social media platform was recorded as Facebook. Sri Lanka has a percentage of above 56 in Facebook usage. Unfortunately, the users' careless attitude in sharing information and weak password usage make online social networks attract the crackers and scammers for attacks. game based learning is a very effective way in improving the awareness level of the society. Cognitive skills which are very important in handling social media problems can be improved using this technique. This work reviews the identification of users' current abilities and improvement of it to prevent the social media problems caused due to over sharing and weak password usage.

Keywords: game-based learning, cognitive skills, user privacy violation

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1 INTRODUCTION

Throughout the past years our world and daily lives has been reformed by technology. Technology has made astonishing tools and resources, putting valuable data at our fingertips. Social media usage has been the most common practice of younger generation. Social media has changed how we engage ourselves and meet each other. It's made fun progressions and significant headways yet contrarily affects individuals too. A great deal of security is required when using social media. For this awareness sessions are held by the professionals in the industry but most of them were not effective.an effective method using game-based learning which leads to improve the abilities and aware people is the best solution.

1.1 Background

Digital technology has transformed our world. It is difficult to disclose to somebody glancing at an IBM mainframe, harking back to the 1960s that sometime in future comparable machines would supplant books and papers, give us suggestions on where to eat and headings for how to arrive, and even chat with us, however today those things have become matters of regular habit. We live in a digital era where data which is produced, stored, shared, consumed, aggregated plays a major role in it. due to this huge impact of data privacy of this is highly required. Privacy is completely intermingled with Big Data (boyd, 2010).

Due to the new technological advancements and opportunities we can access more information and make more connections all around the world than ever before. Social media is the platform providing these types of services. according to the global stats in 2020 the most used social media platform is mentioned as Facebook. According to Mark Zuckerberg, "If Facebook were a country, it would be the 6th most populated country in the world". There are pretty much pros and cons in using Facebook. The prettiness of social media is that you can attach with anyone to learn and share your thoughts [1].

However, the Internet, and social networking sites, also provide communication and interaction, unlike many _old media` (e.g. television) [2].

when it comes to the challenges, user privacy violation, giving potential stalkers information, which is needed to track the user, damaging to the personal reputation are common. Although private messages allow users to share information confidentially, communication over Facebook seems to be seen as 'cheap' and low effort, therefore not adequate enough to maintain serious relationships with people unless geographically distant [3]. Personal information and security can be hacked and shared on the Internet [4]. Client shares excessively data which may posture dangers to them. Indeed, even with the tight security settings your own data may spill on the social locales. Downloading your recordings or pictures and copying your status is a simple assignment and should be possible inside couple of snaps [1].

However, the rise of communicational platforms and social media have necessitated a rethinking of current privacy definitions and models [5]. The root cause for this is over sharing information in Facebook and the use of weak passwords.
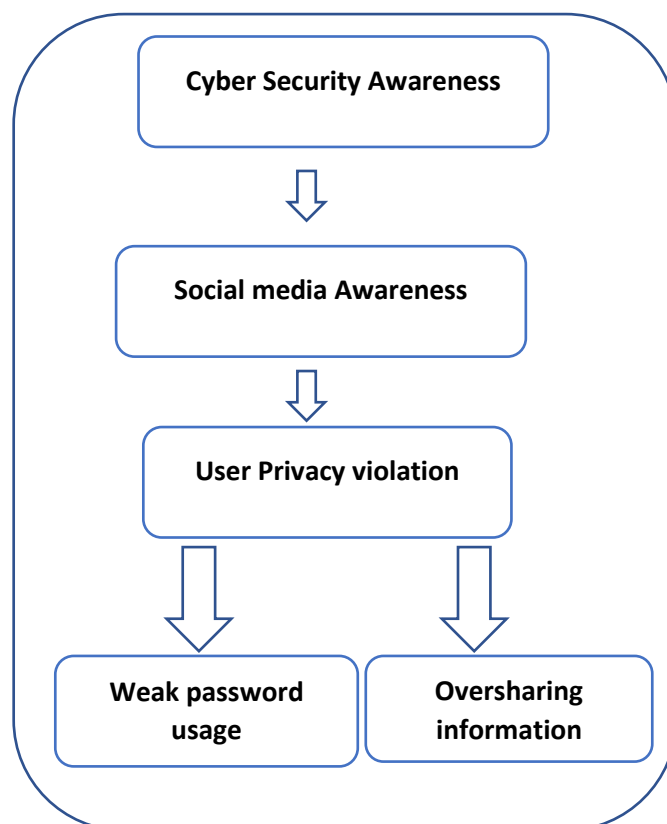
Figure 1.1: Classification of cyber security awareness

When something is posted on the web, it gets public and is not, at this point private. Users can turn privacy settings on for their accounts; notwithstanding, that doesn't ensure that data won't go past their target group. Pictures and posts can be saved, and posts may never truly get erased. In 2013, the Pew Research Center found that "60% of teenage Facebook users have private profiles." This demonstrates privacy is unquestionably something that individuals still wish to acquire. [6].

with the survey done using 63 random people it was clear that the ones with weak password usage or the ones who have shared unnecessary stuff on Facebook have faced their Facebook accounts hacked. Refer Appendix B.

So, to overcome this the best solution is to improve the abilities such as decision making, thinking and reacting speed by designing an awareness game.

even though there are awareness programs present in different areas throughout the country they are not effective. However, in the modern society public awareness through game-based learning is rather a new concept. Games can be an interesting medium for conveying information [7]. Through game-based learning it will help users to improve their abilities when using social media. The advantages of games are as follows: they inspire increased motivation for learning; they make complicated problem solving easier; they promote reflective learning; they facilitate learning from trials and errors; and they support learning while making mistakes in a safe environment [8].

further through the survey the current user abilities and the abilities which need further improvement was decided. People aged above 10 and of any gender participated in this. several types of games were suggested, and the answer of the majority was considered as the most suitable type of game to be implemented. At the end the main outcome is expected to produce users with abilities to face problems in social media problems.

1.2 Literature survey

Several previous researches were done on social media awareness, game-based learning, social media awareness through game-based learning and ability enhancement through game-based learning.

- A study planning to explore the utilization and impression of Sri Lankan youth on the security and privacy aspects of the web-based media with an emphasis on recognizing youngsters use of social media, and their mindfulness and understandings on the security and privacy aspects of online media was done by Sri Lanka Computer Emergency Responsive Team in 2018 [9].

Through several studies it was found out that people are unaware of Social media networks risks but they are more likely to disclose their personal information in such sites.

- Strater and Richter (2007) found that the participants are facing difficulty when navigating the privacy settings of Facebook interviews during interviews [10].
- barnes(2006)observed that the teenage SNS users appeared unaware or ignorant of the public nature of the content they shared through the sites [11].
- another study proved of DiMicco et l. (2009) proved the above findings true by his study where he found out that employees in a workplace use profile information to engage in Negotiating Privacy Concerns and Social Capital Needs in a Social Media Environment [12].

- A study by Bioglio, Livio & Capecchi, Sara & Peiretti, Federico & Sayed, Dennis & Torasso, Antonella & Pensa, Ruggero address the issue of upgrading youngsters' attention to the systems including security in online social networks by displaying an inventive methodology dependent on gamification. They proposed a web application named social4school that permits children and adults to encounter the normal elements of data spread through a sensible intuitive reenactment. Under the supervision of the teacher, the students are

embedded in a little fake social chart, and, through the various phases of game, they can post sentences with various degrees of sensitivity, and "like" or share messages distributed by friends. Toward the finish of game session, the application figures numerous conduct scores, that can be utilized by the teacher to raise the interest of the students and stimulate discussions. Besides, a total intuitive report is created to dissect each students' actions of the ended game sessions. The study has been utilized inside a broad exploratory examination including in excess of 450 children and 22 teachers in seven Italian primary schools. The results show that our approach is stimulating and supports teachers in helping kids discover and recognize potential privacy risks in social network activities [13].

- "Serious games are digital games, simulations, virtual environments and mixed reality/media that provide opportunities to engage in activities through responsive narrative/story, gameplay or encounters to inform, influence, for well-being, and/or experience to convey meaning. The quality or success of serious games is characterized by the degree to which purpose has been fulfilled. Serious games are identified along a continuum from games for purpose at one end, through to experiential environments with minimal or no gaming characteristics for experience at the other end [14]."

- A serious game named friend inspector was developed by Cetto, M. Netter, G. Pernul, C. Richthammer, M. Riesner, C. Roth, and J. S¨anger to enhance the privacy awareness of the social network site (SNS)users. Friend Inspector tends to the present test of SNS clients, to be specific to comprehend who can see their shared personal items. A game-based approach was used to address the younger crowd. The applied plan of Friend Inspector depends on two foundations: firstly, an in-depth understanding of privacy awareness as the match or mismatch between perceived and actual visibility of shared items. Secondly, an inductive learning approach that allows its users to experiment and play with their own Facebook data in order to actively learn about the visibility of their personal items [15].

- CyberCIEGE is a high-end, commercial-quality video game developed jointly by Rivermind and the Naval Postgraduate School's Center for Information Systems Security Studies and Research. This dynamic, extensible game adheres to IA principles to help teach key concepts and practices [16].

- A study focusing on developing a framework for game design to protect computer users against phishing attacks was done by a student in School of Information Systems, Computing and Mathematics in Brunel university, West London [17].

Game based learning is mostly important as it can enhance the abilities or the cognitive skills of the users. Cognition refers to capabilities including memory, thinking and reasoning, spatial processing, problem solving, language, and perception [18]. several studies have been done for this.Cognitive outcomes refer "to the knowledge structures relevant to perceiving games as artefacts for linking knowledge-oriented activities with cognitive outcomes" (Lameras et al., 2016, p. 10) [19].

- Fu, (2016), through a systematic literature review, identify the multi-dimensional positive impact of serious games in business education, with the most frequent outcomes being knowledge acquisition and content understanding. The study also confirms that GBL and serious games can influence player engagement, perpetual and cognitive skills and social or soft skills [20].

- Also, problem solving which is an important cognitive skill which should be improved through the society specially when facing day to day challenges is enhanced through game-based learning. And this enhancement of the cognitive skill is presented by the research done by Liu, C. C., Cheng, Y. B., & Huang, C. W. (2011) [21].

1.3 Research gap

Social4School

Social media awareness through game-based learning was an area where many researchers have focused. If the research on 'social4school' is concerned it is a web application-based awareness game where school children were drawn to attention. The website and the game are in Italian. goal of our game is to let young people experience the typical dynamics of an online social network in a simulated and controlled environment [13]. the social media platform they have considered is Facebook. User privacy violation due to poor awareness of social media usage is the main problem they have payed attention to.
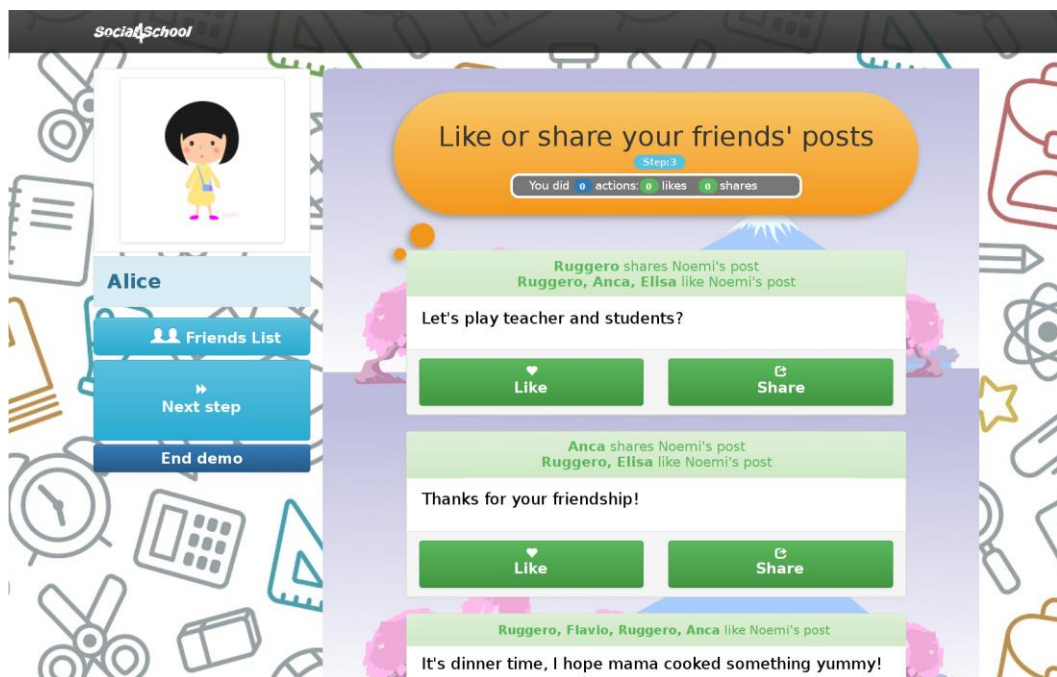
Figure 1.2:UI of game Social4School

CyberCIEGE

CyberCIEGE which is a high-end, commercial-quality video game developed jointly by Rivermind and the Naval Postgraduate School's Center for Information Systems Security Studies and Research.1–3This dynamic, extensible game adheres to IA principles to help teach key concepts and practices [16].
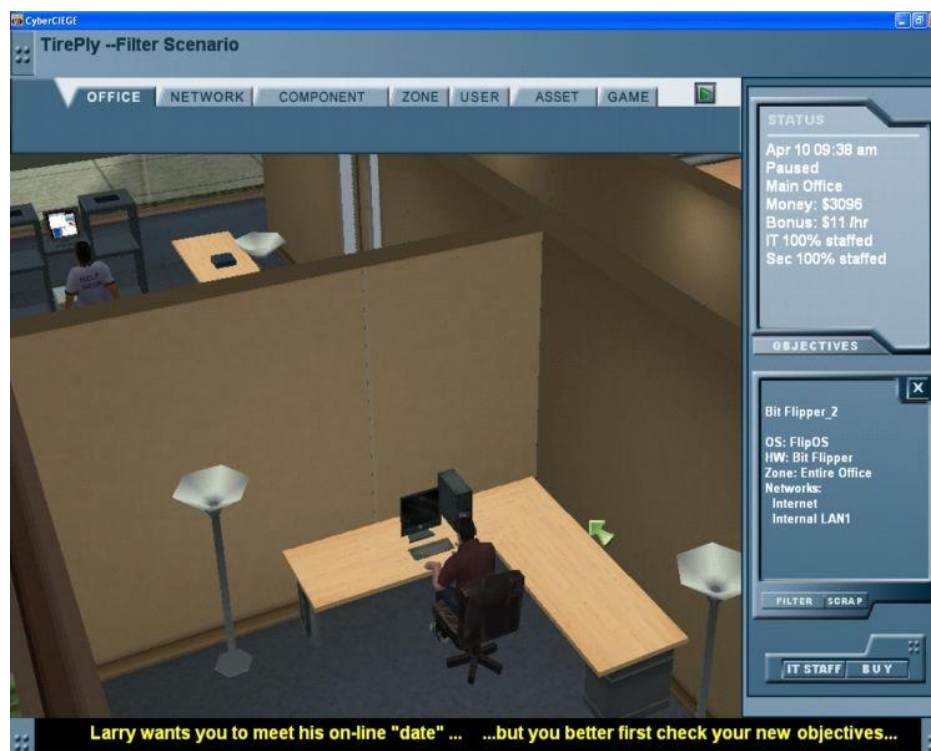
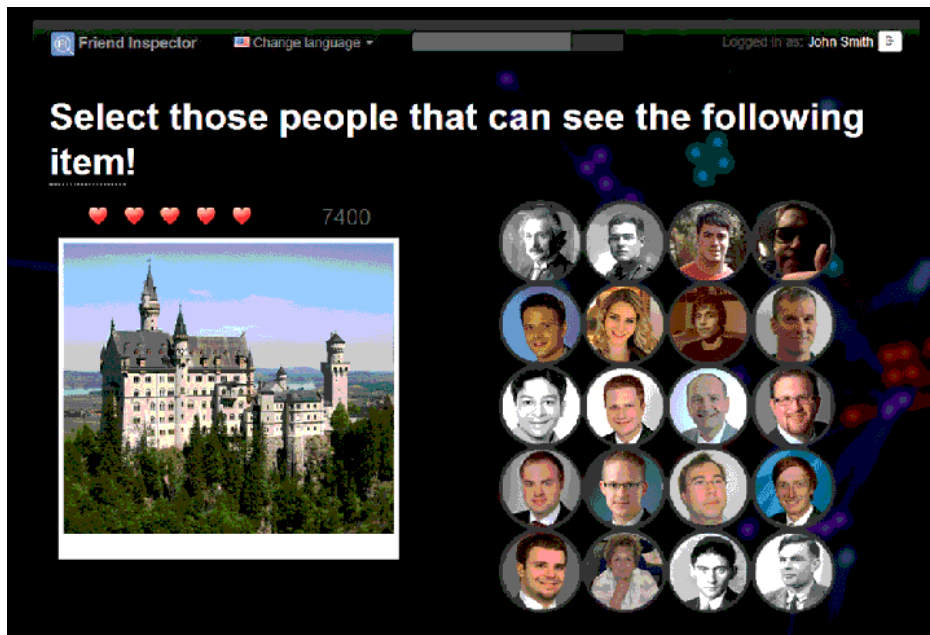
Figure 1.3:UI of game CyberCIEGE

Friend Inspector

Next the research on friend inspector, which is also a web-based game, emphasizes the need for better tools to understand privacy settings on Social Networks. Targets the

younger users aware them from social exclusion due to the consequences of poor privacy awareness [15].

Figure 1.4:UI of game Friend Inspector

AwareMe (proposed game)

AwareME (Proposed game) is a web-based game developed using 2D/3D and VR which helps the users improve their abilities when using Facebook. The ability "decision making" is mostly concerned here as decision making is the most important cognitive skill needed when using technology in a safe manner.

People in any age can use this to improve their awareness level no matter whether the user is a school student an undergraduate or an employee. Over sharing information and weak password usage is the main problem identified for the user privacy violation. So, it is the main area which is focused.

When we focus on the comparison of AwareMe with the above-mentioned games several differences were identified.

Social4school - This game was also implemented as to aware the people about user privacy violation but there they have mainly focused on sharing of posts in Facebook while AwareMe is directly focusing on weak password usage and oversharing information as categories of user privacy violation. Another difference of the two games is that Social4School is designed for kids. But AwareMe was focused on all citizens aged above 10. When considering the technological side AwareMe used 2D/3D/VR technologies while Social4School was a 2D game. Ability identification and improvement of decision-making ability was given a vital role in AwareMe while Social4School is not directly focused on improving the abilities of the kids.

Friend Inspector - current challenges of the social network users is focused here but it is to understand who can see their shared personal items. So, the difference of AwareMe is that it focuses on weak password usage and oversharing information. Friend Inspector is a web based 2D game while AwareMe is a mobile based 2D/3D and VR game. Ability identification and improvement is not concerned by Friend Inspector.

CyberCIEGE - This game is mainly focusing on teaching the network security concepts to the players. This is a sophisticated game. Though it is an awareness game relating cyber security it doesn't aware about Facebook. It is a 3D game where as AwareMe uses 3 technologies. CyberCIEGE is a web-based game while AwareMe is a mobile based game.

The comparison of the above three games with the designed game (AwareMe)is summarized below in the table 1.1.

Table 1.1: comparison between our system and other applications

features	Social4school	Friend inspector	CyberCIEGE	AwareME (proposed game)
User privacy violation awareness	✓	✓	✗	✓
Using virtual reality	✗	✗	✗	✓

Weak password and oversharing information awareness in Facebook	✗	✗	✗	✓
Identification of user abilities	✗	✗	✗	✓
No restrictions for different ages	✗	✗	✗	✓
Mobile based game	✗	✗	✗	✓

1.4 Research problem

Online social networks have changed the way individuals associate, permitting them to keep in contact with their colleagues, reconnect with old companions, and build up new connections with others dependent on hobbies, friendships, relationships and interests. Facebook which is the most used social media platform in the world is an example for this.

Due to the huge social impact on social media day by day the problems associated with it rises. the main problem faced by the society is user privacy violation. Facebook accounts being hacked directly affects the user privacy violation.

The divisional secretariat of Kaduwela district Mrs. A.D.Y.Anandani had a conversation with us where she said that social media is an area where much concern should be given when talking about technology. Though there are awareness programs around the island they are not effective. People don't gain any knowledge by attending those programs. This showed the path to create an awareness game which is effective to aware public about social media issues.

a survey was conducted using 63 random people of age above 10 to identify the cause for Facebook accounts being hacked. Figure 1.1 below illustrate how many participants have faced a Facebook hack at least once in their lifetime.

Has your Facebook account ever been hacked?

63 responses
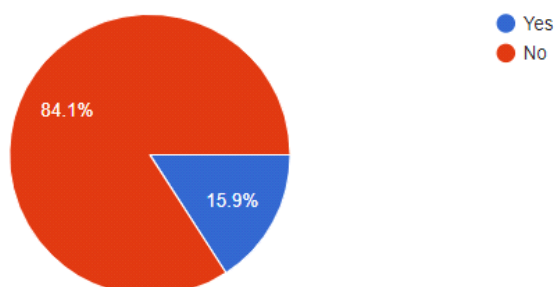
Figure 1.4: Number of participants who have faced a Facebook hack

According to that 15.9% of the people's Facebook accounts were hacked. When this was further analyzed it was clear that the ones with weak password usage and oversharing of information have faced their Facebook accounts been hacked. Figure 1.1 below illustrate weak password usage of participants.

What does your Facebook password consist of?
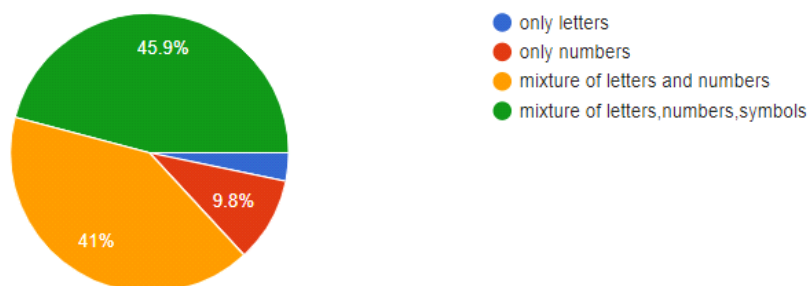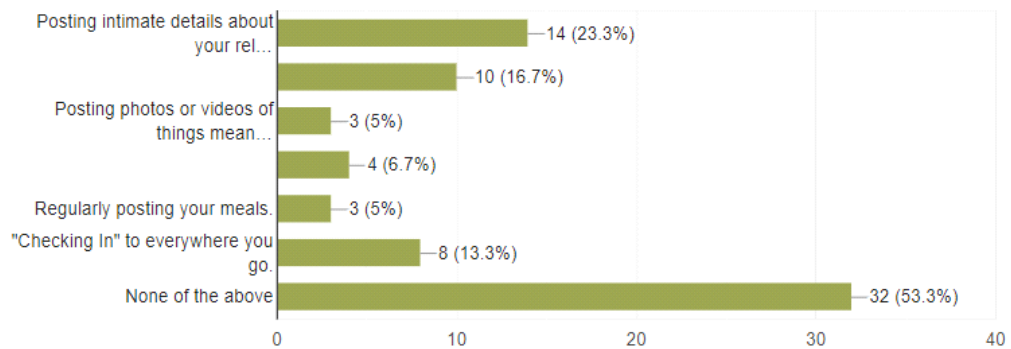
61 responses

Figure 1.5: Weak password usage of participants

Figure 1.1 below illustrate oversharing information of participants.

Select the things you have shared at least once using your Facebook account?

60 responses

Posting intimate details about your rel... — 14 (23.3%)
— 10 (16.7%)
Posting photos or videos of things mean... — 3 (5%)
— 4 (6.7%)
Regularly posting your meals. — 3 (5%)
"Checking In" to everywhere you go. — 8 (13.3%)
None of the above — 32 (53.3%)

Figure 1.6: oversharing information of participants

From the above diagrams it is clear that weak password usage and oversharing leads to user privacy violation. For making people aware about social media first the need to identify their current abilities was required. Then improving the abilities which is lacking was done. Figure 1.1 below illustrate the participants idea in cognitive skill improvement.

Do you think an awareness game will help to improve the cognitive skills (abilities)which are useful when using social media?

63 responses

- Yes
- No

95.2%
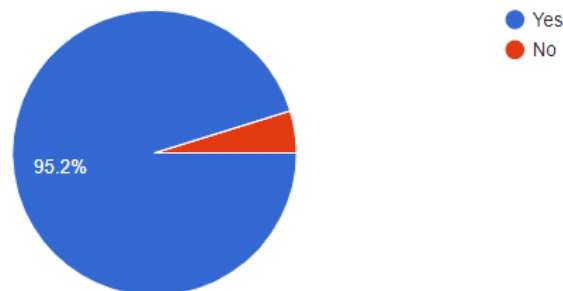
Figure 1.7: participants idea in cognitive skill improvement

Finally, as there is no effective single awareness gaming platform implemented for the above-mentioned problems (oversharing information, weak password usage) and Awareness games for real world problems has not been the subject of much researches

the proposed game (AwareME)is implemented. The most suitable game for the awareness of social media was suggested by the survey participants.

If yes,what type of game is most suitable as an awareness game?
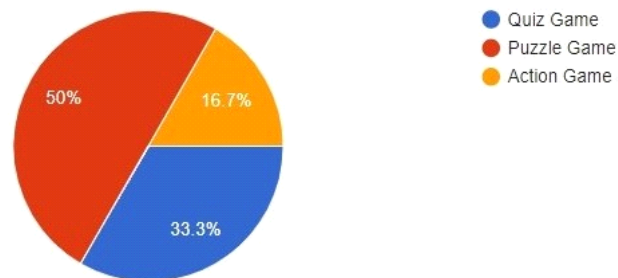
Figure 1.8: Suitable game type

Figure above illustrates that the majority of the survey participants liked a quiz and a puzzle game.

1.5 Objectives

1.5.1   Main objective

Main objective is to improve the abilities of people by making them aware cyber security problems using game-based learning platform. This will help When using social media, to learn about user privacy violation and the importance of avoiding problems related to it. e.g. when it comes to improvement of abilities decision making ability is much needed in using social media awareness as deciding what information should be shared and what not to share is the main challenge to overcome in oversharing information prevention. Also, when using a Facebook password decision making ability is important to decide whether the used password is meeting the minimum password requirements or not.

Majority of the participants in the survey suggested that decision making is the most important ability for social media awareness. So, generate players who are aware of social media problems by improving their decision-making ability through a gameboard effective method is the main objective of the research.

1.5.2 Specific objectives

- Determination of the audience of the research. (in here every citizen above age 10 is considered as the audience)

- Gather data related to social media awareness level and Identify the current abilities of the people related to facing social media problems.

- Study previous researches and projects which has been done under the same topic. Identify the reasons for their failures and success and observe their conclusions through the literature survey.

- select the most suitable game needed to be implemented.

- Design the gaming platform using 2D/3D/virtual reality.

- Identify the improvement of the users by testing their awareness level through a suitable mechanism.

- the mechanism used to test the awareness will be a standard questionnaire which is created by a reputed organization.

2 METHODOLOGY

2.1 Flow of the project
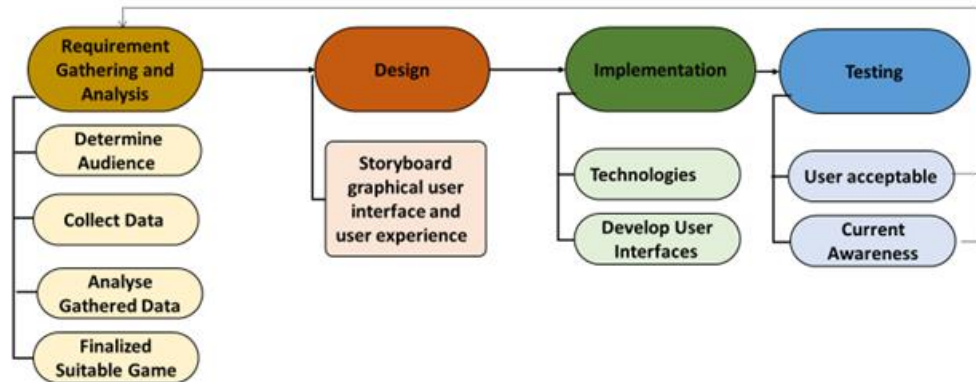
Figure 2.1: Flow of the project

when developing the solution, a waterfall life cycle model was used which consists of four stages as requirement gathering and analysis, design, implementation and testing.

The vital stage of the research is the requirement gathering and data analysis stage. A requirement should be unambiguous, clear, feasible and correct. Proper knowledge about the research area is very important. Initially the problem was identified with the conversation with the kaduwela divisional secretariat. There the need for an effective awareness system for the real-world problems was suggested. As the solution for the problem was not clear data gathering and the analysis stage were used.

An online survey using 63 random people with the age above 10 were used to identify the current social media awareness level of them. A data analysis report was prepared using the responses received through the survey. Refer the appendix.

Finally, with the use of the data analysis report the ability and the suitable game type was selected.

Design

To improve awareness on social media the activities are designed for two stages. In the first stage there will be three levels which includes two quizzes and a jigsaw puzzle. It is to make the player practice for the games in the next stage. Next stage will consist of two games which counts the score and has a time limit set to complete each task. Through the activities, players get the knowledge and practice on what to do and what not to do when using Facebook.

Implementation

In the implementation phase, requirement specifications and design specifications will be implemented. The overall project will be implemented using the waterfall model. 2D/3D and VR are the main technologies used. Tools such as unity, android studio, adobe photo shop, blender, and visual studio code is used.

Testing

One of the most important stages in the research is the testing phase. In this stage testing is done to see how the users have improved their awareness level after playing the game.

This is done using a standard question set extracted from Sanfoundry on cyber security. see appendix. Few questions will be given to the players before and after playing the game and the marks will be recorded in both the attempts.

Finally, the marks before and after playing the game will be compared which would clearly show the difference of the two attempts.

2.2 commercializing aspect
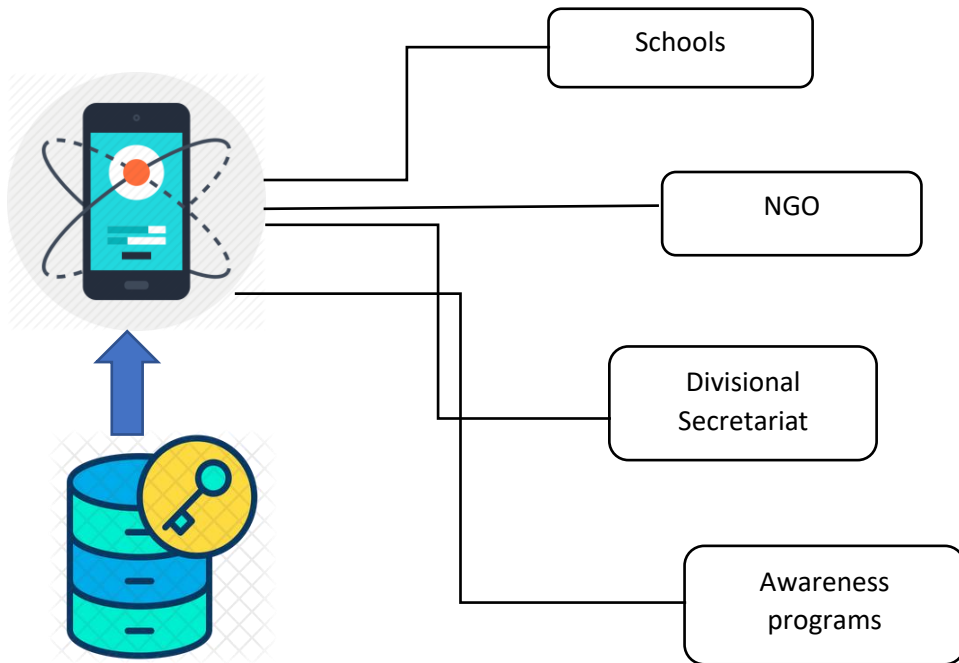
Figure 2.2: Business model

Figure above illustrates the business model of the research. AwareMe application is designed to increase the awareness level of the society in a more effective way. There are no applications implemented for the awareness of Facebook in Sri Lanka. So, this is mainly targeting as a substitute to the boring awareness programs held around the country. This solution provides benefits for several parties in the country. As the conversation done with the divisional secretariat this application will be given to the kaduwela divisional secretariat office where they will distribute for schools, NGOs, and awareness programs when required. The marketing activities of the application are done through social media like Facebook, Instagram and YouTube.

2.3 Testing and implementation

2.3.1 Implementation

An introductory video made with 3D and VR will be displayed before the games are started.

Figure 3.1: UI of introductory video

Three games as suggested by the survey participants will be implemented using 2D technology. Two quizzes and a Jigsaw puzzle is included there.

The players can use the help option to obtain hints regarding the game.

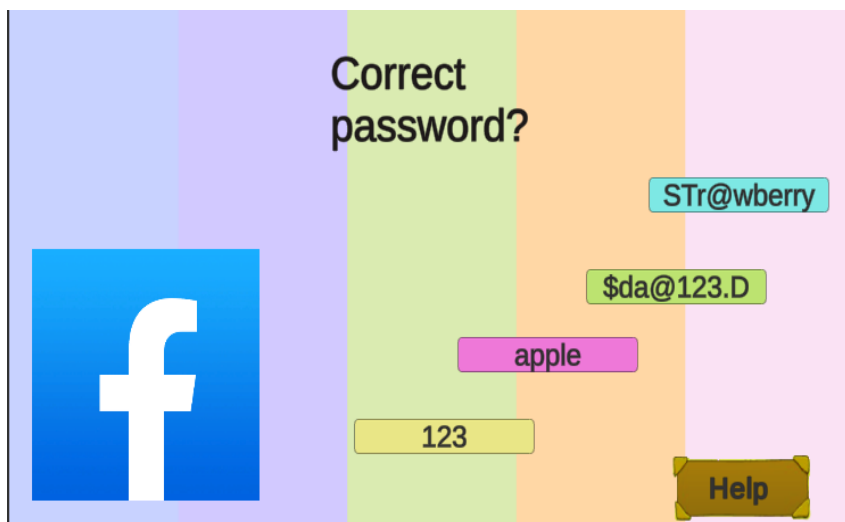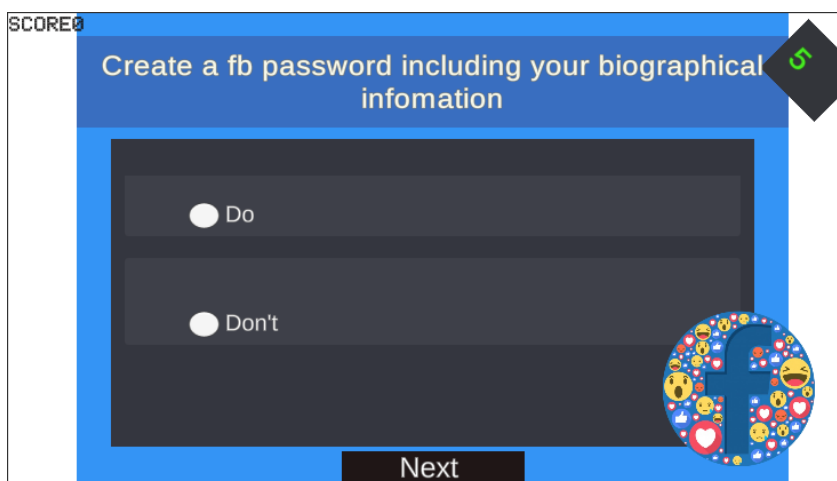*Figure 2.2: UI of 2D quiz (oversharing information)*

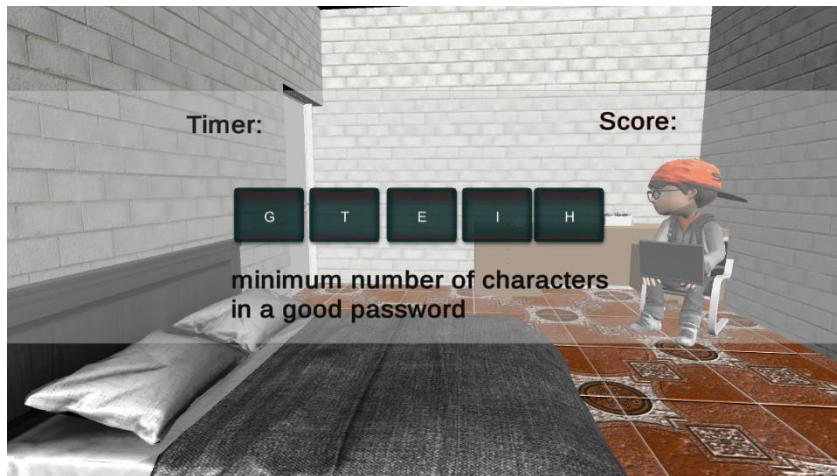*Figure 2.3: UI of 2D quiz (weak password usage)*

Figure 2.4: UI of Jigsaw puzzle

Once the three games are completed two games where the score is calculated will be present. There the player is given a time limit to complete the tasks. These games were made using 2D and 3D technologies.

Figure 2.5: UI of Quiz stage2

Figure 2.6: UI of 3D scrambled word puzzle stage2

2.3.2 Testing

The main expected outcome of this research is to enhance the decision-making ability of social media users so that they can be aware of the social media issues.
Data set was generated using an online survey. A questionnaire was given to 63 people of age above 10.
The same 63 people were used throughout the testing phase. There the people were given a question set consisting of 10 questions selected from Sanfoundry social networking security related questions. See appendix.
The marks obtained by the 63 people were recorded.
Next the implemented game was given to those participants where they will get aware about weak password usage and oversharing information in Facebook. The score of the game is obtained.
Finally, they were given the previous question set to identify the progress of the players awareness level and the marks were compared.

Table 2.3.1: marks of 5 players in both attempts

Player	Marks (%)					
	Attempt 1 (Quiz)	Attempt 2 (Quiz)	Attempt 1(puzzle)	Attempt 2(puzzle)	Attempt 1(Questionnaire)	Attempt 2(Questionnaire)
01	50	70	40	50	60	80
02	40	80	50	90	40	40
03	70	80	80	80	60	60
04	100	100	80	90	80	80
05	90	100	60	70	90	100

Table 2.3.2 above illustrates marks of 5 players in the two attempts of game (Quiz and puzzle) and two attempts of questionnaire. It is clear that the player has either increased the mark or has not changed the mark. Neither of them has reduced their marks.

3 RESULTS AND DISCUSSIONS

The marks of the 63 players in both attempts of questionnaire and both attempts of game were recorded in an excel sheet.

	A	B	C	D	E	F	G	H
1	Name	Marks 1(Questionaire)	Marks 2(Questionaire)	Marks 1(quiz)	Marks 2(quiz)	Marks 1(puzzle)	Marks 2(puzzle)	
2	Ruwin	6	8	50	70	40	50	
3	Lahiru Rasanga	4	4	40	80	50	90	
4	Evanda	6	6	70	80	80	80	
5	Wishva Widanagamage	8	8	100	100	80	90	
6	Lalitha	9	10	90	100	60	70	
7	Hasini	5	5	50	60	70	80	
8	Ranjith logus	7	7	60	80	50	50	
9	Buwaneka	9	10	70	100	60	100	
10	Piyal jayadewa	5	6	50	70	80	90	
11	Widya	8	9	50	50	50	90	
12	Bandula wijesinghe	6	7	60	80	40	70	
13	Samal Karunaratne	6	6	40	70	50	50	
14	Venuka	6	8	50	80	70	80	
15	Sudaraka Ampemohotti	7	8	40	90	80	90	
16	Mithsukha	8	9	100	100	70	70	
17	Dharana Liyanwala	5	10	60	70	90	100	
18	Nelu	6	6	50	70	80	90	
19	Isuru	7	7	90	100	40	70	
20	Shrimalee	9	10	100	100	80	90	
21	Amarajith de silva	9	10	100	100	70	80	
22	Hansi	6	6	60	70	50	70	
23	Sachini	5	6	80	100	40	80	
24	B. S. Fernando	8	9	50	60	70	80	
25	Nethu	7	9	80	90	100	100	
26	Pamuditha	8	10	70	80	90	100	

Figure 4.1: Marks of 63 players in both attempts

	A	B	C	D	E	F	G	H
31	Ravindu dananjaya	8	9	100	100	50	50	
32	Lakmal	8	10	40	60	60	80	
33	Ravindu Ashan	9	10	70	80	40	70	
34	Kariyapperuma	4	7	80	80	50	80	
35	Amali Wijesinghe	9	10	90	100	40	90	
36	Dhanusha	10	10	90	100	100	100	
37	Tamasha	6	6	80	80	60	70	
38	Venuri nethma	5	5	60	90	50	70	
39	Gamini abeydeera	6	6	40	50	90	100	
40	Pevinda	7	8	50	90	100	100	
41	Sisira	5	9	80	80	100	100	
42	Thilak gunathilaka	5	10	80	90	60	70	
43	Chavindu hansaka	8	10	60	70	80	100	
44	Janaki malalasekara	9	10	70	80	50	60	
45	Chamindi Jayasiri	6	7	50	50	80	90	
46	Rasika	5	5	60	100	70	80	
47	Pasindu	7	7	80	90	40	60	
48	Chanura Ekanayaka	8	7	50	90	70	80	
49	Melaka karunathilaka	6	5	40	70	80	80	
50	Tharawa	5	6	50	50	90	100	
51	Niruna	8	10	70	80	90	100	
52	Disantha	9	10	80	90	80	80	
53	Indrajith mendis	6	8	70	70	60	90	
54	Rusiru wageesha	10	10	90	100	40	50	
55	Chathupa Athauda	5	7	80	90	50	90	
56	niraj	5	7	40	70	80	80	
57	Mahesha	7	9	80	90	80	90	

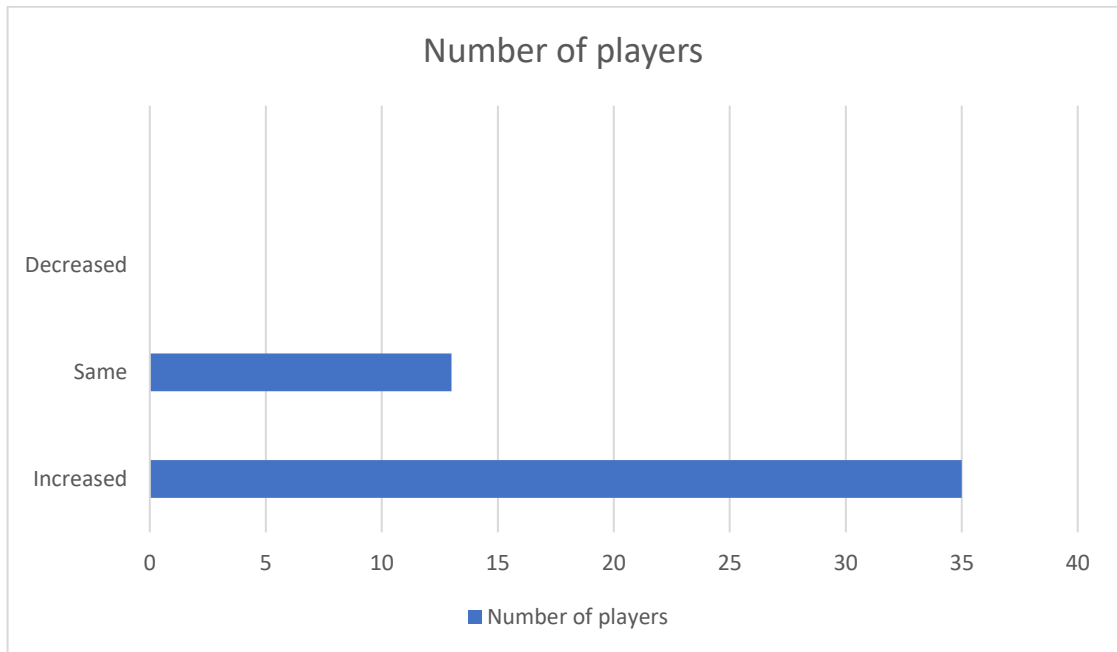*Figure 3.2: Marks of 63 players in both attempts*
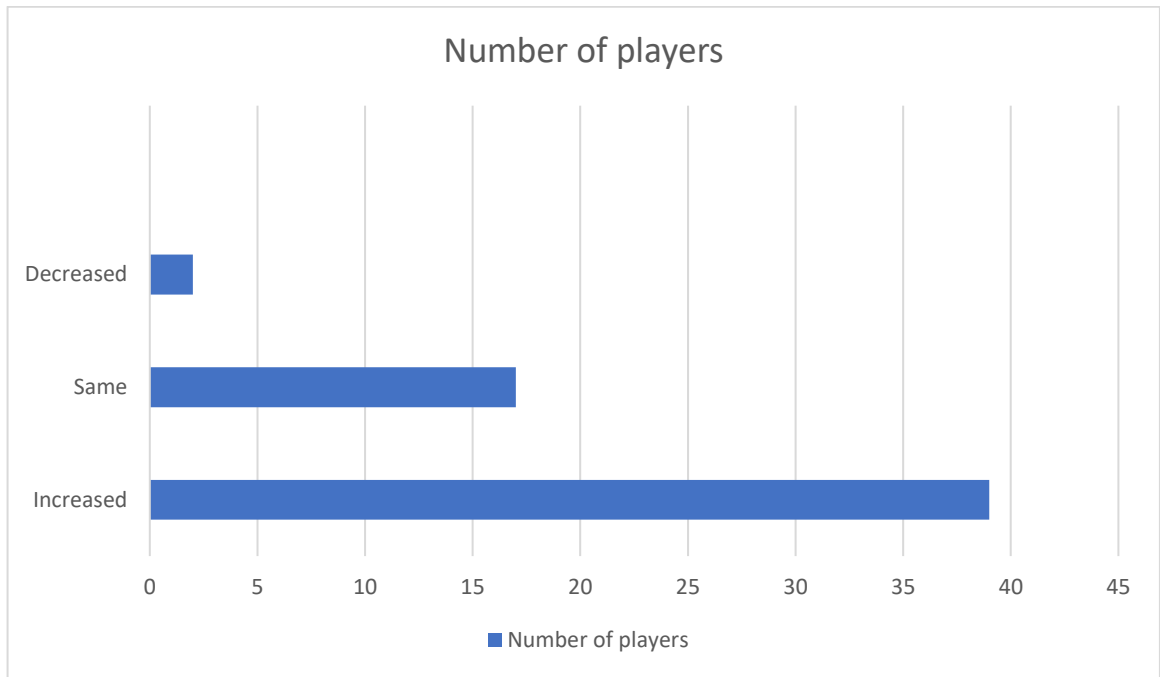
Figure 3.3: Results of the compared marks in questionnaire

The above table illustrates 63 players results of the compared marks of the questionnaire. There were 39 players who has increased their marks than the first attempt. Which mean that they have improved their awareness level.17 players got the same marks in both attempts while 2 players marks were decreased.

The test results show an improvement in the questionnaire marks of the majority after playing the game.

Figure 3.4: Results of the compared marks in game

The above table illustrates 63 players results of the compared marks of the game. There were 35 players who has increased their marks than the first attempt. Which mean that they have improved their awareness level.13 players got the same marks in both attempts while no player had decreased their marks.

The test results show an improvement in the game marks of the majority after playing the game one time. Thus, it shows that this application is much useful in improving the awareness among public.

4 CONCLUSION

People in Sri Lanka are not aware about the real-world problems faced in the country. According to the information gathered by the divisional secretariat in kaduwela one of the main problems faced by people are related to cyber security.

Cyber security awareness for social media is done here. The social media platform which is concerned here is Facebook as it is the most widely used platform among the internet users

Many challenges are faced by the users such as user privacy violation, gives potential stalkers information which is needed to track the user and damages to the personal reputation. The root cause for this is over sharing information in Facebook and the use of weak passwords.

Apart from the risk associated with these problems, the main challenge is making the public aware of these problems. Even though there are public awareness programs on these problems, they are not very effective, as they are not attractive, and the public is too busy to attend the programs.

However, as people are more interested and addicted to mobile devices, developing an interactive awareness platform for mobile devices, is a productive way to improve the awareness. Moreover, instead of traditional approaches, adopting to new concepts such as game-based learning will be more effective to improve the awareness So, a game-based learning system for that specific problem is proposed using the technology of 2D/3D/VR.

After the implementation of the suggested game testing phase begins where 60 participants were used. A specific question set was given to the participants before and after playing the awareness game. The answers in the first attempt is recorded and compared with answers in the second attempt. This is done to get an idea about how they have improved their awareness level.
The test results show an improvement in the marks of the player in the second attempt. This concludes that the relevant skills and awareness on social media can be improved gradually with the help of the proposed solution.

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Appendix A: Online survey

A study on "social media awareness through game based learning"

A short survey to identify the awareness level of social media users and the ability which needs to be increased when using social media.

* Required

What is your name? *

Your answer

What is your age?

○ 10-19

○ 19-30

○ 30-45

○ 45+

What is your current working status?

○ Student

○ Undergraduate

○ employed(full time/part time)

○ unemployed

○ other

Do you use Facebook?

○ Yes

○ No

If yes,rank your awareness level relating to Facebook usage

○ 10%

○ 25%

○ 50%

○ Above 75%

How often do you change your Facebook password?

How often do you change your Facebook password?

○ once a month

○ when a security alert pops

○ when the password is forgotten

○ never

What does your Facebook password consist of?

○ only letters

○ only numbers

○ mixture of letters and numbers

○ mixture of letters,numbers,symbols

How long is your Facebook password?

○ less than 8 characters

○ 8-10 characters

○ more than 10 characters

Does your Facebook password consist of your biographical information(birthday/ID/names of relatives)?

○ Yes

○ No

Have you stored your password in somewhere for future reference?

○ Yes

○ No

If yes, where?

○ noted in a book

○ stored in the mobile phone

○ friend/relative knows

Have you saved the Facebook password in the device you use?

○ Yes

○ No

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Do you reuse the Facebook password for multiple online accounts?

○ Yes

○ No

How often do you share things in Facebook?

○ once a week

○ once a month

○ other

Have you made your contact information(email and phone no)visible to public?

○ Yes

○ No

Select the things you have shared at least once using your Facebook account?

☐ Posting intimate details about your relationships, friendships, family matters, or personal drama.

☐ Using social media as a soapbox or a way to vent your emotions.

☐ Posting photos or videos of things meant to be private.

☐ Posting embarrassing photos or videos of yourself or others.

Select the things you have shared at least once using your Facebook account?

- [ ] Posting intimate details about your relationships, friendships, family matters, or personal drama.
- [ ] Using social media as a soapbox or a way to vent your emotions.
- [ ] Posting photos or videos of things meant to be private.
- [ ] Posting embarrassing photos or videos of yourself or others.
- [ ] Regularly posting your meals.
- [ ] "Checking In" to everywhere you go.
- [ ] None of the above

Has your Facebook account ever been hacked? *

- ( ) Yes
- ( ) No

Which ability is important when deciding whether to share your personal details to public or not? *

- ( ) Logical thinking
- ( ) Decision making
- ( ) Recalling ability
- ( ) Reacting speed

Which ability is important when selecting a password for Facebook(length of the password,password strength)? *

○ Logical thinking

○ Decision making

○ Recalling ability

○ Reacting speed

Which ability is important when deciding what to share in Facebook? *

○ Logical thinking

○ Decision making

○ Recalling ability

○ Reacting speed

Which ability is important if you find your Facebook account is hacked? *

○ Logical thinking

○ Decision making

○ Recalling ability

○ Reacting speed

What do you think is the most important ability which should be developed when using social media? *

○ Logical thinking

○ Decision making

○ Recalling ability

○ Reacting speed

Do you think an awareness game will help to improve the cognitive skills (abilities)which are useful when using social media? *

○ Yes

○ No

If yes,what type of game is most suitable as an awareness game? *

○ Quiz game

○ Crossword puzzle

○ Action game

○ Other: _____

Submit   ▬▬▬▬▬▬▬▬▬▬▬ Page 1 of 1

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Appendix B: Data Analysis Report

Cyber security Awareness (social media awareness)

The data gathering process for the project was done using google forms due to the prevailed situation of spreading a virus.

I mainly used two google forms for this.

1.To identify the current awareness level in social media usage.

2. To identify which ability needs to be improved and the type of game to make people aware about social media usage.

Figure 1: online survey

Figure 2:online survey

How Weak password usage and oversharing information effected people was clearly understood as most people who faced Facebook hacks were the once with a poor awareness level about the above-mentioned factors.

- This online survey was done using 60 people of different ages (more than 10 years old) and different working statuses.

Has your Facebook account ever been hacked?
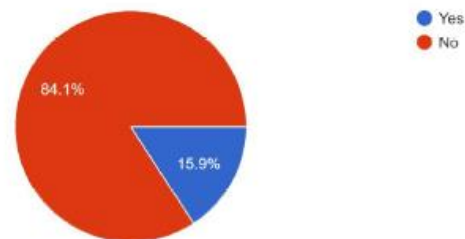63 responses

Figure 3: response for the question about Face Book hacking

- Here in the above diagram you can see that there were few whose fb accounts were hacked.
- When analyzing further on these 15.9% it was clear that they had been careless in using social media.
- (passwords were not up to the required standard and the storing the passwords in places where others can access, oversharing information)
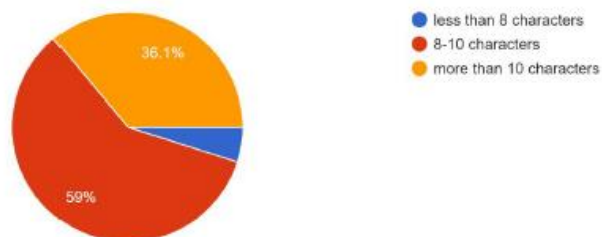
How long is your Facebook password?
61 responses

Figure 4: response to identify the password length
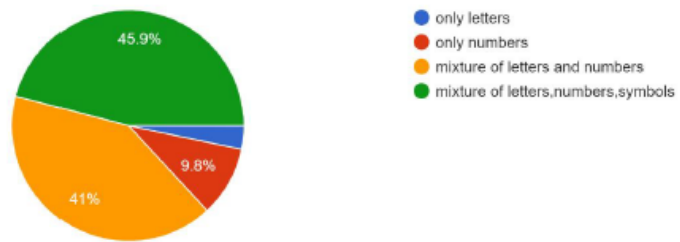
What does your Facebook password consist of?
61 responses

- only letters
- only numbers
- mixture of letters and numbers
- mixture of letters,numbers,symbols

45.9%

9.8%

41%

Figure 5: response to identify what the password consists

Select the things you have shared at least once using your Facebook account?
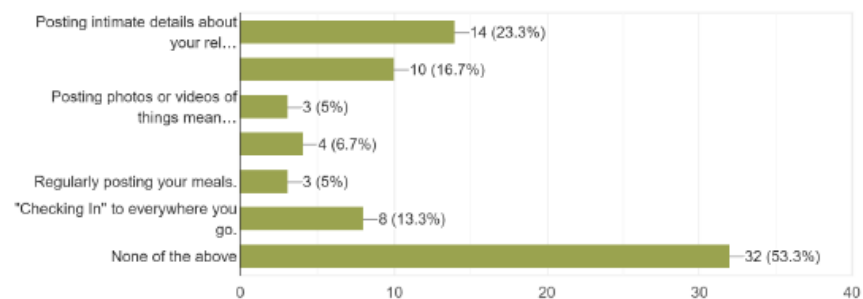60 responses

Posting intimate details about your rel...	14 (23.3%)
	10 (16.7%)
Posting photos or videos of things mean...	3 (5%)
	4 (6.7%)
Regularly posting your meals.	3 (5%)
"Checking In" to everywhere you go.	8 (13.3%)
None of the above	32 (53.3%)

Figure 6: response for identifying what type of information are shared

- Next I focused on which ability needs to be developed if to increase the awareness.
- For that several questions were included in the google forum where the most said answer was **'decision making'**.

What do you think is the most important ability which should be developed when using social media?

63 responses

- Logical thinking
- Decision making
- Recalling ability
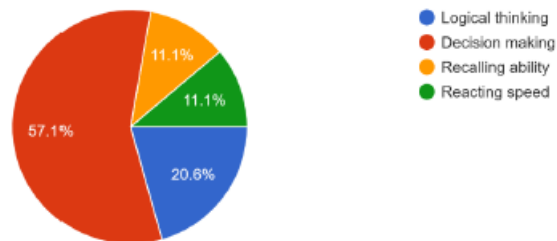- Reacting speed

57.1%
11.1%
11.1%
20.6%

Figure 7: response to identify the ability

- Finally, the games which are to be implemented for awareness of people needed to be focused. **A quiz and a puzzle game** were requested by the majority.
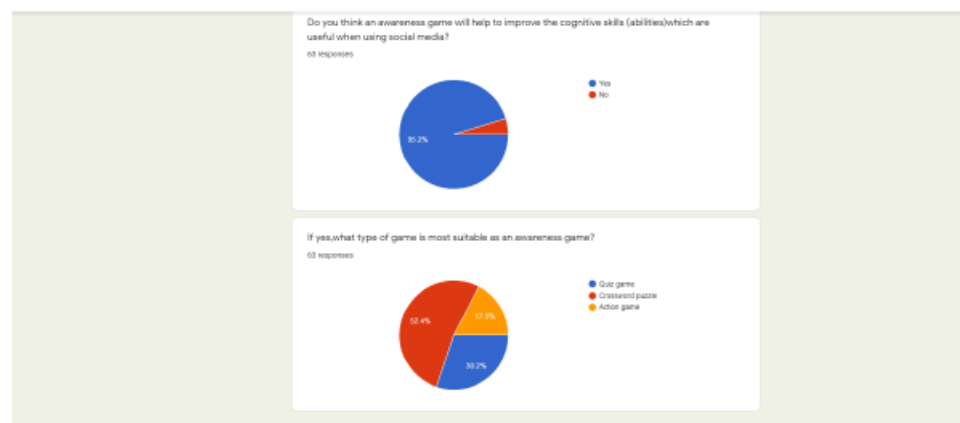

Figure 8: response to identify the game type

Appendix C: Sanfoundry Question set

Cyber Security Questions and Answers – Attack Vectors – Social Networking Security

This set of Cyber Security Multiple Choice Questions & Answers (MCQs) focuses on "Attack Vectors – Social Networking Security".

1. Which of the following is the most viral section of the internet?
a) Chat Messenger
b) Social networking sites
c) Tutorial sites
d) Chat-rooms

View Answer

2. _____ type of sites are known as friend-of-a-friend site.
a) Chat Messenger
b) Social networking sites
c) Tutorial sites
d) Chat-rooms

View Answer

3. Which of the following is not an appropriate measure for securing social networking accounts?
a) Strong passwords
b) Link your account with a phone number
c) Never write your password anywhere
d) Always maintain a soft copy of all your passwords in your PC

4. Which of them is a proper measure of securing social networking account?
a) Never keep your password with any relevant names
b) Keep written records of your passwords
c) Keep records of your password in audio format in your personal cell-phone
d) Passwords are kept smaller in size to remember

View Answer