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A Study on Cyber Safety Awareness among Malaysian Primary Students A Case Study: QR Code Game in SK Bangi

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Abstract--- *This paper explore the coverage and exposure towards the cyber safety awareness among primary school student in Malaysia and later present a study on the practical approach in infusing the cyber safety awareness through multiple platform in increasing the level of understanding of the student about the matter. QR code technology was used as a platform to engage with the students and develop interesting learning environment where the students will involve in activities rather than just sitting and listening to the lecture or talk. Mix method was used and the sample consisted of 5 teachers and 50 children aged 10-11 years old in a primary school. As data collection tools, an observation and interview form were used. The qualitative methodology are used in observing the primary student exposures towards the knowledge on regards of the security risks and threat and the understanding on how the student react and overcome those issues. The findings and recommendation from this study are fundamental in enhancing the approach in delivering the cyber safety awareness to the student apart from only using the school as the medium.*

Keywords--- *Cyber Safety Awareness, Primary School Students, Cyber Security Education.*

I. INTRODUCTION

With the enhancement of technology every day and the accessibility towards the devices, which connected to the Internet, its make the introduction towards the cyber world happens at the early stage of life. Students are exposed to the cyber world either for doing the homework given or for leisure purposes such as playing game, watching YouTube, social media, browsing and others with the absent in mind of the risk that they might encountered while doing such of the activities mentioned [1]. In Malaysia, school have taken a huge step in creating an awareness towards the security issues by included it in the ICT subject which are widely use in most of the school in Malaysia. Apart from Malaysia, other countries such as Singapore, Australia and Oman are actively adopting necessary framework in assisting and guiding the school's curriculum in delivering appropriate security awareness and measurement to the students [1].

The question arise is how far does the information are being crafted inside the module and does the exposure given are sufficiently enough for the student to understand and take reasonable precautions steps in catering possible risk while actively in the cyber world?

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II. CYBER SECURITY EDUCATION IN SCHOOL

ICT subject are already included as part of the primary school curriculum and an agency under the Ministry of Science which is Cyber Security Malaysia also took an action in making a move in developing awareness module which can be used by students at both primary and secondary schools [1]. Currently minimal security topics are covered in the ICT module where other ICT related topic are more widely covered in the subject such as programming, introduction to the other basic application such as Microsoft words and others. The brief coverage of the security awareness is only towards the virus, worm and access control. Theoretically it will be difficult for the primary student to understand especially those who never touch computer at all. Due to that, the understanding towards the matter is questionable and how far the effectiveness of including the security as part of the topic needs to be further investigated [14] [15].

III. ALTERNATIVE MEDIUM IN CHANNELING CYBER SECURITY EDUCATION

Due to the security awareness becoming a crucial issue, there are several medium are use in spreading the knowledge about Cyber Security technologies and safety.

3.1 Animated Series

"Ejen Ali" is one of the popular Malaysian animated series among the children nowadays in Malaysia. The first episode was broadcast on 8 April 2016. This animated series emphasize on the primary school boy named Ali, which accidentally became a Meta Advance Tactical Agency (MATA) agent. The main focus of this animated series is about a high technology device named as Infinity Retinal Intelligence System (IRIS) that owned by MATA, the investigation academy. IRIS is controlled by neuro-signals that enable the person who wear this device to perform actions programmed by the computer. Besides that in the animated series, IRIS are also used as an authentication method when entering certain area [3].

The animated series create an awareness to the audience where there is other methods available apart from the password, pin number or access card as the authentication method to protect the valuable information or objects. Biometric methods have been introduced to the audience through this series when someone wanted to enter the system or building [3].

From the survey conducted with school students, the effectiveness of the medium in spreading the knowledge is improving where the students have an understanding about it while watching the animated series, but unfortunately unable to relate it to the risk or danger when they are in the cyber world. Besides that this animated series also introduce the children on what is hacking.

3.2 Movies

There are several movies that are related to information security breach and advance technology used in cyber security such as The Net, Snowden, Matrix and Circle. The Net is one of the American movies in 1995. This movie is about cyber mystery thriller that focuses on identity theft. A system analyst who rooting out viruses in games stumbles into massive conspiracy when she discovers a hidden program that allows the user to access and manipulate any database. Due to this all her records and identity profiles were stolen. The Net remind the audience

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of how fragile every system is when we completely rely on computers [4].

The Circle is a gripping modern thriller about a young woman who is hired to work for the world's largest and most powerful technology and social media company, she sees it as an opportunity of a lifetime. As she rises through the ranks, she is encouraged by the company's founder to engage in a groundbreaking experiment that pushes the boundaries of privacy, ethics and ultimately her personal freedom. Her participation in the experiment, and every decision she makes begin to affect the lives and future of her friends, family and that of humanity [5].

There are many other movies that are related to cyber security. Most of the movies showed advance techniques and technologies for hacking and attacking. Most probably primary school students will have difficulty to understand on the message that the movies tried to deliver to the audiences. Hence explanation from adults needed for them to understand better.

IV. STUDY APPROACH

The executions of the study are divided into 3 main stages as shown in Figure 1. The start off the project begins with project initialization, identifying stakeholder, development of the instrument to be used in gathering the data, the sampling size and distribution. Execution and data collection are seen in the stage 2 while stage 3 define the findings, model propose and conclusion. The study took 1 year of completion.

First of all Subject expert in Cyber Security and Game Based Learning (GBL) need to identify the objectives of this study before arranging the activities to conduct at selected schools. The objectives of this research are as following [6]:

- To give early exposure on the importance of cyber safety and security at school level.
- To enhance cyber security knowledge and skills among Malaysian students using Game-based learning (GBL) approach and platform.
- To develop customized content development that suits students' level in interactive manner.
- To build and sustain students' interests to keep progressing and fulfilling learning outcomes through GBL approach and platform.

The subject contents start with general online and cyber security that cover on [11] [12] [13]:

1. Online Risks Faced by Children

Introducing and explaining the possible risk that might be faced by the children when they are online such as cyber bullying, identity theft, cyber stalking, Cyber Grooming and child pornography. The explanation based on statistic from the STAR newspaper and several evidences from several resources.

2. Tips and Awareness

The children are given tips and awareness that they can follow when they are online. Several tips given are:

- Value your reputation

The children should think twice or thrice with whatever they want to upload. This is because any information or photos that already on the internet, it cannot be undone.

- Keep your passwords safe

Introducing the children on creating the strong passwords. Strong password with minimum of eight characters which have combination of letters, numbers, and symbols. They should not share their password with anyone.

- Respect all

The children were being informed that they need to treats others the way they want to be treated.

- Don't Spread Rumors
- Stop Cyberbullying

The children should not involve in any cyberbullying. If they are the victim of cyberbullying, they should inform their parents or adults that they trust.

- Privacy setting on social media

By right the children under age of 13 years old should not have any social media account. However the account still can be created by giving fake information such as age etc. If the children have their own social media account or using parents or sibling account, they need to make sure that their privacy setting is not open to public.

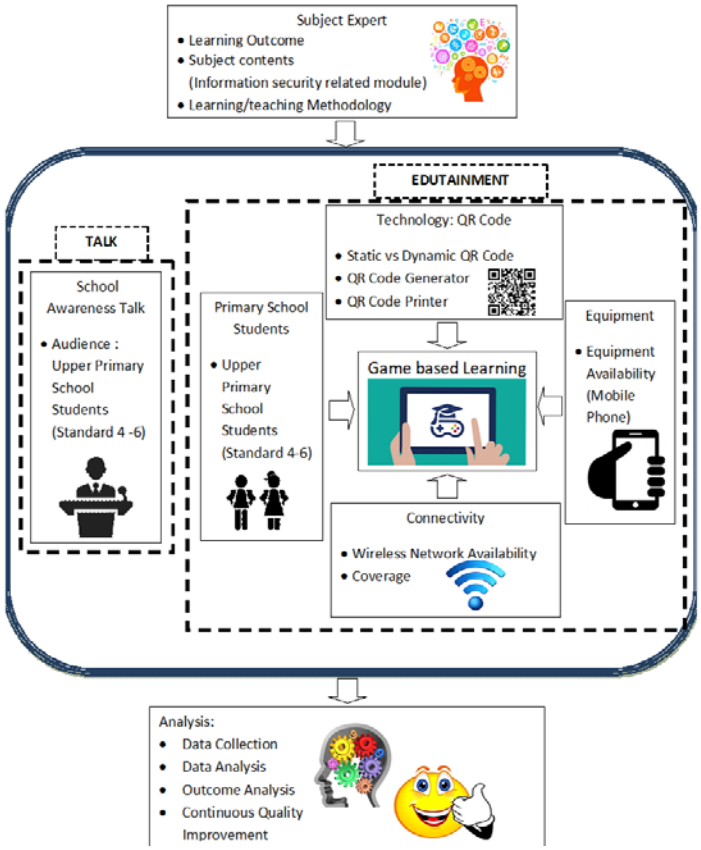

Figure 1: Overall Study Approach

The discussion on the contents, date, time and target audiences being done with either the school's headmaster or Penolong Kanan Hal Ehwal Murid before any activities conducted at the school. Sekolah Kebangsaan Bangi was chosen as the pilot study to promote this cyber safety awareness campaign. There were two main activities

conducted which involved 5 teachers and 50 students aged between10 to 11 years old. The activities that conducted at schools were:

1. Cyber Security Talk

Slides prepared based on the contents discussed above. Two version of slides prepared which are in Bahasa Malaysia and also English. The talk will be given based on the language that preferred by the school's headmaster. Figure 2 shows the talk conducted at Sekolah Kabangsaan Bangi.

Figure 2: Cyber Safety Talk in the School's Hall

2. QR Game

The questions prepared based on the target audience. Two versions of game prepared which are in Bahasa Malaysia and English. 20 questions prepared where the answer is only True/False answer [7] [8]. All the questions prepared will be embedded with the QR code as shown in figure 3.

Figure 3: Quiz Questions in QR Code

The game executed based on facilities available at the school. In order to ensure the game able to run successfully several thing are needed which are:

- Smartphone

Figure 4 shows the student is using the smartphone to scan the QR code to enable her to see the question.

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Figure 4: Student Answering the Quiz Using QR Code

- Mobile data or wireless network access point
- QR reader

QR reader need to be installed to the smartphone that going to be used for the game

If the student answered the question correctly the QR code will display the prize won by the student as shown in figure 5. This is to give motivation and encourage the students in participating the activities conducted. This kind of activities looks like more attractive and fun, especially for the primary students.

Figure 5: The QR Code will Display the Prize Won

If all the students are allowed to bring their smartphone during the activities, the quiz question can be answered individually. However if the smartphone is limited then the students are divided into groups so that the quiz question can be answered in group basis. The scoreboard is display on the screen to identify the winners. In most government schools students are not allowed to bring their smartphone to school, so the quiz conducted by selecting the volunteers who would like to answer the question. The student need to use the smartphone provided to scan the QR Code to view the question, then the student just need to click the answer on the phone.

V. THE QUALITATIVE AND QUANTITATIVE ANALYSIS

Edutainment or Game Based Learning is one of the teaching approach used to attract students to get involved in learning activities conducted [7][8]. This approach giving good responses from the school children. Qualitative

study done for this research that categorize into three categories:

- Category A

Study on the behaviours or elements in GBL in general, and in GBL for cyber safety in specific

- Category B

Study on related content and fields in cyber safety according to groups of targeted students (which cyber security areas are to be more prioritized according to the groups to be developed as GBL content). Besides that, the researchers are also study on the awareness of cyber safety on groups of targeted students.

- Category C

Study on the acceptance on GBL in general and GBL for cyber safety in specific and the areas of improvement and expandability needed in the future.

Qualitative study based on observation done during the activities conducted at the schools. The findings as tabulated in table 1.

Table 1: Qualitative Finding

Qualitative study	***Finding***
Category A	Students showed their interest in using QR Code game during the quiz session. Most of the students volunteered to answer the quiz questions. Based on the teachers feedback, they were surprised with some of the students who were passive in class but showed their enthusiastic during the game session.
Category B	Review on ICT text books for primary school students Based on observation of ICT syllabus that covered for primary school students look like lack of coverage on digital security which is more important nowadays. At least the important and functionality of password should be introduced. Types of malware is covered during standard five that introducing on what is virus and worm.
Category C	All the students participated in activities conducted. Most of them eagerly to answer the quiz questions prepared using QR Code. This showed that most of the students accept and engaged well in the Game Based Learning

After the session ended, the researcher interviewed the students verbally and asked the students what they liked best. Most mentioned event from the interactive QR code game where they got the opportunities to use the smartphone to scan the QR code and answer the question. The researcher did asked the teachers as well and they were so impressed with the students' responses and how the activities had engaged the students who were passive in class.

Quantitative finding based on questionnaires distributed to the teachers and students.

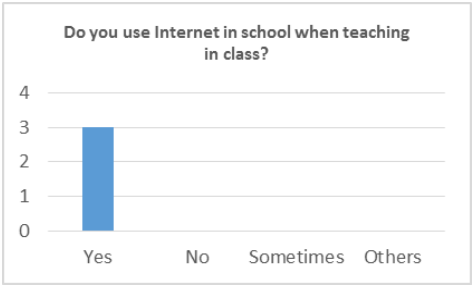

Figure 6: The Use of Internet for Teaching in Class

Based on figure 6 shows that majority of the teachers in primary school are using internet to access resources, education portal or other resources as an aid of teaching in class. There are many educational portal available where some of them are free but some of them need to register and pay. Several example of online educational resources are VLE frog, SmartSelangorFreeTuition.com, score "A" and many others resources.

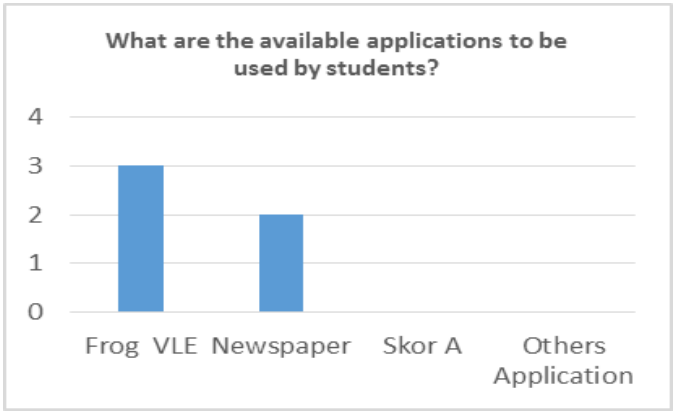

Figure 7: Applications Used by Students

Figure 7 shows that FROG VLE and newspaper are the most common resources used by the teachers and students in teaching and revision study.

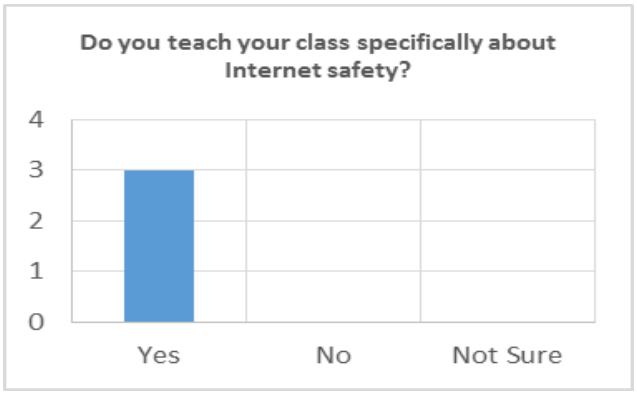

Figure 8: Teach about Internet Safety

Most of the teachers nowadays are aware of the importance of Internet Safety. This can be proof as shown in figure 8 that majority of the teachers responded that they teach their students on Internet Safety during the class session. Further questions being asked to the teachers to get more information on the content of Internet Safety that being covered in class. Figure 9 shows that 20% of the contents cover on password that introduce the students on the purpose of password and impact if people know their password. 7% of the content explain to the students on malware such as viruses and worms. 20% on the spam that cover on the meaning of spam and example of spam email.13% explaining on upload and download process and 20% on information security that explain on how information can be protected such as by setting password to the files and folder etc. The other 20% focuses more on awareness on computer and Internet usage. The students were being explained on games or Internet addiction. The impact of games and Internet addiction to the students. How they should control themselves for not being addicted

to games and Internet. Besides that the main role should be played by the parents in controlling their children on accessing the Internet and playing games.

Then the questions being asked to the students on their feedback towards program and content conducted by the teachers on the Internet Safety.

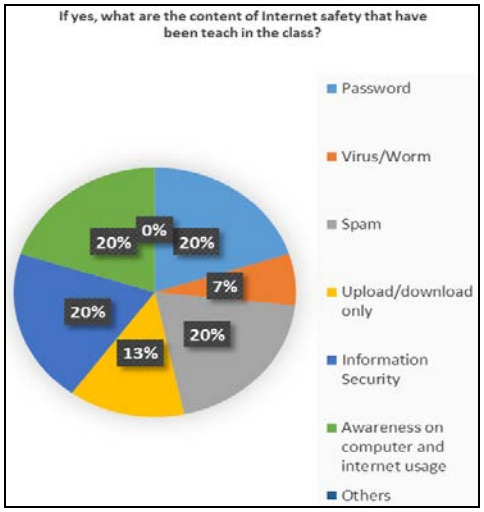

Figure 9: Internet Safety Content in Class

Figure 10 shows the feedback given by the students where 77% of the students agreed that learning activities conducted on Internet safety were interesting. Only 2% of the students said neutral as no comments from them.

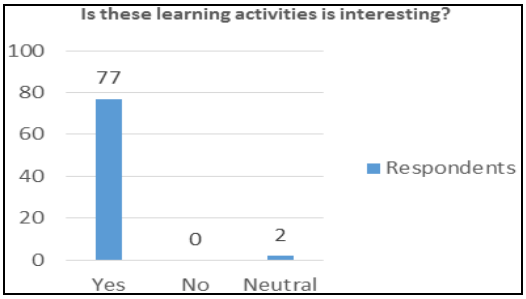

Figure 10: How Interesting the Activities

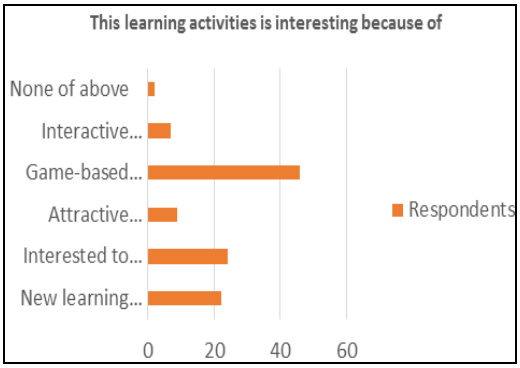

Figure 11: Why the Activity is Interesting

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Figure 11 shows the reason on why the students said that the activities conducted were interesting due to:

- Interactive of leaning
- Game based learning
- Attractive contents and activities
- Interested to explore new technology
- New learning method

VI. CONCLUSION

Everyone nowadays are using advance technology such as smartphones, high end computers, smart TV and so on and so forth. People are dependent on these kind of technologies in their everyday lives. When the technology is so advanced, cyber criminals are getting smarter by each days, thinking of new ways to breach into database systems and hack into people's devices to gain advantages for themselves. People know how to use the devices but not using it in a secure way, therefore this is one of the main reason cyber-crime is rising in this modern era. For example, fraud cases detected in cyberspace jumped 20% last year compared to 2015. Besides fraud, the top cyber-crime were intrusion, spam and malicious code. Data from Cybercrime Malaysia, an agency under the Science, Technology and Innovations Ministry, also show a total of 2,428 cybercrime incidences reported between January and April this year [2].

Due to the increasing of cyber-crime cases, awareness should be given to the community especially school students who are still new and eagerly to explore the new technology and excited with the social media applications [9]. This paper is focusing on approach that being used to the primary school students to educate them in using Internet and computer safely. The approach that being used is more on game based learning rather than talk that unable to attract them to the message that going to be delivered. The game that being implemented is using the QR technology.

Based on the observation, interview and questionnaires that being distributed to the teachers and students, most of them agreed that game based learning is an effective way to deliver message to the students. This is due to that this age of students are prefer fun learning approach rather that classroom or traditional approach that make the students bored and lost focus [10]. During the activities conducted, observation being done by the teachers and feedback given by the teachers that they saw several of students that normally passive in class they become excited and want to volunteer to participate in game activities conducted. This showed that the program conducted at school was successful and able to achieve the objective.

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