



THE HEURISTIC EVALUATION ON THE INTERNET SAFETY GUIDELINE FOR PRIMARY SCHOOL STUDENTS

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ABSTRACT

Nowadays, the use of Internet is becoming more important in teaching and learning at school. A preliminary study shows that even though Internet has many benefits, it also exposes users to danger, especially concerning online communication. The objective of this research is to develop an Internet safety guideline in order to curb cybercrime, especially for students in primary schools. Expert evaluation has been used in this study. It has been chosen because of its ability to identify more problems. An interview with six experts was conducted in validating the guideline. Several comments were obtained. The findings have showed that the experts' comments are helpful in improving the guideline and the result of the Content Validity Index is acceptable. Hence, it is hoped that the Internet safety guideline developed can benefits or provide awareness for primary school students and teachers in the process of giving or getting any information through the Internet. Therefore, this study provides primary school students with a guideline in accessing the Internet safely. This is important for them in expanding their knowledge and thus, be successful in their study.

Keywords: internet safety guideline, security, cybercrime, heuristics, content validity index.

INTRODUCTION

Advancement of technology has made computer to have significant roles in children's education. In both developing and develop countries, computers have become children's ideal companions in learning at school or at home. Previous study has found that students at primary school use more computer at home than at school [1]. The most popular activities on home computers have been playing games and doing social activities such as writing email to friends, online chatting and messaging through social media like Facebook. Findings also indicate that boys spent more time playing computer games whereas girls spent more time on the Internet emailing friends. Researchers have found that 45% of eight to 11 years olds use social networking sites [2]. The top four sites were frequently visits are YouTube, Moshi Monsters, Club Penguin and Facebook. Meanwhile, most popular activities being playing games, private messaging, posting comments and posting their own status updates.

Nowadays Internet technology can help and enrich teaching and learning environment for most subjects in school [3]. The Internet is able to be accessed by students for learning purposes or seeking information through Internet browser. By accessing the Internet, students can develop critical thinking and communicate easily with others [4]. The process of Internet access involves many elements such as electronic media [5] archive file, search, group discussion [6] and conversations [7]. The Internet allows communication among students worldwide. Exchange of information among students can help improve mental and psychological development during the growth process [8]. The Internet provides an opportunity for students to analyze [9] deeper into the subject that interests them. Therefore, it affects their thinking process and contributes

ideas to the group discussions [6]. Furthermore, through the Internet students are able to make their study as a reference and to find a different explanation in order to achieve related information and learn any materials through the Internet.

Generally, the Internet is bringing a lot of benefits, but there are still the disadvantages which cannot be denied, especially when it comes to the young generations [10]. They are exposed and easily influenced by the Internet either positively or negatively [11]. According to the previous research from Cyberspace Research Unit in United Kingdom, it was found that 60% of primary school children was unaware of basic safety guideline [12]. Other study in Belgium found that from their observation, 86.3% of the primary school children did reflect unsafe Internet usage [13]. Currently, being unaware of Internet safety can lead to cybercrime which has become a commercial crime. According to the report of from Cyber Security in a local news article, Malaysia is the sixth most vulnerable to cybercrime [14]. Despite the sophistication of the cyber world, it also invites cybercrimes that affect all levels of society, especially to the children, and this is a cause for concern.

Even though the education of Malaysia has ICT facilities, it is not a guarantee to avoid students from being exposed directly to cybercrimes. The best way in providing awareness on cyber security among children is to provide them with both theories and practices [15][16]. In addition, children need to be given clear and understandable guideline in using the Internet [17]. According to [18] report in local news article, emphasis should be given to students on how to use the Internet in a safe way, apart from the protection required when surfing. Therefore, the objective of this article is to validate the content and visual appearance of the Internet Safety



Guideline (ISG) based on the experts' reviews.

RELATED WORK

Cybercrime such as spam, spyware, computer virus, fake email, and malware still remain the top of the list for online security issues [19-22]. According to previous researches, many Internet users still expose themselves by opening unexpected email attachments, downloading malware, using weak or cooperated passwords, clicking inside pop-ups, clicking on links in emails, or failing to threat the "fine print" before downloading files and registering at a website [20-23]. There are various types of cybercrime activities that always involved children which can be categorized into several parts such as pornography [12], cyber bullying [24,17], cyber talking [17], harassment [25] privacy, meeting strangers [26] and others. In order to prevent these, students need proper guideline so that they would learn and understand the situation [26]. They also need the practice and know the way how to hide necessary information and at the same time, always be alert of their safety [17].

The Internet surfing is a useless process without control. The control from the school [12][27,28] and parents [13] are needed to overcome the increasing cases of the cybercrime. There are various preventions that schools can do to promote safe Internet usage. According to Valcke, et al. (2010), various interventions can be done at schools and public libraries to promote safe Internet use such as: rules and regulations policy, installing filtering software, training programs for teachers to increase Internet competencies, curriculum development and standards, campaign on safety Internet, and center on Internet use from the society perspective. Therefore, these activities have an impact of school-based and parents' Internet safety interventions.

Table-1 provides the comparison on ISG based on previous studies. The first guideline is Cyber Safety Guide [29] which is basically the tips for parents on how to guide their children while using the web. Common activities placed under this guideline are surfing, chat rooms, e-mail, instant messaging, downloading, social networking, gaming, online child solicitation, cyber bullying, harassment and stalking. The second guideline is a brochure about 10 rules that can be followed by children [30]. This guideline is suitable for children to understand because it uses simple text. The third guideline is a summary from a full report which consists is good practice guidance for search service providers and advice the public on how to search safely; published by the Home Office in December 2005 [31]. This document helps to identify and outline what is good practice in doing search on the Internet. The forth guideline was developed by The International Telecommunication Union and UNICEF. This document is called the Guideline for Industry on Child Online Protection. In this report, the roles of the parents and teachers are explained well and it can be used as reference [32].

The fifth guideline is the Guidelines and Resources for Internet Safety in Schools [33]. This guideline is specifically used in school, helping school divisions to develop and implement Internet safety policies and programs. The guideline has input from individuals and organizations which represent the knowledge and perspectives of educators, researchers, law enforcement officials, local, state, and federal representatives; and independent nonprofit organizations. The sixth guideline was taken from a program of the National Center for Missing and Exploited children under NetSmartz Workshop and it is called Your NetSmartz and My Rules for Internet Safety [34]. This guideline uses color papers and images to attract students. This one page guideline has keywords such as cyber bulling, online predators, sharing too much and trusted adults. These keywords are used so that children are aware of all these. Most of the guidelines in Table-1 are presented in text format and suitable for adults in giving information to children. Only two guidelines are really suitable to be used by children which use simple text and graphics. According to previous researcher, visual presenting can improve students' understanding compared to using texts [35]. Therefore, in this study a proposed guideline in graphic and simple text format will be developed to enhance understanding among students while surfing the Internet.

Table-1. The Comparison on Internet Safety Guideline.

No	Guideline name	Author/Webpage	Suitable to	Presentation
1	Cyber Sefety Guide	Cable & Cyber Angels (2007)	Parents & Teachers	Text
2	Kids' Rules for Online Safety	Larry Magid (2005)	Kids	Simple Text
3	Searching The Internet and Child Safety	http://www.kidsmart.org.uk/downloads/searchGuide.pdf	Parents & Teachers	Text
4	Guidelines for Industry on Child Online Protection	http://www.itu.int/en/cop/Documents/bD_Broch_INDUSTRY_E.PDF	Parents & Teachers	Text
5	Guidelines and Resources for Internet Safety in Schools	http://www.doe.virginia.gov/support/safety_crisis_management/internet_safety/guidelines_resources.pdf	Parents & Teachers	Text
6	Your NetSmartz Tips for Tweens	http://cdn.netsmartz.org/tipsheets/tween_tips_2011.pdf	Kids	Simple Text and Grafic

Heuristic evaluation or commonly known as usability experts review is more popular and cheaper method and can perform quickly without involving end users [36]; (Shneiderman & Plaisant, 2005). This method uses a small number of experts to evaluate the interface and document software errors based on the usability design principles [36-38]. Each of the experts assesses the software interface separately. When the evaluation is done, all results of the usability interface will be collected and reported. In



addition, heuristic assessment can improve the validity of the construction during the development [39].

According to a report by Cyber Security Malaysia, which was reported in Utusan Malaysia (2013), a proper guideline is necessary for the primary school students. The guideline is to create and strengthen the awareness and understanding on safe Internet surfing. Thus, this research is about developing a guideline on Internet Safety for the primary school children.

METHODOLOGY

The ISG has been adapted according to the previous research on the guideline development methodology. This original guideline focuses on the medical guideline [40]. Although the guideline focuses on the medical aspects, it is still relevant and compatible to be adapted for Internet security guideline. To do this, seven (7) phases are implemented in developing the guideline. The phases are: 1) Refining the scope area; 2) Searching and reviewing the evidence; 3) Developing the guideline; 4) Validating the guideline; 5) Analysing the guideline 6) Formulating recommendations; 7) End user testing; and 8) Reporting.

Table-2 shows the details activity in developing the guideline. This article only describe until phase 6.

Table-2. The Internet Safety Guideline phase.

No.	Phase name	Activity
1	Refining the scope area	Identify the research objectives, research question, sample, and location.
2	Searching and reviewing the evidence	Identify the keywords that suitable for developing Internet Safety Guideline. Review process of articles (refer to Table-1)
3	Developing the guideline	Design and develop the Internet Safety Guideline according to the previous guidelines.
4	Validating the guideline	Expert review with the six (6) same experts in two (2) iterations.
5	Analyzing the guideline	Calculate the Content Validity Index 1 and 2 (refer to Table-5 and Table-6). Evaluating and implementing the result form experts.
6	Formulating recommendation	Redesign the guideline according to the experts review.
7	End user testing	Testing the guideline with primary school students
8	Reporting	Present the result what had been investigated.

In this study a qualitative methodology were chosen.

a) Respondents

In this study, six experts (3 male and 3 females) who are the evaluators of the proposed ISG. In conducting the evaluation, evaluators answer a questionnaire on the visual appearance of the ISG. The experts are from different areas. They are teachers, parents, graphic designers and Cyber Security Malaysia personnel. All of them have more than ten years of working experience.

b) Research instrument

Two research instruments are used in this study. The first instrument is the ISG. In the first version of ISG is drawn on A3-size paper. These guidelines are drawn by the researcher based on the example guidelines in the literature review. The process of sketching takes less than 2 weeks. This includes the coloring process of writing, pictures or related symbols. The second version of ISG is the combination of the first version of the guideline and a modified symbol. The time taken to develop the second version of ISG is 1 week.

The second instrument is a questionnaire, which is called the "Heuristic Evaluation Questionnaire (HEQ)". A five point Likert Scale is used in the HEQ to evaluate the ISG. There are seven (7) questions that the experts have to answer:

- The type of text used.
- The colors used.
- The matching pictures and text.
- The info graphic.
- The illustration of information.
- The visual of the guide.
- The simplicity of the guideline.

c) Research procedure

The research procedure for experts review on the ISG is shown in Figure-1. The process started with identifying the experts, who are six experts coming from different background. Every expert spent about 30 minutes to 40 minutes examining the guideline. The HEQ were used to evaluate the ISG. From the first evaluation of guideline, the Content Validity Index 1 (CVI1) was calculated and the guideline was updated. The process was repeated in the second evaluation with the same experts and the CVI2 was calculated. Finally, the last step in the procedure was the process of analyzing data through the CVI from the experts for both versions of the guidelines.

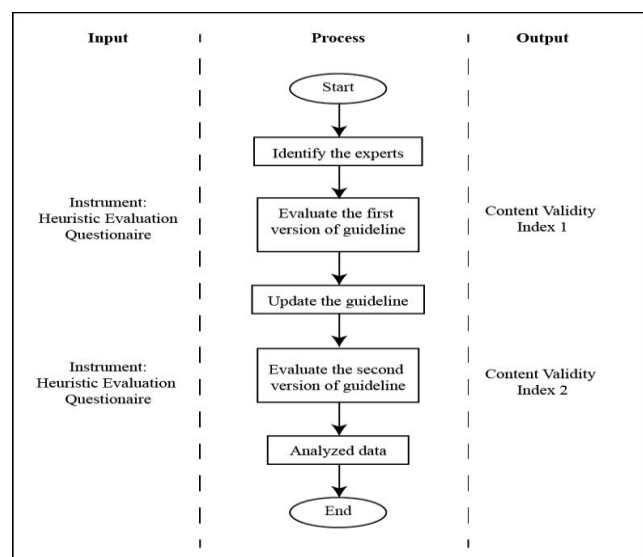


Figure-1. Validate the Internet safety guideline with experts.



RESULTS

Besides the results of HEQ, experts gave some suggestions on improving it. In answering the first objective, the result of this evaluation was used in redesigning the ISG. The first version of ISG was done manually by the researcher. In the first phase, the experts are coming from various areas such as officer from Cyber Security Malaysia, teachers and the officers which directly involved in the graphic and design activity. Based on the feedbacks, it was suggested that the images and text should be computerized as they would look more professional and attractive. Besides the font type used also needed to be amended. According to them, a good guideline should be able to avoid confusion among the readers whereby it should provide a clear message. Figure-2 shows the first version of ISG that been evaluated by experts. Table-3 illustrates the first iteration of comments and suggestions for the guideline.



Figure-2. First version of Internet Safety Guideline.

The information:

- Use the Internet when a trusted adult is with us.
- Always think before type.
- Always think before click on the buttons
- Always think before click on the links.
- Always think before visit a websites.
- Ask a trusted adult before visit any website on the Internet.
- Ask a trusted adult before search further on the Internet.
- Always ask if get lost on the Internet.
- Never give out personal information.
- Never give out the picture of yourself.
- Never give your key to others.
- Never give your password to others.
- Lock your computer with strong password.
- Never meet anyone you don't know.
- Never accept or open an e-mail send by anyone you don't know.

Table-3. First iteration of comments and suggestions for Internet Safety Guideline.

Experts No	Comment	Suggestion
1	No drawing picture if possible.	The related picture can be downloaded from the Internet, check on the copyright.
2	No need too much of pictures. Too messy with too much information.	Change the text to be bigger. Only create one type of text.
3	The illustration is too messy each other.	Separate the information in different pages.
4	Improve on the graphics. Too crowded.	Try to create simple information for one part of page.
5	Improve the content and drawing.	For more information, refer to cyber safe from Cyber Security Malaysia.
6	Info graphic acceptable, but can be improved for improvement. Instructions on info graphics are quite fibrous.	Planned properly in order to be understood more clearly.

Based on the experts' feedbacks, some parts have been changed; among them were position of pictures. Changes were made so that the guideline become more interesting and attractive for users. Among the changes were the choices of colours, which was brighter so that it would attract the young users. The length of the text should not be too long because too long of text can easily confuse users. Thus, the shorter the text is, the better it would be. The illustration on the second iteration of ISG is shown in Figure-3. The second version of the guideline is depicted in Table-4; which shows the second iteration of comments and suggestions.

Based on the experts' comments, the ISG has been divided into three parts. This is shown in Figure-3. Each part represents only one particular tip of Internet safety. The first part shows items related to the password. This part advises students not to give the password to any stranger. The second part shows the photo and text about the personal information. Here students are advised not to expose their personal information and picture on the Internet. The third part tells students what they have to do before they browse the Internet. Students are advised to share with and ask the trusted adults' help before they visit the Internet. The findings from this section are similar to the previous study conducted by Larry Magid (2005) and National Center for Missing & Exploited Children (2011).



Figure-3. Second version of Internet Safety Guideline.

**The information:**

- Never give your password to others.
- Never give personal information.
- Never put a picture of yourself.
- Use the Internet when a trusted adult is with us.
- Ask a trusted adult before visit on the Internet.
- Ask a trusted adult before search further on the Internet.
- Always ask for help if get lost while surfing on the Internet.

Table-4. Second iteration of comment and suggestion for Internet Safety Guideline.

Experts No	Comment	Suggestion
1	No drawing picture if possible. Easy to understand.	The related picture can be downloaded from the Internet, check on the copyright.
2	Much better Still, many words	Only 2-3 words Possible just the picture.
3	Much better to read and understand.	None
4	Improve on the graphics.	Try not to combine the parts.
5	More organized.	Please refer to Cyber Security Malaysia
6	Info graphic more understand and easy for the children to read	None

The total questions in the HEQ were seven. Each question listed as “Strongly Agree”, “Agree”, “Neutral”, “Strongly Disagree” and “Disagree”. Content Validity Index (CVI) was used in order to evaluate the expert’s result. Only item rated by the experts as “agree” or “strongly agree” are considered in calculating the CVI and the total validity index is 1.00 (Pilot & Back, 2006). The first interaction is show in Table-5 [0.93] while the second interaction is shown in Table-6 is [0.98]. The first CVI was evaluated based on the feedbacks from experts from the first version of guideline while the second CVI result was based the experts’ feedbacks from the second version of guideline. The average represents an increase of 0.05 between the first and second interaction. The results of both interactions were more than 0.78 due to the number of experts participated which was more than five, which in this research are seven. Therefore, the results for both interactions were acceptable for this research.

Table-5. Content Validity Index (CVI) – First Iteration.

Item	E x p 1	E x p 2	E x p 3	E x p 4	E x p 5	E x p 6	No Agreement	of	CVI
Q1	X	X	X	X	-	X	5/6		0.83
Q2	X	X	X	X	X	X	6/6		1.00
Q3	X	X	X	X	X	X	6/6		1.00
Q4	X	X	X	X	X	X	6/6		1.00
Q5	X	X	X	-	X	-	4/6		0.66
Q6	X	X	X	X	X	X	6/6		1.00
Q7	X	X	X	X	X	X	6/6		1.00
Average CVI									0.93

Table-6. Content Validity Index (CVI) – Second Iteration.

Item	E x p 1	E x p 2	E x p 3	E x p 4	E x p 5	E x p 6	No Agreement	of	CVI
Q1	X	X	X	X	X	X	6/6		1.00
Q2	X	X	X	X	X	X	6/6		1.00
Q3	X	X	X	X	X	X	6/6		1.00
Q4	X	X	X	X	X	X	6/6		1.00
Q5	X	X	X	X	X	-	5/6		0.83
Q6	X	X	X	X	X	X	6/6		1.00
Q7	X	X	X	X	X	X	6/6		1.00
Average CVI									0.98

CONCLUSIONS

This study is to identify the design problems for the internet safety guideline and calculate the experts’ results via Content Validity Index in improving the guideline. Moreover, our internet safety guideline was validated by six experts in gathered form Heuristics Evaluation Questionnaire (HEQ). Several amendments have been made due to the experts’ review and feedback. From HEQ, Content Validity Index was calculated and the result was increase 0.05 from first iteration to second iteration. According to previous study the result is acceptable because is more than 0.78. There is a room for future work in improving the guideline, for example the illustration can be done by professional illustrator. Another work which will be tested among the primary school students users to ensure the effectiveness of the guideline. Hopefully, this Internet Safety Guideline for primary students will help them expanding their knowledge in accessing the Internet safely.

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