Fight Identity Theft (FIT) A Comparison of Text-based and Game-based Learning

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Abstract - Identity theft is a deceitful method of fraud that negatively affects communities and individuals worldwide. The purpose of this paper is to report results from a study that assessed two educational strategies at the college level that focused on identity theft. One informational delivery method is text-based. The other direction is a game-based method. On examination of the data, results show that students who were exposed to information by way of the game-based method scored higher on the identity theft survey than those who received education through the text-based method. Additionally, the game-based learners continued working in the educational module longer and expressed greater satisfaction with the process than those who were exposed to the text-based informational unit.

Categories and Subject Descriptors

[Software organization and properties]: *Virtual Worlds Software – Interactive Games*

[Human and Societal Aspects of Security and Privacy]: *Social Aspects of Security and Privacy*

[Human Computer Interaction (HCI)]: *HCI Design and Evaluation Methods-User Studies*

[Education]: *Interactive Learning Environments*

[Professional Topics]: *Computer Crime – Identity Theft*

General Terms

Identity Theft, Identity Theft Education, Game-Based Learning, Interactive Learning, Security

Keywords

Crime, Deceit, Deception, Education, Fraud, Fraudster, Identity, Identity Theft, Identity Thieves, Phishing, Scam, Spurious, Theft

1. INTRODUCTION

Identity theft is growing at a horrific pace. It is a harbinger of suffering, countless hours and/or years of chaos, and forecasts subsequent peril for each person who becomes a victim of the *crime*. On a global scale, *identity theft* portends financial mayhem the magnitude of which can subvert international economies. The crime has metastasized. The response to it must be acted on worldwide. Measures to mitigate *identity theft* span educational and technical solutions. The results of which have been mixed. In part this is due to the fact that *fraudsters* or *identity thieves are* resourceful, determined and creative. They assess weaknesses, study possibilities, explore methods of attack, and are more than willing to commit the time that is required to engage in *fraud*. In the majority of scams, they have a great deal to gain and virtually nothing to lose. *Identity thieves* benefit from vulnerabilities at many levels. They conduct *phishing* which involves the fraudulent collection of information through the abuse of email; phone scams, remove personal documents from an individual's mailbox, engage in *dumpster diving* or sifting through trash to acquire personal information (PI); steal credit card numbers to make illegal purchases; sell and trade stolen PI; get medical treatment by exploiting illegally obtained *identities*; and perpetrate felonies in the name of the victim to list only a few of their illicit activities. [1 2 3 4 5 6] Data compiled by the Anti-Phishing Working Group (APWG) and included in Tables I through IV shows that the greatest number of *phishing* sites in 2015 were hosted in the United States. [7 8] It is a continuation of the significant and ongoing risk in this country of falling victim

to Internet based *fraud*. Information that reflects this trend is available from the APWG and appears in the Organization's quarterly reports for 2014. For example, between the 1st and 4th Quarters of 2014 the United States ranked highest with respect to countries that hosted the greatest number of *phishing* sites. Information that follows represents averages for each of the four month periods contained in the 2014 quarterly reports with the United States far exceeding any other country: Q1 47.60%; Q2 39.88%; Q3 35.96%; and Q4 46.91%. While candidates for the second position change, related statistics for the remaining nations listed in the reports pale in comparison with that of the level of *fraud* perpetrated in the United States. Statistics reflect an increase of 11.61% in *phishing* sites hosted in the United States from 2014 to 2015. [9 10 11 12] Identity theft is increasing at an alarming speed. Methods to contain and prevent it must be addressed. Multiple strategies are required to reduce the offense. Material posted on government websites such as the Federal Trade Commission substantiates cause for concern. [13] Social and technical options are under review to help to thwart *identity theft*. [14 15 16] The objective of this study is to consider and enhance educational strategies to provide individuals with information about *identity theft*. Topics that are examined in this research include individuals' erroneous conceptions prior to becoming a victim; mistaken beliefs of the outcomes that can result after becoming a victim; and associated jargon. Long standing educational directions focus on presenting informational materials through text-based methods. Frequently, these strategies expect the reader to remain focused over an extended period of time in order to absorb a significant amount of written content. The direction of this project is different with the emphasis being to engage participants via active learning through game play. The position suggested in this study is to attract students and, once done, hold their attention through the learning process. [17 18 19]

Students in college, the target population of this study, have a tendency to be trusting, open and unaware on the potential for long-term significant consequences that may result from their actions. Due to their lack of knowledge, college students can be exploited by *identity thieves*. Their future earning path and growing ability to gain subsequent credit provides a lucrative resource for *crooks*. Ill-gotten *identities* acquired by *thieves* over time and held in "escrow" can result in future havoc for

the unsuspecting victims when they are used to perpetrate crimes. The resources needed to restore a fraudulently used stolen *identity* such as time and funds can be extensive.

Social and ethical implications are substantive. At the individual level the effect of a stolen *identity* can be tragic. The victim is defiled and then pursued by the associated aftermath of transgressions perpetrated in her/his name by the *identity thief*. Steps taken by the victim to overcome the multitude of issues that can result from a stolen *identity* demand substantial time, perseverance and are never completely put to rest since the prospect of another *identity theft* related incident persists. At the societal level, trust is negatively impacted. The adverse fallout can promote and exacerbate unsustainable commerce and destabilize economies. Unreliable employment and undependable income can affect the greater population. Additionally, as is the case with other illegal activities, the total losses sustained must be addressed. Across industries where *identity theft* can be exploited to gain access to a victim's resources, providers are forced to increase the cost of their goods and services in order to make up for the losses due to fraud. For example, in businesses such as healthcare, real estate, and retail sales extra fees and charges are necessary and, in turn, passed on to the customer in order to cover the related losses due to the activities of *fraudsters*. In the end, regardless of whether an individual becomes a victim of *identity theft*, she/he is required to pay more, because of the illegal acts of *identity thieves*. The obligation to address *identity theft* in order to help prepare students is evident. This work examines multiple educational strategies and their efficacy to educate college students of the significant harm and risk that exists with respect to becoming a victim of *identity theft*.

2. HEADING OBJECTIVE

The objective of this study is to consider the effectiveness in college students of text-based learning in comparison to game-based learning about *identity theft*. Research participants must be 18 years of age or older. Many text-based informative resources about the *crime* are readily available as online material and as printed media. Regrettably, access to available resource materials has not lessened the growth of

identity theft. Cases exist through the population and are not confined to individuals from a specific demographic such as socio-economic group, age or gender. College students serve as a substantial pool of prized resources for *identity thieves* due to the fact that their *identities* generally increase over time. The *fraudster* may retain a victim's *identity* data for a significant period, perhaps years. In the future, once the victim's earning capacity has increased, the thief may use the *identity* or perhaps sell or trade it. As a consequence, the unsuspecting victim may learn that her/his *identity* was stolen long after the compromise. It becomes clear only when she/he is unable to acquire credit, get a prescription filled, access medical services, or finds that an outstanding arrest warrant exists for an illegal act that the individual did not commit. [20 21 22] This research considers two different educational strategies to educate college students with respect to *identity theft*. Three focus areas include the individuals' misconceptions prior to becoming a victim; the deficit in understanding of the effects after an attack; and the related jargon. Fight Identity Theft (FIT) software, expressly written for this research, includes two distinct educational paths. One is a traditional text-based direction that is much like material found on websites or in informational flyers. The other method is a game-based approach that supplies information through a variety of media sources such as question and answer, audio, puzzles and video. A participant scores points for correct answers as she/he moves through the game. Results recorded from surveys, one before and one after either of the two educational modules, determine the individual's knowledge of the three areas being assessed in this study. Additionally, user feedback regarding the participant's experience with respect to FIT is collected and examined. The three feedback areas include level of benefit, level of enjoyment and open response.

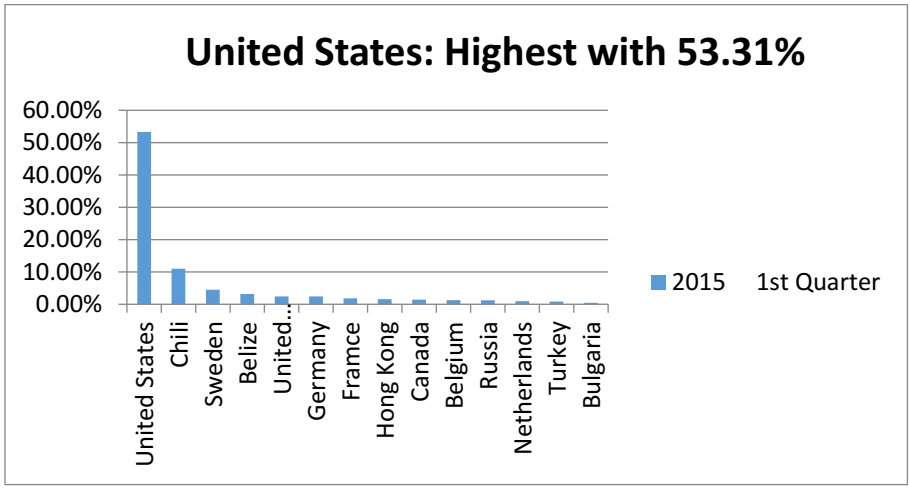


Table I. Countries Hosting Phishing Sites – Q1 2015

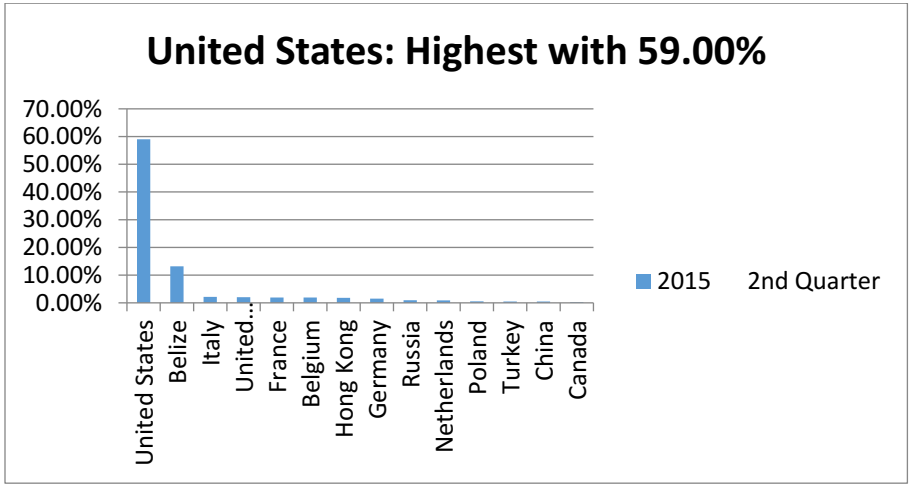


Table II. Countries Hosting Phishing Sites – Q2 2015

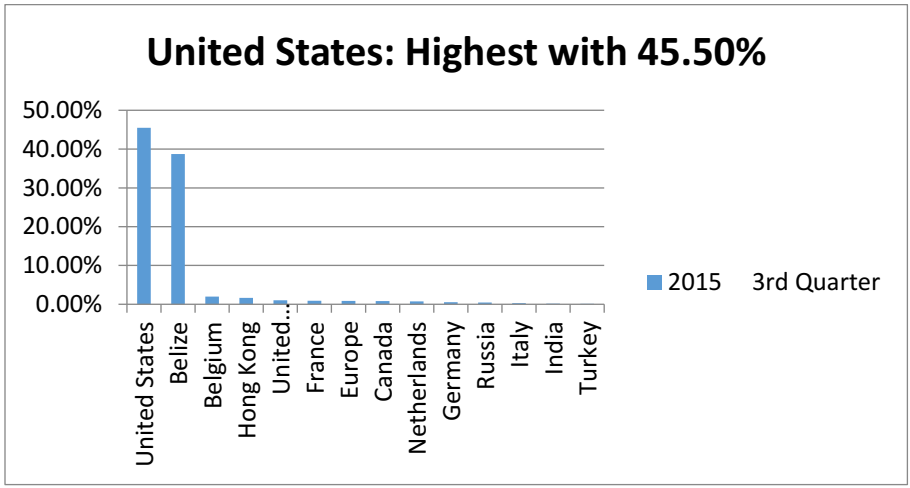


Table III. Countries Hosting Phishing Sites – Q3 2015

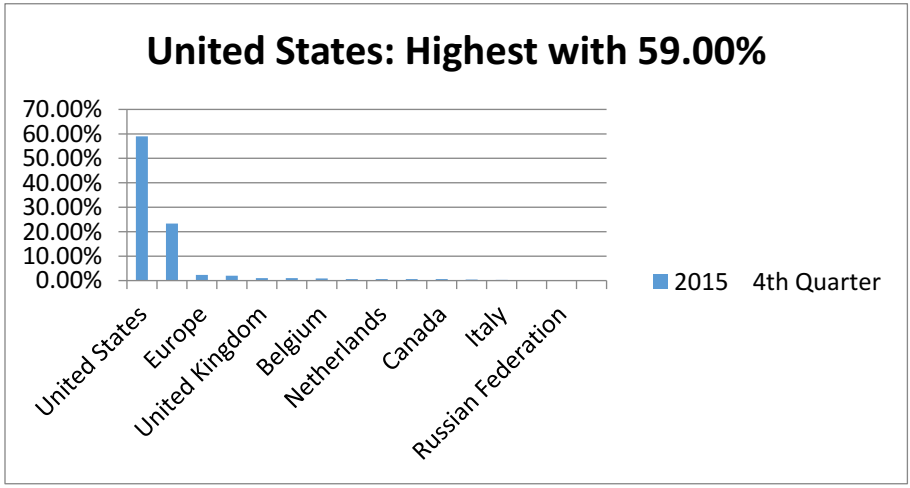


Table IV. Countries Hosting Phishing Sites – Q4 2015

3. METHODOLOGY

The pedagogical strategies in this research center on two distinct learning methods, text-based and game-based, with a focus on *identity theft*. The established text-based strategy offers an individual a set of topics to examine by reading written material. Related information is provided in paragraphs of text and is similar to web-based resources. The alternative game-based strategy presents the individual with an interactive learning opportunity that includes questions and answer, audio, puzzles, and videos. Educational materials are represented in several ways as the individual steps through the game and attempts to improve her/his score.

Because the research includes human subjects, the Institutional Review Board (IRB) evaluated the project to assess if Federal policies were in place. This study has the sanction of the IRB. Related documentation that concerns this research is accessible for examination at the Office of the IRB at the host institution.

Approximately 250 participants are included in this research. To determine the effectiveness of the two educational directions surveys, one before and one after either educational module, are administered and the responses are collected. Participants are randomly chosen for one of the two learning tracks. Statistical methods and assessment is used to examine the data.

4. SOFTWARE AND TECHNOLOGY

FIT (Fig. 1 a-b) is a software application that was written in MATLAB for this research and executes on computers running Microsoft Windows operating systems. A coin toss early in the FIT program execution determines the educational method that each participant will receive. Once established, the learning track remains set through the program run. Principal components collected in FIT comprise demographic data (age, gender, level of education, major, and self-assessment of technology savvy); two sets of survey results, one before and one after review of informational resources that target the three topic areas under consideration (prior erroneous conceptions; mistaken beliefs regarding outcomes; and associated jargon); and the individual's feedback responses with respect to her/his experience with the

application. Additionally, FIT gathers and records the length of time the individual has access to information about *identity theft* for every text-based and game-based educational resource in the nine areas of the study (finance, health, entertainment, work, home, education, shopping, home, and mobile communication). Six focus areas are examined in every one of the nine educational paths of investigation for both delivery methods. In the text-based track, written information about *identity theft* is contained on panels or screens. An individual may select any panel multiple times and return to it repeatedly to examine resources before exiting the educational module of FIT. The time a participant opts to remain on each text-based panel is collected. If an individual returns to a text-based panel to spend additional time to review material, the length of time for each successive visit is combined with the previously recorded sum. The game-based direction presents interactive learning opportunities that host a variety of media formats and include questions and answer, audio and video segments and puzzles. Six questions make up the question pool for each of the nine study areas. Graphical buttons on the game board allow the user to choose an area to investigate through play. Questions are chosen at random from the constituent nine question pools. A question is displayed a single time with its associated educational material, such as an audio file. The participant can click on the audio activation button numerous times to listen to the resource repeatedly before making a choice to respond to the question. Correct answers earn points. Scores are recorded. A variety of sounds are generated such as cheering crowds and bells. The time a participant opts to remain on each game-based panel is collected. Additionally, FIT archives questions and their respective responses in the game-based learning module.

Fig. 1.a FIT Game Board Screen

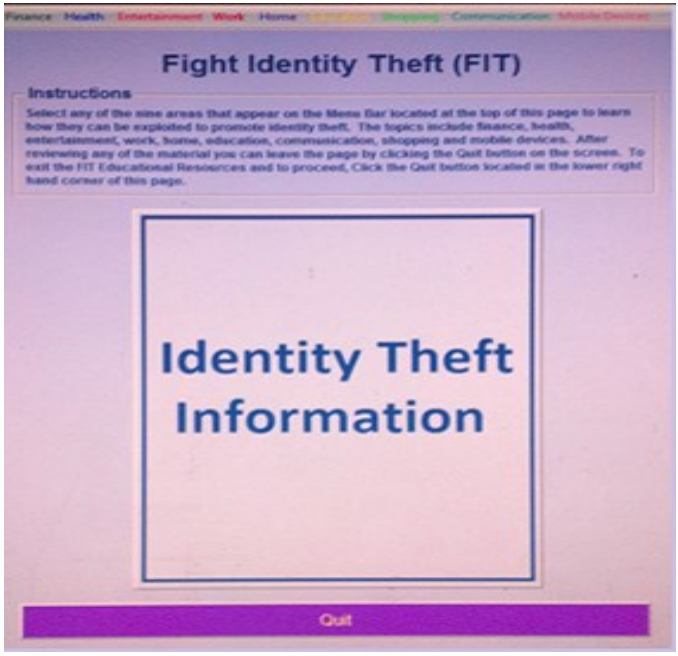


Fig. 1.b FIT Text Selection Screen

5. RESULTS

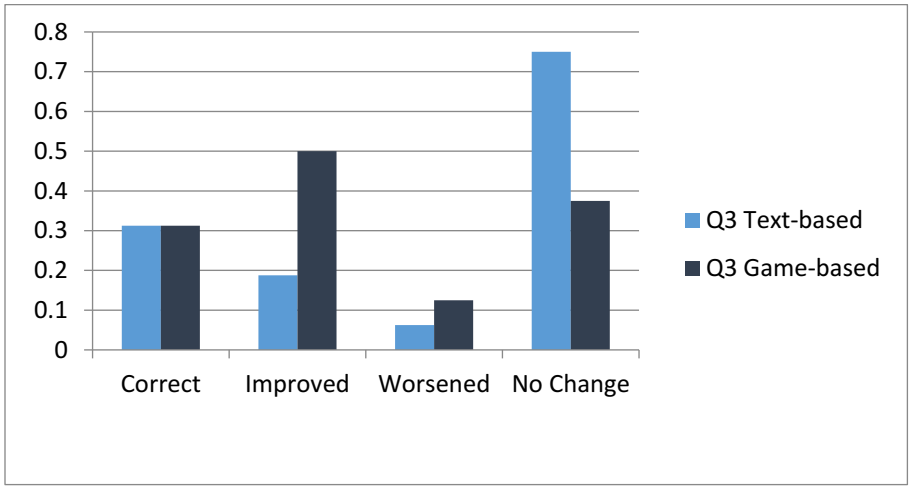
Table V, Table VI and Table VII represent graphs that compare results from Survey I and Survey II for three of the nine questions examined in the study: Question III, Question V and Question VII, respectively. Column labels from left to right are Correct, Improved, Worsened and No Change. The Correct column shows the relative percent of initial correct responses recorded for the question on Survey I for the two different educational methods. The Improved column shows the relative percent of improvement recorded from Survey I to Survey II for the question for the two different educational methods. In this study improved is defined in one of two ways. In the first case, the participant selected an incorrect response on Survey I and chose the correct response on Survey II. In the second case, the participant selected an incorrect response on Survey I and chose a "better" response on Survey II. For example, in case two suppose the correct response is "False" and the participant selected "True" and "I Don't Know" on Survey I and Survey II, respectively. The movement in the correct direction is counted as improvement. The Worsened column shows the relative percent of worsening recorded from Survey I to Survey II for the question for the two different educational methods. In this study worsened is defined in one of two ways. In the first case, the participant selected the correct response on Survey I and chose an incorrect response on Survey II. In the second case, the participant selected an incorrect response on Survey I and chose a "worse" response on Survey II. For example, in case two suppose the correct response is "False" and the participant selected "I Don't Know" and "True" on Survey I and Survey II, respectively. The movement in the incorrect direction is counted as worsening. The No Change column shows the relative percent of no change recorded from Survey I to Survey II for the question for the two different methods.

Table V. Question III Results data reveals that the number of Correct responses on Survey I, prior to exposure to the educational modules, were similar for participants who received the text-based learning method and game-based learning method. Results show that the number of Improved responses were significantly different and favored the game-based learning method over the text-based approach.

Research indicates that the number of Worsened responses slightly favored the text-based learning method over the game-based learning strategy. Finally, the study reveals that the number of No Change responses is substantially greater for the text-based learning method in comparison to the game-based learning approach.

Table VI. Question V Results data reveals that the number of Correct responses on Survey I, prior to exposure to the educational modules, were similar for participants who received the text-based learning method and game-based learning method. Results show that the number of Improved responses were significantly different and favored the game-based learning method over the text-based approach. Research indicates that the number of Worsened responses were similar for the text-based learning method and the game-based learning strategy. Finally, the study reveals that the number of No Change responses is substantially greater for the text-based learning method in comparison to the game-based learning approach.

Table VII. Question VII Results data reveals that the number of Correct responses on Survey I, prior to exposure to the educational modules, were similar for participants who received the text-based learning method and game-based learning method. Results show that the number of Improved responses were significantly different and favored the game-based learning method over the text-based approach. Research indicates that the number of Worsened responses slightly favored the text-based learning method over the game-based learning strategy. Finally, the study reveals that the number of No Change responses to be substantially greater for the text-based learning method in comparison to the game-based learning approach.



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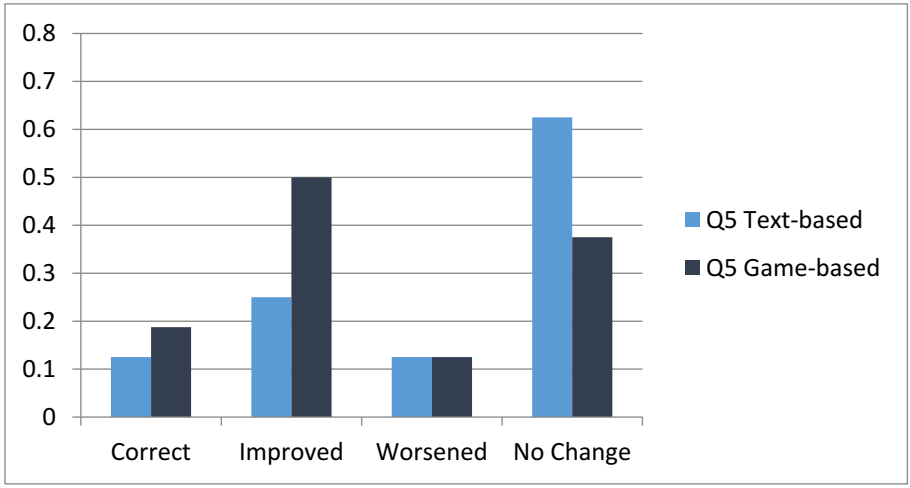

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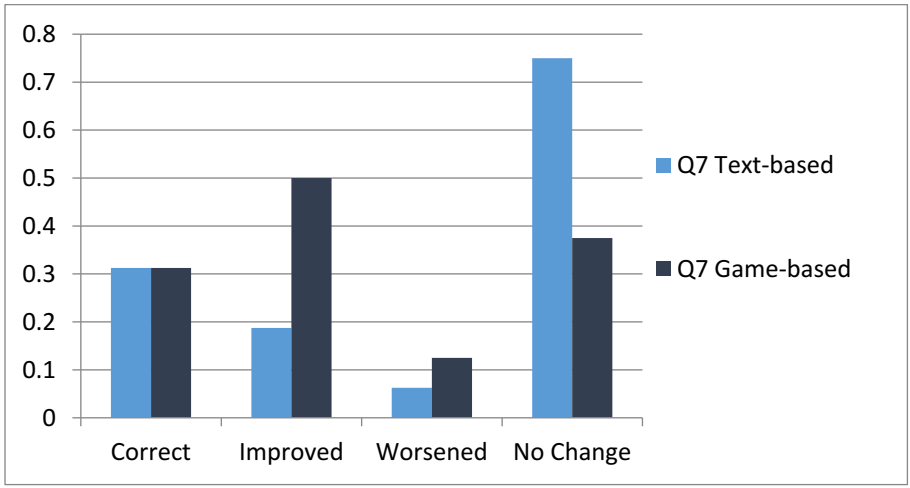

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6. CONCLUSION

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