Assessment of implementing a Digital Game-based Learning system over Facebook

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Abstract—In this study, we implemented a digital game-based learning (DGBL) system over Facebook platform. For better understanding the impact of DGBL applied to social networking, the technology acceptance model (TAM) was employed for the evaluation. Results of this study showed that the DGBL incorporated into a social network is a feasible and sound model for teaching. This study investigated the potential important design issues of the application over a social network. It is believed that this study could bring teachers a better understanding how those characteristics of social networks can attribute to the success of users' learning.

Keywords: Facebook, Digital Game-based Learning(DGBL), Social Networking, Technology Acceptance Model(TAM)

I. INTRODUCTION

Over last two decades, digital game-based learning (DGBL) has accomplished a wealth of research and teaching in widespread applications. DGBL can not only elicit learners' motivation for learning, reduce learning frustration, and immerse into learning environment but also refine knowledge and concepts to be learned. Thus, DGBL can be both joyful and instructional at the same time, and achieve the purpose of entertaining and educational functions. In recent years, with the trend of fast popular social networks like Facebook, MySpace and other social networking sites, some studies have shown that social community site provides the tools to support learning activities by interaction, cooperation, active participation, and the possibility of sharing resources and critical thinking[1-3].

In this study, the learning subject of database normal form (NF), a IT department's core course, is adopted for the experiment. We tried to convert the learning subject into a highly interactive game of digital learning content in the Facebook platform. Through the platform, learners and peers can easily access it by taking advantages of the social networking site characteristics, even achieve enjoyable and sustainable learning after school.

II. RELATED WORK

Social network is an informal learning environment, where users are mostly students. Therefore, social network can provide users sort of outside-classroom extension of interaction and learning with peers, playing a significant influence on learning in a informal manner. [3]. Yet, the rapid popularity of Facebook, MySpace, Twitter, YouTube, and other social network sites, stemming from sharing photos, personal information, videos and other contents, now become ever easy to use to share experience of daily life, even do it in real-time. With those functions provided, its potential to establish spontaneous relationship and further support the interactive learning activities and communication so as to promote the realization of the aims of education becomes very promising. [1]. Thus, adopting the features of social network to attract learners to immerse learning imperceptibly, making the learning process more effective and successful, providing more opportunities to acquire new knowledge for learners who could enjoy in learning through the context provided by an interactive learning content. [4].

There are a number of researches conducted to a large-scale measurement study of the usage characteristics of social network based applications [5]. In addition, previous studies have pointed out that the game through social network interaction can effectively enhance the learning motivation and learning concentration [6]. Thus, it is a fair bet that the DGBL over social network sites is a feasible and valuable model of learning.

III. RESEARCH METHOD

A. Implement the Game in Facebook

In Facebook platform, we built an App. server using the Flash, PHP, and MySQL, serving as data access, server communication, and exercise of social tools, then used the Facebook Markup Language (FBML) as the script language transport users’ information to Facebook platform and App. server. In this architecture, system operation is divided into six stages, as shown in Figure 1.

1. Web Browser requests send to Facebook server.
2. Facebook server requests send to App. server.
3. App Server API requests return to Facebook server.
4. Facebook server result returns to App. server.

Figure 1. System architecture.
5. App server made FBML to Facebook server.
6. Facebook sends FBML to Web Browser.

The game was designed based on Garris et al. [7] who proposed Input-Process-Outcome Game Model as shown in Figure 2. Figure 3 shows the game interface. Users could drag a candy from left column to right one, and map to correct position. And then a game message will hint user to do the right choice for understanding the meaning of 2NF.

B. Learning Objectives and Activity Design

The learning subject is the curriculum of database NF, and the game’s content was designed based on concept of NF, and the whole system was implemented in Facebook platform. Learners play in the game must classify candies, prices, discounts and roles. In the game activities, the embedded concept implicitly helps learners achieve the learning objectives in learning process.

C. Technology Acceptance Model

In the study, for better understanding the impact of game applied in social networking, we used TAM as the assessing tool, by that, learners were asked to fill out a questionnaire which elicited information concerning his perceived usefulness (PU), perceived ease of use (PEU), Content Quality (CQ), Perceived Enjoyment (PE) and Social Interaction (SI). The questionnaire was designed based on previous studies with a total of 24 items. This questionnaire is tested by using Cronbach's $\alpha$ and the 5 dimensions ranging from 0.692 to 0.915. Total Cronbach's $\alpha$ is 0.957, demonstrating a high reliability.

IV. DATA ANALYSES AND RESULTS

Data were collected primarily by means of questionnaire, and six classes participant were from an Institute of Technology in central Taiwan. Totally, 134 effective questionnaires were obtained. Pearson's correlation test is used to analyze the questionnaire. The result of the 3 dimensions of correlation coefficient was between 0.591 and 0.753, which shows significant positively correlation. Subsequently, further analysis by using regression analysis for testing was conducted and the result is presented in Table I.

The obtained adjusted $R^2$ is as large as 0.632, which suggests that the relationship between CQ, PE, SI and PU is strong. Similarly, adjusted $R^2$ are 0.414, 0.450 is moderately strong between PEU with other dimensions. The results show a striking effect in this study, where DGBL applied in social network was generally well accepted by learners. In Table I, each dimension has shown the positive correlation with each other and the consistence with research hypothesis, unsurprisingly in line with previous studies.

<table>
<thead>
<tr>
<th>DV</th>
<th>IV</th>
<th>CC</th>
<th>Beta</th>
<th>Adjusted $R^2$</th>
<th>t-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>PU</td>
<td>CQ</td>
<td>.590**</td>
<td>0.140</td>
<td>0.632</td>
<td>2.045*</td>
</tr>
<tr>
<td></td>
<td>PE</td>
<td>.722**</td>
<td>0.329</td>
<td></td>
<td>4.123***</td>
</tr>
<tr>
<td></td>
<td>SI</td>
<td>.753**</td>
<td>0.425</td>
<td></td>
<td>5.135***</td>
</tr>
<tr>
<td>PEU</td>
<td>CQ</td>
<td>.545**</td>
<td>0.247</td>
<td>0.414</td>
<td>2.859**</td>
</tr>
<tr>
<td></td>
<td>PE</td>
<td>.573**</td>
<td>0.236</td>
<td></td>
<td>2.345*</td>
</tr>
<tr>
<td></td>
<td>SI</td>
<td>.591**</td>
<td>0.265</td>
<td></td>
<td>2.537*</td>
</tr>
<tr>
<td>PU</td>
<td>PEU</td>
<td>.674**</td>
<td>0.674</td>
<td>0.450</td>
<td>10.489***</td>
</tr>
</tbody>
</table>

* $p<0.05$, ** $p<0.01$, *** $p<0.001$

DV: Dependent Variable, IV: Independent variable, CC: Correlation Coefficient.

V. DISCUSSIONS

In light of outcome, four of these findings are worth summarized. (1) Most learners hold positive willingness and perspective to use game embedded in social networking. (2) Enjoyment seems a key factor considered by learners. (3) How to help learners achieve effective learning is one of the important factors which could affect the students whether to use the system. (4) Most believe that the game in social network can fuse education in amusement.

In short, the findings in the study are likely to provide evidence that embedding game in social networks is promising and effective, worthy to be explored in the future.

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