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AN EXPLORATIVE STUDY OF VIRTUAL TRADING GAMES: A MEANS-END CHAIN APPROACH

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ABSTRACT

In order to help students acquire relevant knowledge on various financial investments in this rapidly changing environment of the global economy, it is crucial for educators to identify game elements that will attract students and keep them focused on learning. In this research, Digital Game-Based Learning and Means-end Chains have been chosen as the theoretical basis for the study, with ladder interview and content analysis as the tools of analysis to discuss the structure of the "game attribute-learning consequence – terminal value" chain of virtual trading games from the perspective of students. Results of the study revealed that through game attributes such as Diverse investment tools, Virtual chips, Team work, and Virtual platform, students were able to benefit from learning consequences including Practice for financial planning, Accumulation of investment experience, Reduction of error rate, Enhancement of team learning, Increased practical experience, Reduction of pressure and accountability and pursue terminal values such as Sense of achievement, Fun and enjoyment of life, Warm interpersonal relationships, Sense of security. Hopefully these findings will help educators to better understand students' value perception structure in digital education gaming in order to develop new teaching solutions, and game developers to design innovative game attributes.

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KEYWORDS: Digital Game-Based Learning, Means-end Chain Theory, Virtual Trading

INTRODUCTION

With the massive influx of innovative teaching technologies entering the classroom, teachers no longer play the dominant role in teaching/learning activities but instead assume diversified roles in these processes (Loveless, Devoogd, & Bohlin, 2001). Numerous studies conducted in the past have also pointed out that in an effort to boost students' interests in learning, teachers have attempted to blend games into their lessons so as to allow students to learn and acquire knowledge through gaming (Coller & Scott, 2009; Papastergiou, 2009; Robertson & Howells, 2008). During the process of Digital Game-Based Learning (DGBL), students will be able to simulate scenarios of reality in the game and thereby develop various advanced skills (Lin & Lin, 2014; Lin & Tu, 2012). DGBL not only offers ideal learning results but also encourages students to be proactive in their learning. In order to help students acquire relevant knowledge on various financial investments in this rapidly changing environment of the global economy, it is crucial for educators to identify game elements that will attract students and keep them focused on learning.

In order to create opportunities for students to get hands-on practice for online trading, colleges and universities in Taiwan have constructed learning systems that offer realistic simulation of actual financial trading environments. Virtual trading is also known by other terms including "Internet-Based Virtual Stock Markets", "Prediction Markets" or "Information Markets" (Servan-Schreiber, Wolfers, Pennock, & Galebach, 2004). Virtual trading has already been extensively deployed in teaching and research relating to finance and has provided adequate knowledge and experience for learners (Wu, Tseng, Chan, Huang,

Chu, & Chen, 2012). Past research has focused on the effects of using real and virtual currencies in virtual trading (Rosenbloom & Notz, 2006; Servan-Schreiber et al., 2004) while others have suggested that learners would be able to build their knowledge in a risk-free, simulated environment that is highly realistic (Hartley, 2006). PC simulation learning not only allows learners to engage in experiential online learning but serves as the most vital and essential component of digital learning/teaching software (Boehle, 2005). Nonetheless, few studies in the past have touched on the derivation of various learning consequences from their corresponding virtual trading game attributes or identified the values that each learning consequence had to offer learners.

Through the behavioral analysis of DGBL, results revealed that students in fact had a crucial impact on learning behavior and learning results. The needs of students inevitably have a foundation for development, which goes to highlight the value of DGBL for specific learning processes. In order to determine the terminal values that students seek from DGBL, the research has chosen Means-end Chains (MECs) as its theoretical framework coupled with Laddering as the tool for in-depth interviews, which were designed to reveal the structure of students' "game attribute – learning consequence – terminal values" chain for virtual trading. Hopefully, the results of the study will serve as a useful reference for digital educational game developers for innovative product development and marketing strategy formulation. As for educators, the findings of this research should also help them to identify suitable teaching principles and key points of instruction for digital game-based learning.

The paper is organized as follows. Section 1 briefs the motivation and purpose of the research. Section 2 reviews related literatures and studies about DGBL and the MEC theory. Section 3 structuralizes our research methodology consisting of research framework, the subjects participating, the method of data collection, and the analysis methodology. Section 4 summarizes and discusses the empirical results. Finally, Section 5 contains our concluding remarks and implication of the study.

LITERATURE REVIEW

Prensky (2003) believes that compared to the regular curriculum offered by schools, teenage students devote more focus on playing digital games than on their school work. The use of games for the presentation of course content can trigger students' motivation to learn and inspire them to grow independently while gaming. Past studies found that through the use of simple games for learning, teachers were able to raise students' learning motivation and output (Papastergiou, 2009; Virvou, Katsionis, & Manos, 2005). In fact, students were not only more inclined to focus on the subject matter but would actually take the initiative to engage in game-based learning (Ebner & Holzinger, 2007). A number of existing research papers have proven the positive effect that game-based learning has on education (Kirriemuir & McFarlane, 2004; Squire, 2005).

Following the rapid development and advancement of information technology, technological media have witnessed extensive application and gradual recognition in education. DGBL has achieved close cohesion between PC gaming and educational contents (Prensky, 2007) and in addition to becoming more popular in the fields of educational technology (Becker, 2007), it has emerged as a new model for digital learning (Aldrich, 2004; Squire, 2005). And as such, the feature of edutainment that DGBL provides enables students to discover a means of learning that is far more interesting than what they get from conventional textbooks (Embi & Hussain, 2005). Many previous studies have already pointed out that through the processing of playing digital games, students are able to develop many new cognitive abilities (Gee, 2003). Adopting DGBL as a teaching strategy will not only help students to boost their interest in learning, encourage them to be proactive in learning, create individualized opportunities for learning and experience transfers, will but also create a social learning network amongst students (Hsiao, 2007; Oblinger, 2004). On top of that, DGBL also offers concrete improvement of students' capacity for creative thinking, logical deduction,

critical thinking (McFarlane, Sparrowhawk, & Heald, 2002), reading ability, problem solving ability and strategic planning capabilities (Jenkins, 2002).

The means-end chains theory is proposed by Gutman (1982) and the theory was formulated in an effort to better understand customers' motivation at a deeper level. Through qualitative, in-depth interviews, one would be able to understand how consumers expect to arrive at their desired outcomes through specific products/service attributes, and the chains of the consequences would in turn be used to account for consumer behavior (Olson & Reynolds, 2001). Peter and Olson (2009) pointed out that when consumers choose to buy a product, it is not because the product has attracted the consumers but rather because the consumers believe that the product would help them achieve their desired goal or satisfy their needs. In other words, consumers buy products because they believe specific attributes of their chosen products would allow them to arrive at specific values they anticipate in their minds (Reynolds & Gutman, 1984).
MECs can be broken down into three tiers of primary elements, namely Attributes, Consequences and Values (Olson & Reynolds, 1983). "Attributes" refer to the characteristics or features that consumers take into account while selecting products/services (Olson & Reynolds, 2001). Attributes can be divided into "Concrete Attributes" that are tangible or "Abstract Attributes" that are intangible (Peter & Olson, 2009). "Consequences" refer to more specific experiences/results that consumers expect from specific traits/characteristics of a product (Olson & Reynolds, 2001). Consequences can be divided into "Functional Consequences" that offer more concrete or direct experience to users or "Physiological Consequences" that generally refer to the more abstract psychological perceptions that users may have (Valette-Florence & Rapacchi, 1991). "Values" are important goals and targets that consumers strive to achieve through specific consequences they generate from particular attributes and can be separated into "Instrumental Values" and "Terminal Values" (Miele & Parisi, 2003).

DATA AND METHODLOLGY

Laddering is the most commonly adopted approach to the construction of MECs theories (Gutman & Miaoulis, 2003). Featuring one-on-one in-depth interviews, laddering involves "Direct Elicitation" that gradually unveils how users take advantage of attributes of a specific product in order to pursue their desired consequences/benefits and terminal values (Peter & Olson, 2009). A number of open-ended questions (as shown in Table 1) were posed to the learners to gather their responses. After the data had been collected, it was processed through the quantification technique of Content Analysis (Franzosi, 2008). After the data had been organized and sorted, the study used an Implication Matrix to record the chain correlations between different elements in quantifiable methods in order to summarize the tiers of various values constructed by the respondents (Reynolds & Gutman, 1988).

Table 1: Outline of the Interview Questions

Procedures	Semi-structured Questions
Laddering	1. What attributes or characteristics of virtual trading games appeal to you?
	2. Why do(es) the attribute(s)/characteristic(s)matter to you?
	3. What benefits or learning consequences does it offer?
	4. What personal values do you derive from the advantage/learning consequence?

This table shows the interview questions. Based on ladder structuring, the above open-ended questions were posed to the respondents in the above order.

Jones (2003) pointed out that 70% of the undergraduate student samples played PC games and 65% of those students were gamers. Considering Reynolds, Dethloff and Westberg (2001) proposal that samples of laddering interview should not be less than 20, the study has therefore adopted the approach of Purposive Sampling to select 50 users of virtual trading game platforms currently enrolled at different universities in Taiwan for in-depth interviews during the spring of 2013. Among the 50 respondents, 16 were male (32%) and the remaining 34 were female (68%); 33 of them were from national universities (66%) and the

remaining 17 were enrolled in private universities (34%); 35 of them major in Business and Management (70%) and the remaining 15 major in Finance (30%). On a related note, 23 (46%) of the respondents had previous experience in virtual trading competitions and the other 27 (54%) had no prior experience; 24 (45%) of them had no more than 1 month of playing experience while the other 26 (52%) had more than 1 month of experience with virtual trading games (as shown in Table 2).

Table 2: Demographics of Participants

Measure	Frequency	%	Measure	Frequency	%
Gender			Major		
Male	16	32	Business & Management	35	70
Female	34	68	Finance	15	30
Age(19-23)	50	100	Playing Experience		
Education(Undergraduate)	50	100	Below 1 month	24	48
University			More than 1 month	26	52
National	33	66	Competition Experience		
Private	17	34	Has	23	46
			Has not	27	54

This table shows the demographics of participants. The 2nd &5the columns report the number of different measures.

RESULTS

The study identified a total of 33 variables. It comprised ten (concrete and abstract) attributes representing the characteristics of the virtual trading games, fourteen (functional and psychological) consequences and nine values (as shown in Table 3). In addition, the 50 respondents constructed a total of 126 value ladders and 362 chains (as shown in Appendix A).

Table 3: Identification Classification of the Attributes, Consequences and Values

Attributes	**Consequences**	**Values**
Concrete attributes	**Functional Consequences**	**Instrumental Values**
-Diverse investment tools (A1)	- Obtain information on current affairs (C3)	- Sense of security (V1)
- Virtual chips (A2)	- Increase practical experience (C6)	- Fun and enjoyment of life (V5)
- Offers information (A5)	- Facilitate independent learning (C9)	- Excitement (V7)
- Digital learning function (A6)	- Reduce pressure and accountability (C10)	
- Team competition (A10)	-Help with decision-making (C11)	
	- Enhance learning motivation (13)	
	- Train logical thinking (C14)	
Abstract attributes	Psychosocial Consequences	Terminal Values
- Mirrors the reality (A3)	- Practice for financial planning (C1)	- Sense of accomplishment (V2)
- Team work (A4)	- Accumulate investment experience (C2)	- Self-fulfillment (V3)
- Virtual platform (A7)	- Reduce error rate (C4)	- Well-respected (V4)
- Practice for operation(A8)	- Enhance team learning (C5)	- Warm interpersonal relationships (V6)
- Educational (A9)	- Integrate professional knowledge (C7)	- Sense of belonging (V8)
	- Facilitate positive competition (C8)	- Self-respect (V9)
	- Diversion of investment risks (C12)	

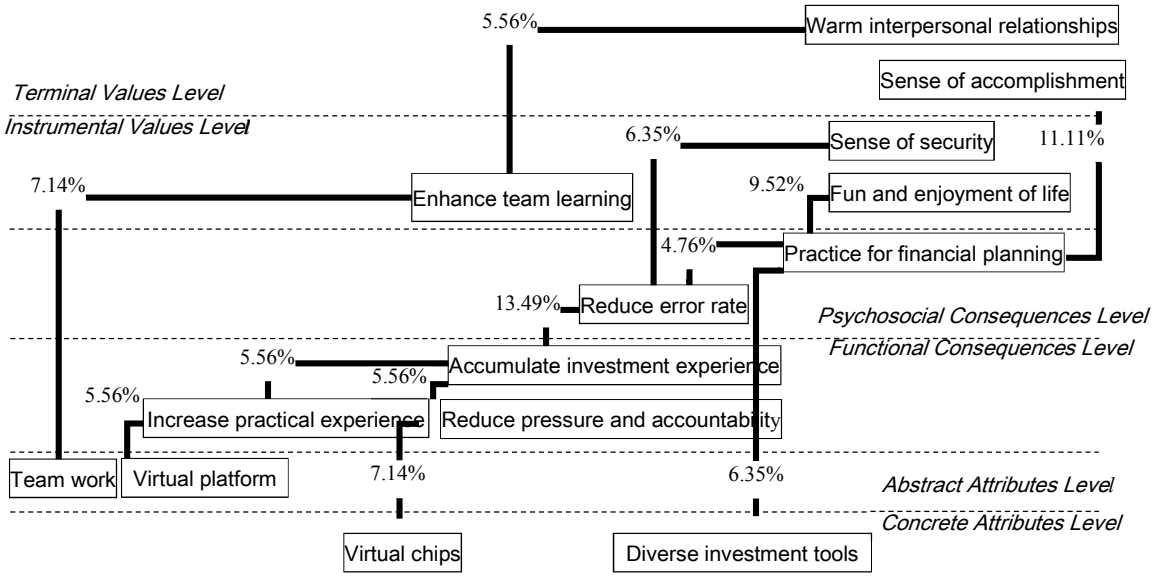
This table shows the identification classification in this study. There are 10 attributes, 14 consequences and 9 values. Attributes can be divided into “Concrete Attributes” or “Abstract Attributes”. Consequences can be divided into “Functional Consequences” or “Physiological Consequences”. Values can be s divided into “Instrumental Values” or “Terminal Values”.

Figure 1 shows the important linkage paths of students playing virtual trading games. The following explains the major four paths respectively.

Diverse investment tools → Practice for financial planning → Sense of achievement : Virtual trading games feature a number of investment tools (such as securities, bonds, futures). Through virtual trading, students were able to use diverse investment tools and choose specific investment tools to obtain practice for

financial planning. In the process of practice, students could pick up many skills and techniques for financial management and derive a Sense of achievement from the experience.

Figure 1: Hierarchical Value Map of Virtual Trading Gamers



This Figure shows the HVM of the gamers. Four major routes were identified from the HVM. (1)Diverse investment tools → Practice for financial planning →Sense of achievement (2)Team work→ Enhance team learning→ Warm interpersonal relationship (3)Virtual chips→ Reduce pressure and accountability → Accumulate investment experience→ Reduce error rate→ Sense of security (4)Virtual platform→ Increase practical experience→ Accumulate investment experience→ Reduce error rate→ Practice for financial planning→ Fun and enjoyment of life The 50 respondents constructed a total of 126 value ladders. Percentages of links were depicted.

The reason why digital games are able to catch people's attention lies in their diverse features (such as continual challenge and victory) that were able to trigger gamers' intrinsic motivations and in turn evolve into a Sense of achievement (McGrenere, 1996). With Diverse investment tools, virtual trading in a volatile environment can generate an infinite number of investment combinations and possibilities. In order for students to effectively engage in Practice for financial planning, the study suggests game developers to design different game units for different investment tools and state the characteristics of various investment tools in corresponding units to enhance students' capacity and knowledge on the application of the featured investment tool.

Team work → Enhance team learning → Warm interpersonal relationship: Team work is a vital element of virtual trading. Through group discussions, students would be able to determine their investment target and directions. And by engaging in virtual trading in a team, students would not only be able to facilitate the flow and transfer of knowledge, but also Enhance team learning. By participating in multiple sessions of effective communication and immersed in an ideal atmosphere for learning, students will be able to benefit from the terminal value of Warm interpersonal relationships.

Lin and Tu (2012) pointed out that Team work not only facilitates diverse thinking for students but also has a significant influence on emotional exchange for students. The study by Bhatt (2004) also indicates that a connection system that incorporates network technologies would create a higher degree of social interaction. And as such, the study suggests game developers to design a Team work play format that uses internet connectivity to enable multiple students to engage in online learning simultaneously. This would not only resolve the issue of account sharing by multiple players but also allow students to form a social network of learning to enhance their learning results.

Virtual chips → Reduce pressure and accountability → Accumulate investment experience → Reduce error rate → Sense of security: A virtual trading system offers a substantial amount of Virtual chips for students to freely invest without any restriction. Students believe that since the use of Virtual chips does not involve the commitment of their personal assets in real life, they will be able to learn from virtual trading with a relaxed mindset in an environment that Reduces pressure and accountability. On top of that, students can also continually accumulate investment experience in this relaxed learning environment. Through virtual trading, students will gradually pick up the skills to Reduce error rate and ultimately arrive at the terminal value of Sense of security.

It is worth pointing out that when students use Virtual chips they might neglect modest amounts of investment or even make random investments due to the lack of pressure and accountability. This contradicts all forms of financial investments in the real world. And thus, the study recommends game developers to incorporate a system of currency conversion in their virtual trading games so that students would gain more authentic and practical experience through the conversion and exchange of currencies. This would hopefully help students to accumulate investment experiences that are more aligned to reality.
Virtual platform → Increase practical experience → Accumulate investment experience → Reduce error rate → Practice for financial planning → Fun and enjoyment of life

The strength of a virtual trading system lies in the fact that it does not involve the presence of financial institutions; students may simply use a Virtual platform to make investments. Through the process of learning to invest, students will not only be able to Increase practical experience but also learn to reduce error rate through Accumulation of investment experience. When students reach specific levels of proficiency, they will be able to start their Practice for financial planning in pursuit of their terminal value of Fun and enjoyment of life. Simulation games provide an ever-changing environment for decision making processes for students, and through repeated decision-making, students will gradually learn the skills of diagnosing and resolving conflicts and be able to effectively apply these skills in the real world (van Houten & Verbraeck, 2006). Therefore, the study suggests game developers to incorporate various potential situations and scenarios that are likely to happen in real life in their Virtual platform so that students will be able to Increase practical experience and Accumulate investment experience. By facing and overcoming different situations.

CONCLUDING COMMENTS

This research has been designed to examine the correlation between the attributes of virtual trading games, learning consequences and terminal values. With MECs theory as the theoretical framework, the study adopted the laddering technique for data collection. The participants for this study were 50 college students. The next step involved the application of content analysis for data processing. The processed data produced a total of 10 game attributes, 14 consequences and 9 values. These factors were then processed with structural implication matrix and HVM to identify the chains of all variables for analysis and comparisons. HVM can be used to explain the students' psychology in the play of virtual trading game, indirectly explain the ultimate values the gamers pursued, and also explain the process of the gamers' behavior paths.

Results of the study showed that virtual trading not only brings about effective personal learning consequences but also facilitates group learning. Through virtual trading with diverse investment tools, students were able to Obtain information on current affairs and thereby Help with decision making in order to achieve the learning consequence of Practice for financial planning. Through the motivation to achieve outstanding investment performance, students would benefit from the consequence of Facilitating independent learning and eventually arrive at the terminal values of Sense of achievement, Self-actualization and Fun and enjoyment of life. At the same time, there are multiple game attributes that will enable students to Accumulate investment experience. Through the use of Virtual chips, students can

Reduce pressure and accountability and from there Accumulate investment experience; through a Virtual platform that features Digital learning functions and Mirrors reality, students were able to Increase practical experience during the process of learning about investment and trading, and in turn Accumulate investment experience. Accumulation of investment experience not only improves students' precision in the timing of trading but also helps them to reduce error rate in subsequent investments, to ultimately deliver the terminal values of Sense of security and Self-actualization.

The study found Enhanced team learning to be a fairly important learning consequence for virtual trading games. Since most students lacked actual experience with investment, it would be unlikely for them to be able to solve investment related issues immediately when they encounter such issues. And as such, it is crucial for students to find the right channels for problem-solving. The format of Team work helps students to overcome their shortcoming of being inexperienced in investment by enabling students to engage in discussions to determine investment decisions. The process not only facilitates the exchange of investment knowledge but also brings the consequence of Enhanced team learning. Students also believe that by fostering an atmosphere of learning for the team, it would bring about the terminal value of Warm interpersonal relationships. On the other hand, Team competition could facilitate positive competition among students if their investment performance were to be integrated with their academic grades; students who do well would in turn benefit from a Sense of achievement.

Therefore, the study suggests teachers to introduce small-group competition in their instructions before encouraging students to participate in various formal competitions once they have demonstrated specific level of progress. This should enable students working with virtual trading to benefit from more positive learning consequences. However, there is the limitation in this study. The study's samples may be biased in that the study surveyed players mostly university students. Future researches may choose other groups to compare the finding. For different demographics of virtual trading gamers, it is recommended that future researches focus on the differentiation of market segments (i.e. different majors). In addition, future research might concentrate on how virtual trading games can be applied in studying various aspects of course. A quantitative follow-up study based on the results is useful.

Appendix A. Implications Matrix of Virtual Trading Gamers

	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11	C12	C13	C14	V1	V2	V3	V4	V5	V6	V7	V8	V9	Total
A1	**8**		**5**			3			**4**			2												22
A2	1	1								**9**														11
A3		3	**5**	1		**4**	1		1			1	2											18
A4					**9**																			9
A5		1	1	1							3													6
A6		**4**				**4**	2		2	2			2											16
A7	1	**5**				**7**			2	3				1										19
A8		2				2	1						2											7
A9	2	1			1	1	1		2				**4**	1										13
A10								**5**																5
C1		1		1											3	**14**	**9**	1	**12**		2			43
C2	3			**17**					1		2			1		3	**4**					1	1	33
C3		1		2							**5**	1		1		1	2							13
C4	**6**										1				**8**	3	**6**	1	**4**				1	30
C5													1					1		**7**		1		10
C6	3	**7**		**4**			3		3								1							21
C7	1							1	1		1					3	2							9
C8									1				1			**4**		1			1			8
C9	**5**		1	3									3		1	2	1	1	1					18
C10	3	**7**						1	1						2									14
C11	**5**							1							2	2	1		1					12
C12	1												1		1							1		4
C13	**4**		1	1			1									1	2	1	2		3	1		17
C14													1		1	1					1			4
Total	43	33	13	30	10	21	9	8	18	14	12	4	17	4	18	34	28	6	20	7	7	4	2	362

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