Applying Social-network to Enhance Distance Learning Program

HSIEH-HUA YANG, WEN-CHEN HU, LUNG-HSING KUO, HUNG-JEN YANG

***Abstract*—**The purpose of this study was to design an on-line learning activity for high-scope project based upon social network. Social network could enhance on-line activities according previous research results. There is a need to figure out what kind network could help learner more, peer network or tutor network. Research has indicated the importance of social connection in a virtual world. A distance learning platform was developed according to the on-line learning goals for the High-Scope project which is a NSC research project which had been conducted by the research group for promoting high school students learning emerging technology since 2010. This study reports the process of developing a distance learning system for contest and e-portfolio assignment designed for contest activity. During the gaming, social network were established among learners and instructors. Based upon the social network awareness, learning interactions were enhanced for this distance learning program. By investigating the follow up data, the hypothesized relations were tested. Total six groups of 45 students were within the whole contest procedures, the grouping stage, the learning stage, the problem solving stage, the presentation stage, and the reflection stage. Analyses of quantitative data were presented. A major result indicated that the learner peer network is considered as a pragmatic vehicle to assess learners' interaction.

***Keywords*—Social Network, High-Scope Project, Distance Learning**

I. Introduction

SOCIAL network awareness has been used extensively as one of the strategies to increase knowledge sharing and collaboration opportunities. However, most social network awareness studies either focus on being aware of peer's knowledge context or on social context. This study proposes online learning with social network awareness of peer support and tutor support. In this Information Age, learners have at their disposal enormous amounts of data collected in transactional systems. These systems are designed for the well-organized selection, storage, and retrieval of data, and are vital for learners to keep track of their knowledge formations.[1-7] Collecting data through computers' assistance become a regular situation. How to promote learning based on network relation establishing on-line becomes an interesting issue.

In general, providing feedback on formative assessments is difficult for teachers because they face a large number of students, lengthy pieces of work, or practical constraints such as time and workload[8]. Additionally, the amount of questions that students generate in an assessment can overwhelm a teacher[9]. Online learning systems may solve the above difficulty, but most of them only provide fixed and predetermined answers and references as learning feedback[10]. These predetermined answers and references cannot offer adaptive assistances and satisfy individual student's needs. Another problem of online learning systems is a low participation rate among students in such systems [11, 12]. This significantly influences learning effects and in turn downgrades learning achievements. Thus, designing an appropriate auxiliary mechanism to address the above issues of online formative assessments is important [13].

The standard-based, performance-based assessment and curricula have increasingly been emphasized on schools in many parts of the world. The Republic of China have national standards of technology education as well as for various teaching subjects that provided accountability measures that impacted teaching and learning. Education programs ought to be responsive to the direction of performance education. Urgently, in the developing on line competition, such as High-Scope, there is even greater need to introduce and implement this direction to provide quality education to emerging technology learning.

Vercellone-smith, Jablokow and Friendel [13] pointed out peer interaction is one of prominent principles of good feedback practice in assessments. The peer interaction and collaboration can motivate student learning, provide individual assistances, and reduce student frustration [12]. Student can receive substantive feedback through a socially interactive process [11]. However, students need to know the social activities, knowledge degree, and contexts of others to increase knowledge sharing opportunities and to communicate and collaborate effectively [10]. Social network awareness has been used extensively as one of the strategies to address this issue [9, 10, 14]. Social network awareness is used to be aware of the knowledge context and social context of the others [8].

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Knowledge context, which reveals the peer candidate's knowledge expertise and experience, is used to match 'who knows what' in the knowledge dimension. Social context, which reveals the nimbus (i.e. willingness to help other) of the peer candidates, their social network tie, and social network position (i.e. central/peripheral positions in a network), is used to harmonize 'who is willing to collaborate. Being aware of both context information and the interactions among peers are deemed as scaffolds at stimulating students to reflect on learning, to imitate peers' actions, and to motivate coherent discussions.

Knowing who has expertise is a precursor to seek a specific helper out when we are faced with a problem. But, knowing what someone else knows is only useful if you can get access his/her thinking in a sufficiently timely fashion. This accessibility is heavily influenced by the one's social context within a community [8].

II. Social Network for learning

Aggregating data into levels at which patterns can come into view, ordering levels into hierarchies to support drilling down and up through the levels, and using investigative functions such as lag, moving total, and year-to-date are among the techniques used to transform data into information. This information can provide a major boundary in a competitive marketplace.[15]

The last ten years have seen an enormous growth of interest in e-portfolios and the benefits they can bring to learners. In this session, what e-portfolios are would be examined, the range of ways they can be used, the benefits they can bring and ways to realize these benefits, now and in the future.

The definition for a portfolio could be: 'a container ... for loose papers, drawings, etc.: a collection of such papers.' This does not conjure up exciting connotations: it evokes images of old boxes of yellowing papers in a dusty attic. However, two things contradict this image and make e-portfolios one of the most exciting areas of development in education and training at the moment.

- •The "e" side. The essence of networked computers is their potential to transform static, "dead" information into dynamic, flexible, growing information, which can be shared, developed, re-contextualized, searched and viewed from different perspectives.
- The move to lifelong learning, which places the learner - their work, achievements, reflections and goals - at the centre of the learning process. In the stereotypical "old days", when learning consisted of long, fixed blocks, the place of portfolios was limited. However, in the new knowledge economy, it is important for learners to take ownership of their learning, and to continually reflect on where they are, the learning and achievements which have brought them there, where they want to go, and the learning they need to get there. e-Portfolios provide a vehicle to enable this.

An e-portfolio is an electronic format for learners to record their work, their achievements and their goals, to reflect on their learning, and to share and be supported in this. It enables learners to represent the information in different formats and to take the information with them as they move between institutions.

A. Social network awareness

Social network awareness has been extensively used as one of the strategies to promote the opportunities of peer interaction and collaboration, and to support the co-construction of knowledge and the sharing of information [8, 10, 16]. Deeper mutual awareness of peer social context enables more fluid and expressive communication between individuals, resulting in a more effective coordination of ideas, opinions, and actions [9, 11]. However, most social network awareness related works focus on the awareness of either peer's knowledge context or peer's social context. The social-context studies mainly focus on being aware of peer's social status, including social network tie, social network position,

and social interaction. For example, Vercellone-smith et al. [13] developed an social network awareness system which interaction aimed at promoting the opportunity of knowledge sharing. The system provided two types of information in a visual way. One type is social network ties among the members within the community. Each node in the network represents a person and each arrow represents the direction of knowledge transfer. The other type is social interaction patterns, including the number of contacts, the number of receiving transfers, and the number of sending transfers. Lin and Lai [8] presented a method of mining social interactive networks, which used a prediction model based on peer's past social interaction (i.e. request and response messages), to recommend appropriate peer helpers for a requester. On the other hand, the knowledge-context studies mainly focus on being aware of peer's proficiency level of a specific domain, including knowledge level and experience. For example, Lin et al. [8] proposed a ubiquitous learning system, which used a prediction model mainly based on candidates' proficiency level to recommend the qualified candidate for a help seeker. The provided awareness information mainly included a helper's academic level, interests, physical location, and the detected objects. However, the social context of a candidate is not considered.

Knowing that someone else knows something of relevance does little good if people cannot gain access to their knowledge and helps. This accessibility is heavily influenced by the one's social context within a community. In a virtual environment users should be able to perceive and compare the social and knowledge patterns of activity with their own models of work and interaction. This could enhance users' motivation to communicate and collaborate, allowing them to structure their social networks to maximize their benefits by getting closer to the existing resources and opportunities. Therefore, Kuo, Wei, Chen, Wang, Ho, and Yang [3] have proposed a prediction model to recommend candidates based on a peer's trust

association and knowledge association. The knowledge association is the level of proficiency of a candidate pertaining to a specific knowledge domain. The trust association is the trustworthy level of a seeker to a candidate, which is determined by past social interaction (i.e. request and response messages) experience. Although their work has considered both contexts, the social-context information merely contains past interaction experience. In addition, to calculate trustworthy level of a candidate, the model needs sufficient (or large enough) samples of past interaction experiences.

B. Social Network & Interaction

Social networking sites have the potential to facilitate interaction, communication, and collaboration, and as a result have been prominently featured in discussions centering on the use of technology to support and amplify educational endeavors [6]. Empirical research on their role in online education is limited, even though researchers have identified an accelerating use of social software in formal learning contexts [3]. To fill this gap in the literature, this study would be focused on the network relations among on-line learning environment. The peer support relationship and tutor support relationship would be studied for the contribution on interaction levels.

Historically, distance education has been plagued by feelings of learner isolation and alienation [17], lack of participant interaction (both student-student and student-tutor), and high dropout rates [18]. The rise of Web 2.0, social networking sites, and a general interest in student-centered pedagogies have attracted attention to the use of popular Internet tools to enhance distance education and address the aforementioned problems. For instance, Kuo, Yang, Lin and Lin [6] suggest that online social networks enable learners and instructors to present themselves socially in an online environment and connect with one another while enabling individuals to engage in recurring meaningful experiences with others. Nevertheless, prior research strongly suggests that technological innovations need to be accompanied by pedagogical enhancements for technology-rich interventions to be successful [2, 19]. Researchers also recommend examining which course delivery format fits particular pedagogical approaches [20]. Therefore, there is a need to figure out how social network relations contributed toward interaction in an on-line learning environment. Based upon reviewed theory, it was hypothesized that the social network among learners and instructors would a significant predictor of learning interactions.

C. Technology Education & High-Scope Game

Technology education is a subject area of common education and provides learner the opportunity of understanding technology. New technology grows everyday and the information and knowledge of technology expands, too. Systems of technology in some areas are even exploded, such as energy & power technology and information & communication technology. In science education, how to integrating emerging technology into formal education becomes a concern. Education reform acts in Taiwan pointed out this trend and raised a “High Scope Curriculum Development” project to foster teachers to design teaching material and learning activities of emerging technology.[3, 4]

The key questions concerning any proposed new technology should include the following:

1. What are alternative ways to accomplish the same ends? What trade-offs would be necessary between positive and negative side effects of each?
2. What will the proposed new technology cost to build and operate? How does that compare to the cost of alternatives? What will the social costs be?
3. What risks are associated with the proposed technology? What risks will the technology present to other species of life and to the environment?
4. What people, materials, tools, and knowledge will be needed to build, install, and operate the proposed new technology?
5. What will be done to dispose safely of the new technology's waste materials?

The Technological Method Model provides a fran1ework for teaching technology. That is, it provides the framework for the immersion of students in actual technological practice. & such, in its educational counterpart, the Model for Technology Education (Fig l), students will identify problems or opportunities utilizing the problem solving method, selecting the appropriate resources and employing technological processes to produce outcomes for which they will assess the consequences.

In effect, to teach technology, students must "do" technology which translates into involving students in each element in the Model for Technology Education and in the interactive nature of the Model.

- Applying Human Direction
- Identifying Problems or Opportunities
- Selecting Resources
- Employing Technological Processes
- Assessing Outcomes and Consequences
- Practical Implications for the Study of Technology

The purpose of this study was to design an on-line learning activity for high-scope project based upon social network on the context of High-Scope gaming and learning portfolio.

A “game” is exercise that has a winner. The winner of the game is the individual or team that first successfully completes the requirements of the game. The game essentially provides a competitive setting for learning specific subject matter.

In contrast, games are competitive interactions among participants to achieve pre-specified goals. These interactions may feature cooperation within groups.

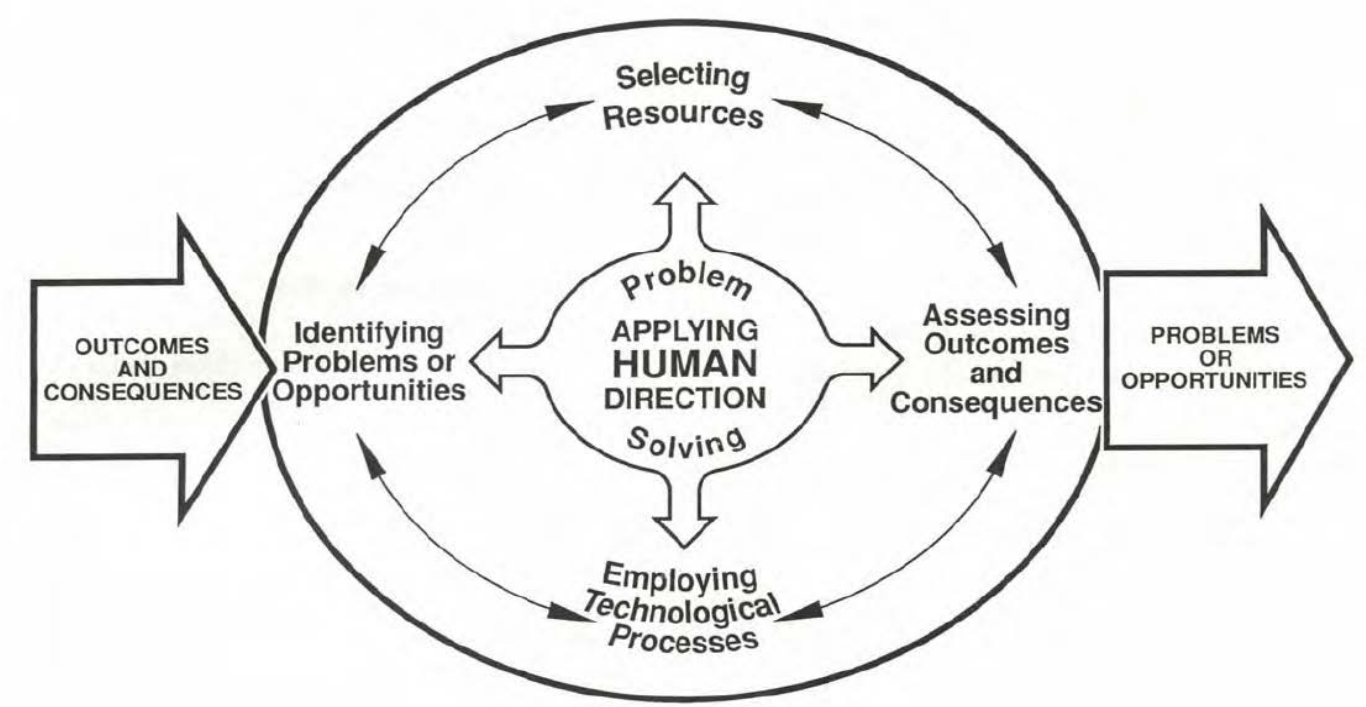

Fig. 1. A Model for Technology Education

Games are usually played for entertainment and clearly identify winners and losers. Participants' success is dependent upon skill or chance or some combination of the two. Games make no attempt to replicate real-world behavior and rules of behavior for the game need apply to the game only.

From these two ideas, simulation to represent elements of reality and gaming to stimulate interaction and simulation games have developed as powerful learning constructs. Creating a "winner" inside the context of a simulation provides a driving force for the participants to understand the environment and be successful. Though there are fundamental differences in the three types of exercises, for the purposes of this paper, the terms "game", "simulation" and "simulation game" will be used interchangeably, unless there is a particular reason to highlight the differences.

Every game must have a purpose and game must have a structure. These purposes and structures combine to form different types of games.

Although the following examples may not represent mutually exclusive categories, they do serve to differentiate among the variety of simulations and games. For example, non-simulation games are competitive learning exercises in which a participant's success is determined by the degree that the desired goal is achieved during the game play.

Inter-personal games are learning exercises in which the participant responds, as if he/she were in the actual system being simulated. Interaction is structured by rules and physical circumstances. Large system games are exercises for the examination of the dynamics of complex systems of interaction. The focus may range from examining the variables affecting a business community to an analysis of the nation-state system of the international community/market. The participant is engaged in the simulated system as a planner, a decision-maker, or an observer in order to better comprehend the variables affecting the dynamics of human and business behavior within the context of the system being modeled.

A game is a complex structure that can be viewed from many different directions. The success or failure of a simulation or game will depend on how well it is designed and whether or not its complexity is appropriate or overpowering. One benefit of complexity is that there may be opportunities to modify the exercise to achieve other purposes. A robust structure can result in a family of games, each with a specific educational purpose.

III. Methodology

The purpose of this study was to design an on-line learning activity for high-scope project based upon the portfolio thinking theory and identify the relationship between interactivity and on-line supports. Research has indicated the importance of evaluating the experiences related to developing e-portfolio, electronic portfolio, to contribute to the overall excellence in teaching and learning. This is an empirical study with both qualitative and quantitative verification on the research questions.

The goals of on-line contest were established during the prior study. A game based on-line platform with e-portfolio functions were designed according to the purpose of learning game.

A. Participants and Survey

In this study, the contest was mainly designed for high-school students for learning emerging technology. Participants were 45 high-school students in 6 groups who enrolled in the on-line contest for emerging technology learning.

Each group was required at least one teacher as a coach. All these coaches are qualified high-school teacher and major teaching area in the science & technology.

Table 1. Items of the survey instrument

Interactivity
I explain my ideas to other students.
I ask other students to explain their ideas.
other students ask me to explain my ideas.
other students respond to my ideas.
Tutor support
the tutor stimulates my thinking.
the tutor encourages me to participate.
the tutor models good discourse.
the tutor models critical self-reflection.
Peer support
other students encourage my participation.
other students praise my contribution.
other students value my contribution.
other students empathies with my struggle to learn.

For review participants final products and formational evaluation functions, three evaluators were invited. All three evaluators had more than ten years experience on applying information and computer technology for education.

A survey was developed by researchers to include aspects related to the on-line activity, e-portfolio development, and experience gained to adequately provide insight into participating learners' perceptions. Twenty four items were included. There are three sub-categories, interactivity, tutor support, and peer support. Those items were purposefully presented to reflect good practice and theory in a five-point Likert scale and listed in Table 1.

B. Platform & Functions

The data collected in this contest could be identified into three parts. The first part is personal information for introducing self to other members. The second part is on-line learning records. The third part is final team project.

- *The first part data was collected by students finishing their basic information sheet and upload their own selected artifact.*
- *The second part data was collected while student doing their on-line learning activities.*
- *The third part data was collected while students doing their final group project.*

Those collected data could be included following types information:

- Text
- Graphic
- Audio
- Video

In this e-portfolio task, students are expected to create an e-portfolio organized around the emerging technology conceptual framework elements of High-Scope project. The portfolio is submitted to instructors as a Website. In general, the on-line contest was conducted on a platform that could promote a social constructionist pedagogy and assignment modules for recording learning performance as well.

The registration time was from 2013/06/17 to 2013/06/28. There were three steps in the contest. The first step of the contest is for familiar with both the on-line environment and competitors. The second step of the contest is for learning the contents of emerging technology. The third step is creating their final product. The time periods for each step are two weeks, four weeks, and two weeks.

For the contest, the starting date of each step were listed in the followings

- 2013/07/01
- 2013/07/15
- 2013/08/19

The server was close the upload function for their final products at 2013/08/30, 17:00.

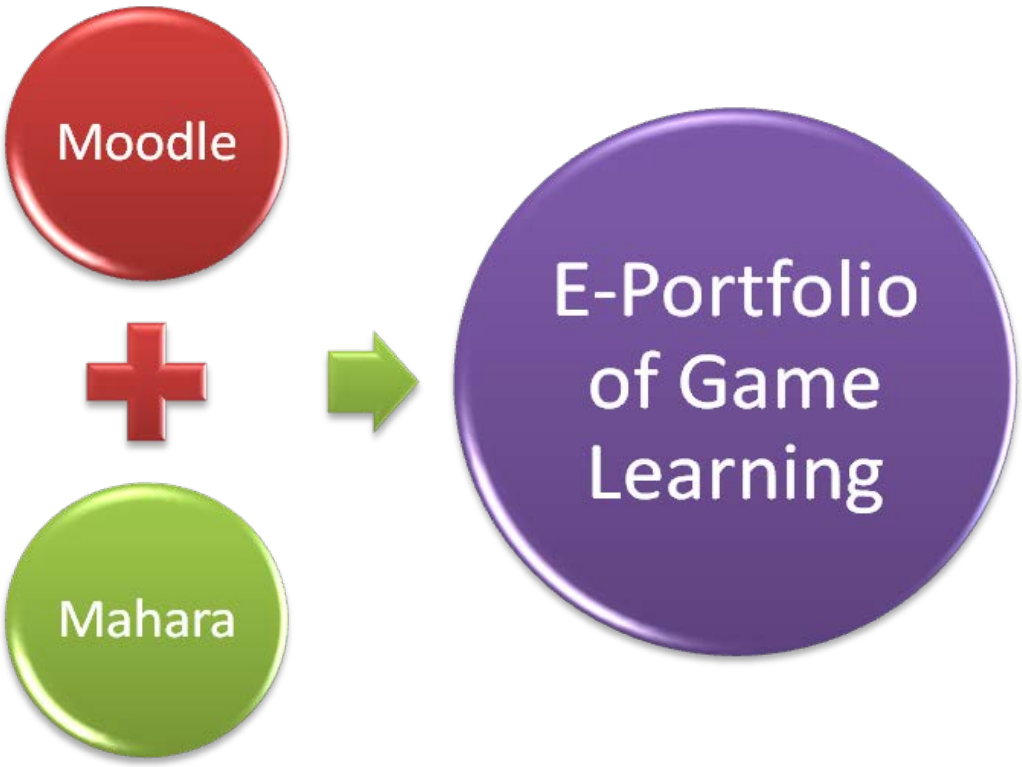

Fig. 2. Conceptual model of inactive-service and active service

C. Survey Results

There are five sub-categories, relevance, interactivity, interactivity, tutor support, peer support, and interpretation. Those items were purposefully presented to reflect good practice and theory in a five-point Likert scale. The values are from one to five and represent almost never, seldom, sometime, often, and almost always.

For understanding the survey responses under sub-categories, the results were calculated by reference group, reflect thinking group, tutor group, peer support group, and interpretation group. In table 2, the mean of interactivity category is 3.38. The mean of tutor support is 4.03. The mean of peer support category is 3.58. All five values are higher than three, sometimes. On the other hand, they are close to four, often. Learners' response is positive in each category.

Table 1. One-Sample Statistics of Survey Response in Sub-categories

One-Sample Statistics

	N	Mean	Std. Deviation	Std. Error Mean
Interactivity	45	3.38	1.09959	.16392
Tutor Support	45	4.03	.88	.13
Peer Support	45	3.58	.81	.12

Table 2. One-Sample t-test of reference, reflect thinking, tutor support, peer support, and Interpretation.

One-Sample Test						
	Test Value = 3					
	t	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
Interactivity	2.339	44	.024	.38333	.0530	.7137
Tutor Support	7.797	44	.000	1.02778	.7621	1.2934
Peer Support	4.766	44	.000	.57778	.3334	.8221

For further identify whether there exists significant difference between the learners' response and the value of scale sometimes, three, one-sample t-test procedure was conducted. In Table 3, the significant values of each category are less than 0.05. It was concluded that there exists significant difference between learners' response and the scale value 3 in all five categories. The positive tendency in reference, reflect thinking, tutor support, peer support and interpretation of on-line gaming/e-portfolio activity was confirmed statistically. For identifying the relationship between interactivity and support, a regression test was applied. It was hypothesized that reflect thinking could be significantly predicted by tutor support and peer support.

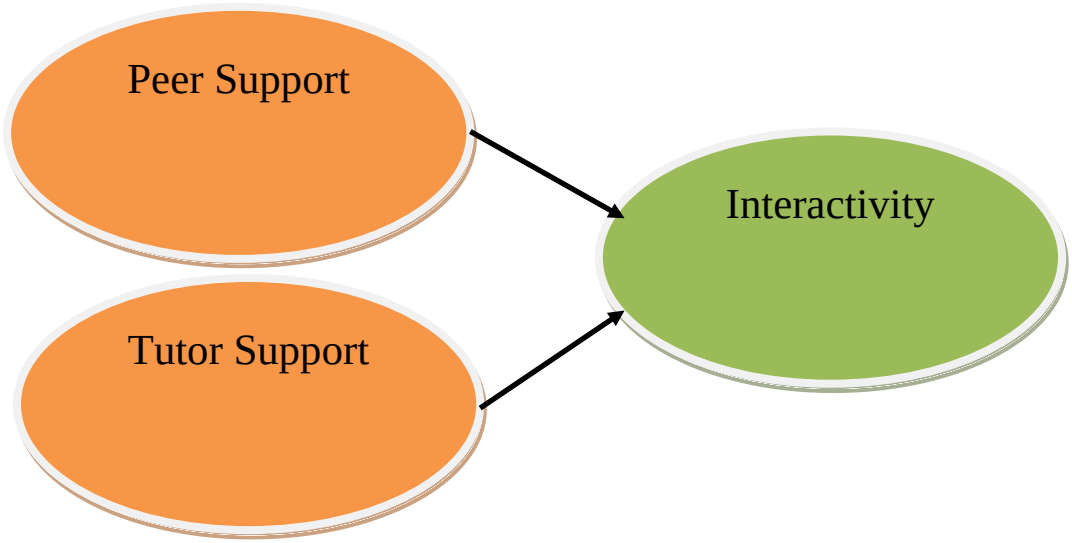

Fig. 3 Conceptual framework of Interactivity upon social networks of peer and tutor.

Table 3 Regression Model Summary and ANOVA Test

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.647[a]	.419	.391	.85789	.419	15.143	2	42	.000

a. Predictors: (Constant), PeerSupport, TutorSupport

b. Dependent Variable: Interactivity

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	22.289	2	11.145	15.143	.000[b]
	Residual	30.911	42	.736		
	Total	52.200	44			

a. Dependent Variable: Interactivity

b. Predictors: (Constant), PeerSupport, TutorSupport

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	-.354	.692		-.511	.612		
	TutorSupport	.444	.164	.357	2.713	.010	.798	1.253
	PeerSupport	.544	.178	.403	3.059	.004	.798	1.253

a. Dependent Variable: Interactivity

In table 4, the regression model is illustrated. The interactivity could be significant predicted by peer support and tutor support at 41.9%. The equation could be listed as following.

Interactivity = 0.444 X Tutor Support +
0.544 X Peer Support -
0.354

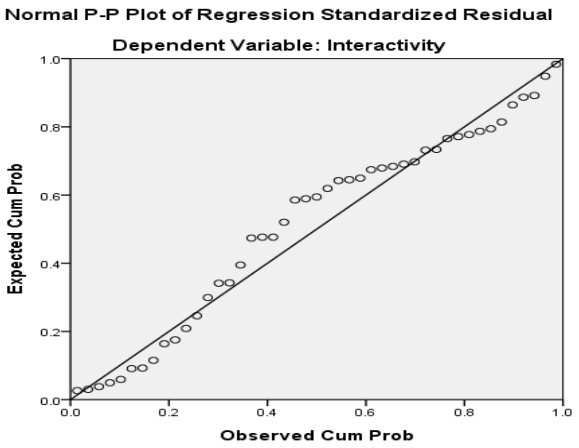

Fig. 4 Normal P-P Plot

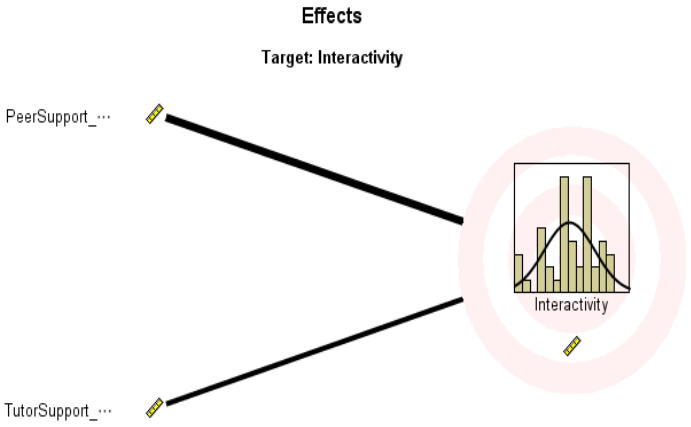

Fig. 5 The Effect of predictors, Peer support and Tutor support, on Reflect Thinking

In Fig. 5, the factor of peer support shows higher effect on interactivity by the thicker line. In Fig. 6, the importance of both predictors are displayed. Peer support is more important than tutor support on predicting interactivity.

In Fig. 7, the histogram of studentized residuals compares the distribution of the residuals to a normal distribution. The smooth line represents the normal distribution.

The closer the frequencies of the residuals are to this line, the closer the distribution of the residuals is to the normal distribution. This concludes that both peer support and tutor support are significant predictors of interactivity.

Separately views of each factor are shown in Fig. 8. The smooth line from lower left to higher right provides the evidence of linear relation between 1).interactivity and peer support, and 2) interactivity and tutor support.

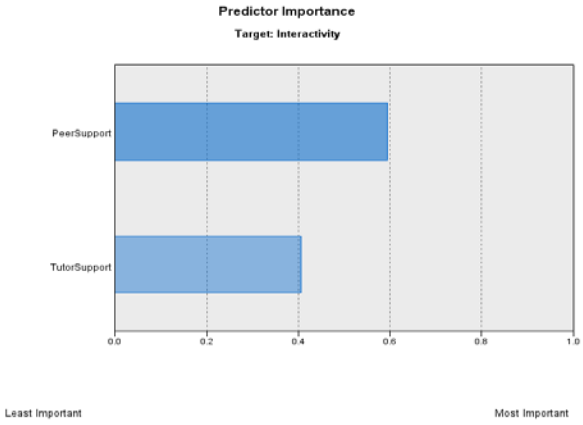

Fig. 6 Predictor Importance of both peer support and tutor support

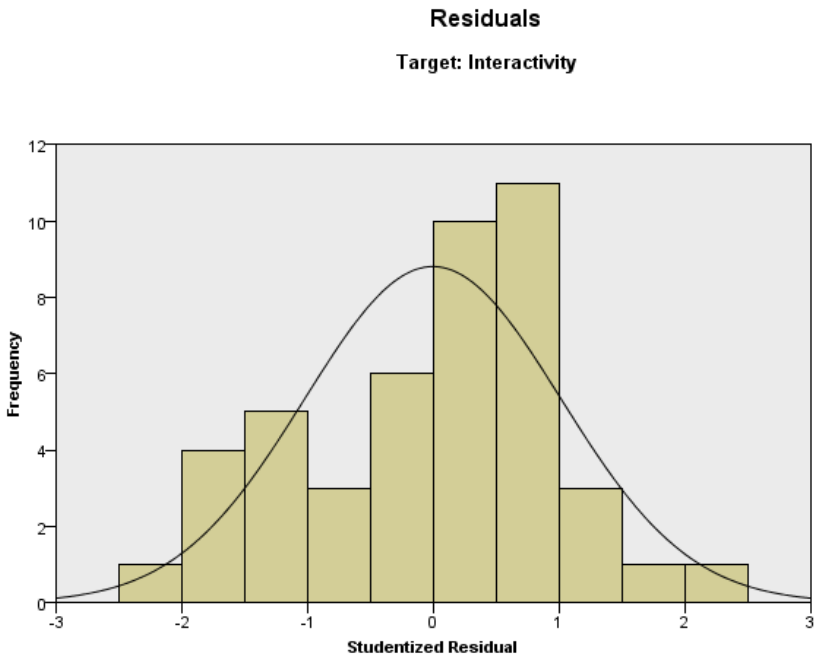

Fig. 7 The historgram of studentized residualof the predicting model

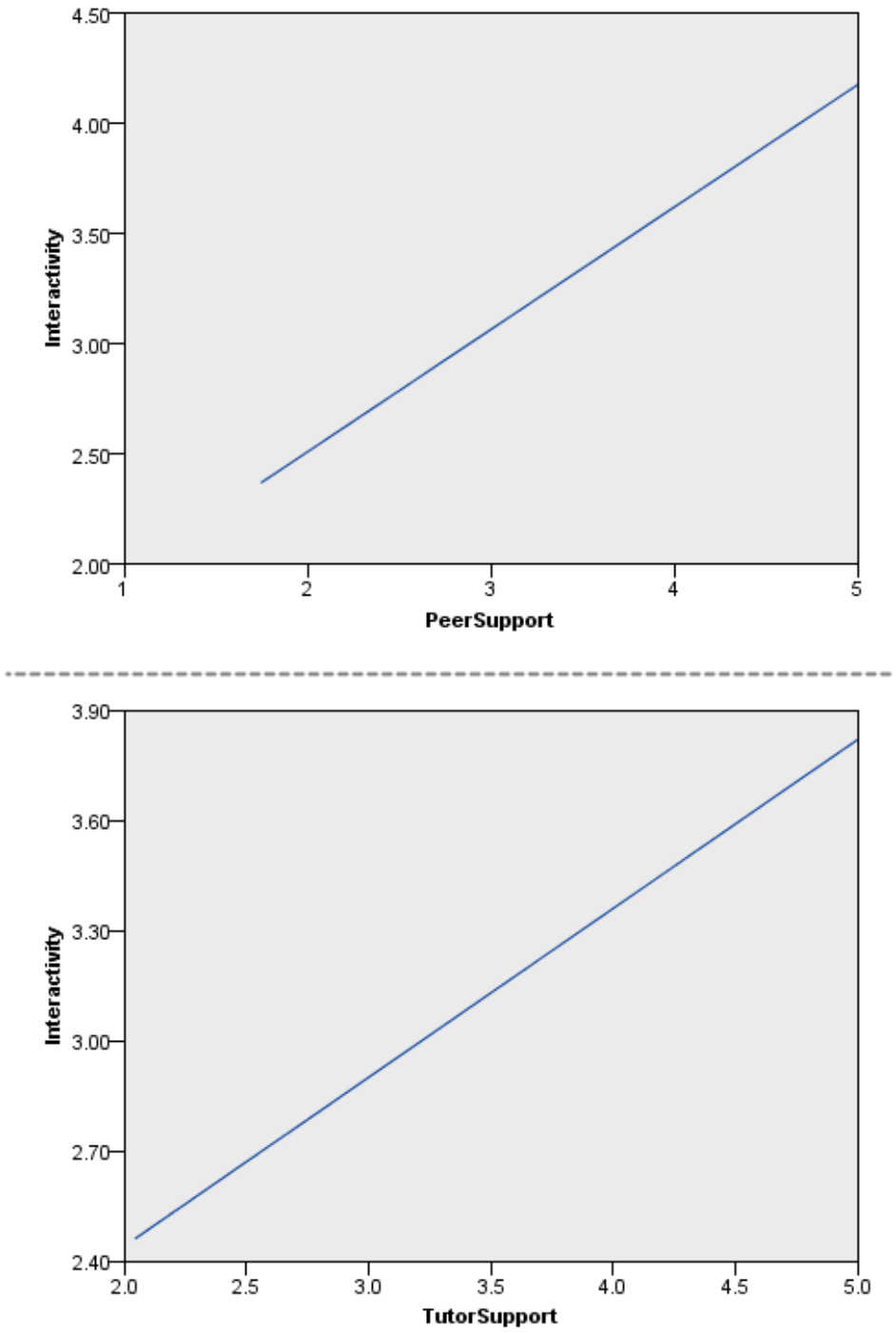

Fig. 8 Estimated means charts for the significant effects ($p<.05$)

IV. Discussion & Conclusion

The literature review showed a great need for addressing whether the social network experience of peer and tutor support contributes to the development of on-line interactions. From a constructivist point of view, people actively construct new knowledge as they interact with their environments.

Everything people see, hear, read, feel, and touch is tested against his/her prior knowledge and if it is viable within your mental world, may form new knowledge he/she carry with. Knowledge is strengthened if one can use it successfully in one's wider environment. People are not just a memory bank

passively absorbing information, nor can knowledge be "transmitted" to people just by reading something or listening to someone.

This is not to say people can't learn anything from reading a web page or watching a lecture, obviously people can, it's just pointing out that there is more interpretation going on than a transfer of information from one brain to another.

Social network could enhance on-line activities also confirmed based upon the statistical findings. Research has indicated the importance of social connection in a virtual world. In this study, a distance learning platform was developed according to the on-line learning goals for the High-Scope project which is a NSC research project which had been conducted by the research group for promoting high school students learning emerging technology since 2010. This study reports the process of developing a distance learning system for contest and e-portfolio assignment designed for contest activity. During the gaming, social network were established among learners and instructors. Based upon the social network awareness, learning interactions were enhanced for this distance learning program. By investigating the follow up data, the hypothesized relations were tested. Analyses of quantitative data were presented. The statistical result indicated that the learner peer network is considered as a pragmatic vehicle to assess learners' interaction.

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