

# Effects of Cooperative E-Learning on Learning Outcomes

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Received 29 March 2014; accepted 26 July 2014

This study aims to discuss the effects of E-Learning and cooperative learning on learning outcomes. E-Learning covers the dimensions of Interpersonal communication, abundant resources, Dynamic instruction, and Learning community; and, cooperative learning contains three dimensions of Cooperative motive, Social interaction, and Cognition construction. Teachers and students in ten public and private universities in southern Taiwan are selected as the research subjects. Total 500 questionnaires are distributed and collected on-site, and 327 valid copies are retrieved with the retrieval rate 65%. The research finding show partially significant correlations between E-Learning and cooperative learning, between cooperative learning and learning outcomes, and between E-Learning and learning outcomes. Finally, several suggestions are proposed for teachers in E-Learning and cooperative learning.

*Keywords:* E-Learning, Cooperative learning, learning outcomes

## INTRODUCTION

The rapid development of the Internet in recent years has changed the presentation of knowledge and the exchange of information that the society and living style are changed, largely affecting traditional education. Educationally, cultivating students with problem-solving capability has been a primary objective for adapting to the rapidly changeable society. Meaningful learning should be started from students' specific experiences and daily situations, corresponded to the cognitive development, and gradually connected to formative knowledge from natural ideas. In regard to the theory and practice of recent instruction, cooperative learning, tending to achieve the learning objectives through students' cooperation, has been gradually emphasized.

Traditional instruction therefore could no longer satisfy students' demands.

The learning activities should be expanded to the web in order to well apply the resources on the Internet, as a brand-new learning method could be merely created by the learning environment through World Wide Web.

The characters of course presentation and network convenience have reinforced the instruction and learning effects as well as allowed students contacting with diverse knowledge and learning methods. In such a stream of network information, the acquisition of data becomes convenient and simple. Nevertheless, learning is not the memory of broken knowledge but the methods to collect and organize data for being transformed into information, which is further internalized for solving daily problem (Cheng, 2009). The progress of network technology allows cooperative learning not being restricted in classrooms. However, any cooperative learning activities should be well designed, like the one in traditional classrooms, as cooperative learning requires the proper planning of network environments. This study tends to discuss whether cooperative learning could enhance students' problem-solving capabilities and learning outcomes in E-Learning and expects to provide notices and feasible methods for the teachers.

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doi: 10.12973/eurasia.2014.1212a

**State of the literature**

- This study tends to discuss the factors in learning effectiveness, the theories in web-based learning, relevant learning theories in web-based instruction, and cooperative learning theories through data collection and organization from literatures.
- From such literatures, the past research mainly focused on the same grades, subject, materials, and curriculum that the depth was insufficient.

**Contribution of this paper to the literature**

- The factors in web-based learning, cooperative learning, and learning effectiveness are organized through questionnaire survey.
- The organized factors are proceeded Factor Analysis, Validity Analysis, and Regression Analysis for the effects of web-based instruction and cooperative learning on learning effectiveness.
- Moreover, this study is proceeded investigation during school time so as to correspond to the actual learning conditions. It is expected to better reflect the actual situations when schools open or conduct web-based instructions. This experiment could also provide the instructors with directions for further web-based learning and cooperative learning.

**Literature and Hypothesis****Cooperative Learning**

Cooperative learning, as a model of interactive groups constructing knowledge (Slavin, 1995), is regarded as the instructional strategy stressing on students' interactive learning. Cheng (2010) defined cooperative learning as a team with more than two people participating in certain activities, in which the members should negotiate and communicate to achieve the common objectives. Each person participating in the activities in cooperative learning are assumed to respect, trust, and consider others, understand the group objectives, and clearly know individual responsibilities so that the cooperation contents could be any forms.

Chen (2009) proposed the following dimensions for cooperative learning.

1. Cooperative motive. Cooperative learning aims to create a common objective for the team to successfully achieve that the members could achieve the individual objectives. In this case, team members should help each other achieving individual objectives.
2. Social interaction. Mutual dependence among members is the principle of a team, as it is a dynamic whole. When a member or a sub-group is moved, the

state would be changed, as the internal nervousness could facilitate an individual work hard to accomplish the objectives, integrate a common objective among individuals, and induce cooperation, competition, and individual behaviours through mutual dependence.

3. Cognition construction. Cooperative learning could promote students' learning achievements by enhancing students' information process. When individual students appear cognitive conflict with the group, the cognitive imbalance would stimulate the insight and cognition development.

**E-Learning**

The boom of the Internet not only has brought enormous business opportunities, but has also been widely utilized for education. The advantage of not being restricted by time and space has universities actively develop the distance teaching platforms. For educational applications, E-Learning is an alternative space beyond traditional school education, providing a virtual learning community. E-Learning contains the following dimensions (Lin & Cheng, 2009). (1) Interpersonal communication. The real-time and non-concurrent diverse communication functions could assist the users in communications and interaction. (2) Abundant resources. In network software, the knowledge field could be infinitively extended through hyperlink and information provision and propagation could be enhanced. (3) Dynamic instruction. The learning resources on the web are increasing, and the users' opinions and feedback could be included to reinforce the learning contents at any time. (4) Learning community. In addition to the learning community in real classes, anyone could be a member of learning groups on the Internet. In other words, web-based learners could play the roles of students, moderators, or instructors.

Presently, a lot of sectors transform traditional textbooks into web pages. Such websites show the most resources and diverse presentations that students could collect, organize, and analyze data on their own. Well applying such information could assist teachers in instruction and students in the cultivation of problem-solving capabilities (Chang, 2009). Li, Han, Chou, Hung & Zhang (2010) also mentioned the presentation of teaching materials in present information webs being integrated with videos, texts, images, and instructional contents and suggested to include artificial intelligence and virtual reality in distance systems so as to enhance learners' learning motivation.

**Learning outcomes**

From the aspect of information system trainings, the learning activities contain the system intension, training

methods, and the complex interactive relations between users and the system. Consequently, understanding the interaction in-depth and further predicting the users' learning achievement could effectively promote the training effects. Bostrom et al. (1990) proposed a complete theoretical structure for information system trainings that the interactions among Target system, Training method, and User's individual difference could affect the output of the trainings. Such influence includes direct effects and indirect effects through the establishment of user mental model. In regard to the instructional efficiency, Soong (2001) proposed three dimensions for the learners' learning effects. 1. Human factors cover teachers' instructional methods, teachers' technological attitudes and effectiveness, students' attitudes towards computer use, students' experiences in computer use, maturity of students' perceived belief, and learning motivation. 2. Curriculum dimension contains the number of students attending the courses, teaching materials, and interactive courses. 3. Science and technology includes technological reliability, quality, and the richness of media.

### ***Study on the correlations among E-Learning, cooperative learning, and learning outcomes***

A lot of literatures indicated that cooperative learning could actually enhance students' learning outcomes. For example, Slavin (1995) found out that the students in cooperative learning situations were requested to learn so that the learning being more lively allowed catching up the peers. Cooperative learning could promote students' learning outcomes and enhance the comprehension and problem-solving capabilities. Johnson & Johnson (1996) regarded that team discussions allowed the members explaining to others, finding solutions, and proceeding discussions and debate to acquire the development of high-level thinking skills and enhance the learning outcomes. The advanced web technology has cooperative learning activities not being restricted in classrooms. E-Learning could extend the cooperative learning in traditional classrooms with fixed members, space, and time, to a wider learning community with flexible members, space, and time. Nonetheless, any cooperative learning activities should be well designed similar to traditional classrooms. Particularly, cooperative learning with E-Learning requires more appropriate planning (Chiu, Chen, Wei, Hu, Chiao & Li, 2009). Cooperative learning with E-Learning allows students crossing the borders between campuses and countries and sharing and exchanging the research outcomes with people with distinct backgrounds, races, genders, and ages, rather than isolated learning situations. Under the web-based environment, teachers still master in the directions and contents of courses, while students have larger learning

space to cooperatively explore the contents with classmates or search for relative knowledge (Hung, 2009).

Based on the above literatures, the following hypotheses are proposed in this study.

H1: E-Learning presents significantly correlations with cooperative learning.

H2: Cooperative learning shows remarkable correlations with learning outcomes.

H3: E-Learning appears notable correlations with learning outcomes.

## **Empirical research design**

Operational definition and measurement of variable

### **E-Learning**

E-Learning covers the dimensions of Interpersonal communication, abundant resources, Dynamic instruction, and Learning community. The scale is revised from the one proposed by Lin & Cheng (2009). With Likert's seven-point scale, number 1 stands for Extremely Disagree and number 7 for Extremely Agree. The overall reliability coefficients appears of 0.88 on Interpersonal communication, 0.86 on Abundant resources, 0.87 on Dynamic instruction, and 0.90 on Learning community.

### **Cooperative learning**

Cooperative learning contains three dimensions of Cooperative motive, Social interaction, and Cognition construction. The scale is revised from the one proposed by Chen (2009). With Likert's seven-point scale, number 1 shows Extremely Disagree, and number 7 reveals Extremely Agree. The overall reliability coefficients show 0.80 on Cooperative motive, 0.85 on Social interaction, and 0.82 on Cognition construction.

### **Learning outcomes**

Learning outcomes include three dimensions of Human factor, Curriculum dimension, and Science and technology. Revised from the scale proposed by Soong (2001), Likert's seven-point scale is utilized. Number 1 stands for Extremely Disagree and number 7 for Extremely Agree. The overall reliability coefficients present 0.89 on Human factor, 0.90 on Curriculum dimension, and 0.93 on Science and technology.

### **Research subject**

The teachers and students in ten private and public universities in southern Taiwan are selected as the research samples. Total 500 questionnaires are

**Table 1.** Regression Analysis of E-Learning and cooperative learning

Dependent variable	Cooperative learning								
	Cooperative motive			Social interaction			Cognition construction		
	$\beta$	Beta	P	$\beta$	Beta	P	$\beta$	Beta	P
Interpersonal communication	1.775*	0.256	0.018	2.316**	0.334	0.000	1.971*	0.296	0.010
Abundant resources	0.447	0.086	0.588	1.621*	0.247	0.019	1.577*	0.232	0.021
Dynamic instruction	0.617	0.097	0.423	1.887*	0.283	0.012	0.340	0.043	0.834
Learning community	1.538*	0.221	0.022	2.146**	0.318	0.000	2.276**	0.325	0.000
F		11.383			15.892			21.634	
R <sup>2</sup>		0.239			0.262			0.325	
Regulated R <sup>2</sup>		0.217			0.243			0.302	

\*p < 0.05 \*\*p < 0.01

Data source: Self-organized in this study

**Table 2.** Regression Analysis of Cooperative learning and learning outcomes

Dependent variable	learning outcomes								
	Human factor			Curriculum dimension			Science and technology		
	$\beta$	Beta	P	$\beta$	Beta	P	$\beta$	Beta	P
Cooperative motive	1.618*	0.235	0.032	1.833*	0.254	0.017	0.782	0.182	0.261
Social interaction	1.723*	0.246	0.026	1.962*	0.271	0.013	2.166**	0.321	0.000
Cognition construction	1.544*	0.217	0.037	0.522	0.133	0.473	0.871	0.195	0.182
F		13.845			19.764			28.032	
R <sup>2</sup>		0.287			0.317			0.352	
Regulated R <sup>2</sup>		0.263			0.297			0.336	

\*p < 0.05 \*\*p < 0.01

Data source: Self-organized in this study

distributed and collected on-site, and 327 valid copies are retrieved, with the retrieval rate 65%. The ten universities contain Chang Jung Christian University, Kun Shan University, National Sun Yat-sen University, National Kaohsiung First University of Science and Technology, Shu-Te University, I-Shou University, National Cheng Kung University, National Kaohsiung University of Applied Sciences, National University of Kaohsiung, and National Chung Cheng University.

### Empirical Research Result

Regression Analysis of E-Learning and cooperative learning

Multiple Regression Analysis was utilized for testing the hypotheses and the theoretical structure. The first

regression tested the effects of E-Learning on Cooperative motive. The analysis showed the positive effects of Interpersonal communication and Learning community on Cooperative motive (Beta = 0.256, p = 0.018; Beta = 0.221, p = 0.022). The second regression tested the effects of E-Learning on Social interaction. The analysis presented the significant positive effects of Interpersonal communication, Abundant resources, Dynamic instruction, and Learning community on Social interaction (Beta = 0.334, p = 0.000; Beta = 0.247, p = 0.019; Beta = 0.283, p = 0.012; Beta = 0.318, p = 0.000). The third regression tested the effects of E-Learning on Cognition construction, where Interpersonal communication, Abundant resources, and Learning community revealed remarkably positive effects on Cognition construction (Beta = 0.296, p =

**Table 3.** Regression Analysis of E-Learning and learning outcomes

Dependent variable	learning outcomes								
	Human factor			Curriculum dimension			Science and technology		
Independent variable	$\beta$	Beta	P	$\beta$	Beta	P	$\beta$	Beta	P
Interpersonal communication	1.622*	0.242	0.024	1.764*	0.256	0.016	0.316	0.091	0.841
Abundant resources	0.637	0.147	0.271	1.661*	0.247	0.023	1.542*	0.219	0.037
Dynamic instruction	0.433	0.117	0.324	2.046**	0.311	0.001	1.927*	0.283	0.011
Learning community	1.815*	0.262	0.015	1.137	0.196	0.121	1.814*	0.259	0.014
F		27.160			33.414			36.583	
R <sup>2</sup>		0.288			0.347			0.382	
Regulated R <sup>2</sup>		0.267			0.318			0.354	

\* $p < 0.05$  \*\* $p < 0.01$

0.010; Beta = 0.232,  $p = 0.021$ ; Beta = 0.325,  $p = 0.000$ ) (Table 1). Hypothesis 1 was therefore partially supported.

#### Regression Analysis of cooperative learning and learning outcomes

Multiple Regression Analysis was applied to testing the hypotheses and the theoretical structure. The first regression tested the effects of cooperative learning on Human factor, in which Cooperative motive, Social interaction, and Cognition construction appeared positive effects on learning outcomes (Beta = 0.235,  $p = 0.032$ ; Beta = 0.246,  $p = 0.026$ ; Beta = 0.217,  $p = 0.037$ ). The second regression tested the effects of cooperative learning on Curriculum dimension. The analysis showed the remarkably positive effects of Cooperative motive and Social interaction on Curriculum dimension (Beta = 0.254,  $p = 0.017$ ; Beta = 0.271,  $p = 0.013$ ). The third regression tested the effects of cooperative learning on Science and technology, where Social interaction revealed notably positive effects on Science and technology (Beta = 0.321,  $p = 0.000$ ) (Table 2). Hypothesis 2 therefore was partially supported.

#### Regression Analysis of E-Learning and learning outcomes

Multiple Regression Analysis was used for testing the hypotheses and the theoretical structure. The first regression tested the effects of E-Learning on Human factor, in which Interpersonal communication and

Learning community presented positive effects on Human factor (Beta = 0.242,  $p = 0.024$ ; Beta = 0.262,  $p = 0.015$ ). The second regression tested the effects of E-Learning on Curriculum dimension, where Interpersonal communication, Abundant resources, and Dynamic instruction appeared significantly positive effects on Curriculum dimension (Beta = 0.256,  $p = 0.016$ ; Beta = 0.247,  $p = 0.023$ ; Beta = 0.311,  $p = 0.001$ ). The third regression tested the effects of E-Learning on Science and technology. The analysis showed the notably positive effects of Abundant resources, Dynamic instruction, and Learning community on Science and technology (Beta = 0.219,  $p = 0.037$ ; Beta = 0.283,  $p = 0.011$ ; Beta = 0.259,  $p = 0.014$ ) (Table 3). Hypothesis 3 therefore was partially supported.

#### CONCLUSION AND SUGGESTION

The research findings present remarkable correlations between E-Learning and cooperative learning outcomes, and between E-Learning and learning outcomes. The results and the findings are further concluded and proposed the following practical suggestions.

Enhance the trainings and practice for cooperative learning. Since students can seldom express or solve problematic interpersonal communication, they are likely to use old discussions.

The teachers therefore should explain the social interaction skills in cooperative learning and provide proper rewards. The social interaction between teams, cognition construction, and cooperation concepts

should be cultivated in ordinary instructions, and students with distinct capabilities should be offered different tasks so as to establish the self-confidence and integrate into various learning communities. The real spirit in cooperative learning can therefore be developed.

Enhance the application of web to the instruction. Information integrated instruction is emphasized, aiming to well apply the abundant resources on the Internet to promote learning outcomes and increase social interaction and cooperative motive. Apparently, the combination of web and curriculum design would be increased. As a result, relative sectors should more actively conduct teachers' information trainings on science and technology. Promoting teachers' information application capabilities cannot be ignored. Teachers, on the other hand, should actively participate in self-improvement in order to enhance the science and technology use skills and application capabilities to instructions. In this case, abundant resources and Dynamic instruction could stimulate students to promote the interpersonal communication and learning interests so as to integrate into learning communities and enhance the learning outcomes.

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