An Investigation on Factors in The Integration of Reciprocal Teaching into Multimedia Teaching

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ABSTRACT
The popularity of the Internet has toppled people's thinking models and teaching styles as well as influenced the operation of school education. In teaching processes, computers could attract students' attention through vivid images, bright colors and characters, and sound to further promote their learning concentration and interests. Research on the application of integrating information into instruction is increasing, and lots of studies prove that technology could help students' learning and improve their learning attitudes.
In this study, the nonequivalent pretest posttest control group design is utilized for the quasi-experiment research. Total 236 students in two classes each from Xiamen University and Fuzhou University in Fujian Province are selected as the research objects for the 32-week experimental instruction for 3 hours per week (total 96 hours). The research results reveal 1. significant effects of adventure education on comprehension, 2. remarkable effects of adventure education on learning effectiveness, 3.the best promotion of comprehension with Reciprocal Teaching under multimedia teaching, and 4.the best promotion of learning effectiveness with Reciprocal Teaching under multimedia teaching. The results are further discussed to propose specific suggestions in this study. It is expected to enhance teachers' teaching skills and promote students' learning effectiveness.
Keywords: Reciprocal Teaching, multimedia teaching, comprehension, learning effectiveness

INTRODUCTION

The 21st century is a highly informatized era when people live in the environment full of digital, virtual, network, and integrated characteristics. The convenience of information allows people receiving global information in a second. Being in such an information explosion era, it becomes a primary issue for people rapidly organizing key points and absorbing important information among enormous messages. Information technology is closely related to living and presents great effects and changes on education. The popularity of the Internet topples people's thinking models and teaching styles as well as influences the operation of school education. In teaching processes, information technology is an essential

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State of the literature

- School teachers should follow the trend to assist the instruction with computers and network, combine technology and information network with the instruction, and design learning activity integrating information technology into subjects to change the teaching styles and innovate the new way of knowledge transfer.
- The implementation of education is not simply the supply and increase of hardware; more importantly, it is to cultivate students' learning habits to enjoy learning, get used to learning, and achieve the expected educational objectives through learning.

Contribution of this paper to the literature

- The integration of information into instruction expects to promote students' learning achievement and motivation with the advantages of technology.
- After unit instruction to offer students with true and effect feedback about students' absorption, the construction and reinforcement of prior knowledge, the adjustment of teaching design, the control of teaching process, and the presentation of research results.
- Concerning about students with imitation situation, teachers are suggested to timely give guidance and monitoring and induce their thinking ability and imagination to give guidance.

teaching tool for teachers as computers could attract students' attention through vivid images, bright colors and characters, and sound to further enhance students' learning concentration and interests. The Internet, distance learning, e-books, and interactive multimedia learning environments play a critical role in teaching and learning processes. Accordingly, school teachers should follow the trend to assist the instruction with computers and network, combine technology and information network with the instruction, and design learning activity integrating information technology into subjects so as to change the teaching styles and innovate the new way of knowledge transfer. The development of information technology and the multiple presentation models have increased the research on teachers integrating information into the instruction. A lot of studies prove that technology could assist students in the learning and improve their learning attitudes. In the wireless network environment, portable mobile PCs are used in classes for the cooperative learning activity. It not only provides the opportunity for individualized learning and repeated practice but also promotes students' reading interests through the function of multimedia. Apparently, integrating information technology into the instruction could create lively and vivid teaching contents as well as largely enhance students' learning effectiveness, in addition to the multi-sensory stimulation. Teachers could give students chances of repeated practice by designing CAI conforming to reading lessons with simple software and matching it with the presentation of sound and pictures to help students' reading comprehension and establish their learning confidence. The implementation of education is not simply the supply and increase of hardware; more importantly, it is to cultivate students' learning habits to enjoy learning, get used to learning, and achieve the expected educational objectives through learning. This study therefore aims to investigate the effect of integrating Reciprocal Teaching into multimedia teaching on comprehension and learning effectiveness.

LITERATURE REVIEW

Integrating Multimedia Information Technology into Instruction

Herschbach (2011) considered that computers could attract students' attention through vivid images, bright colors and characters, and sound to further promote students' learning concentration and interests. Regarding the integration of information into the instruction, it is a primary issue to well utilize network resources in such a network booming era. A lot of computer assisted instruction systems have therefore been developed to assist teachers in instructing students to use network resources (Makitalo-Siegl & Fischer, 2011). Artino (2012) also regarded the important role of the Internet, distance learning, e-books, and interactive multimedia learning environment in teaching and learning processes. Consequently, school teachers should follow the trend and realize to utilize computers and network for assisting the instruction to combine the instruction with technology and information network as well as design learning activity integrating information technology into subjects to change the teaching styles and innovate the new way for knowledge transfer. Doug (2012) also emphasized to treat computers as mind tools or cognition tools for learners proceeding meaningful thinking and to help students construct personal knowledge systems to achieve higher-level learning. It is worth mentioning that information integration is not computer teaching that it is not necessary to teach students all computer skills, but teach them computer skills for application; it is the so-called learning by doing (Chen & Pedersen, 2012). Multimedia learning refers to learning with characters and pictures that multimedia learning is also called dual-code learning and dual-channel learning. In other words, multimedia presentation is the message presentation with characters and pictures. Multimedia teaching message or multimedia teaching presentation is to explain learning with character and picture presentation (Oncu & Cakir, 2011). Zacharis (2011) proposed the derivative theory of multimedia learning which emphasized that all learning should go through the processes of graph-text selection, organization, and integration. Selection referred to picking relevant and important messages from character and non-character messages, storing in the working memory, and organizing and structuring selected character and non-character messages to form two logical scenario models, which are then integrated and combined (Sadafet al., 2012).

Reciprocal Teaching

Esfendahad (2010) pointed out the function of education as to promote mental development through special social languages that the dialogues between teachers and students and among students became critical. Reciprocal Teaching, a socio-instructional approach developed by Artino & Jones (2012) based on Vygotsky's idea, is a kind of reading strategy teaching to enhance reading comprehension. With commonly discussed reading material contents to enhance and monitor individual student's understanding of reading materials, it could assist teachers in promoting students' self-regulation and thinking of reading comprehension through the dialogues.

Cheng & Tsai (2011) indicated that Reciprocal Teaching should contain the following points.

(1) Predicting

Predicting referred to readers, based on the prior knowledge, predicting the possible contents of reading materials or the results with the titles or graphic illustrations or the possible contents of the following paragraphs according to the description in the previous paragraph in the reading materials.

(2) Questioning

Questioning referred to readers, before, during, and after reading, forming questions from the key concepts in the article and self-requesting to check the comprehension condition. It not only helped readers recognize main messages and key points in the article and explained readers' integration of the article but also led students more actively monitoring personal comprehension.

(3) Summarizing

Summarizing referred to readers being able to find out the key concepts of the author from the paragraph contents and the full contents of reading materials. Readers, during summarizing, had to decide the messages in the reading materials being inclusive, irrelevant, or trivial and to re-organize messages to ensure the summary conforming to the author's meaning.

(4) Clarifying

Clarifying referred to readers immediately adopting proper strategies, when encountering difficult and incomprehensible sentences in the reading process, to improve the reading comprehension by applying some repair strategies, such as read-again and context reasoning, so as to simplify difficult comprehensive contents to guide the thinking.

Comprehension

Comprehending the meaning of a question and recognizing the major part of a question (e.g. what is unknown, what are known messages, and what are the conditions) are the basis of problem-solving (Ellis et al., 2011). Asghar et al. (2012) pointed out at least three elements covered in "comprehension", including comprehensive objects, knowledge representation structure, and the match or adaptation between knowledge representation structure and objects. Comprehension has questions be the comprehensive objects to generate meaningful translation through topics and transfer the topic contents into proper knowledge representation. Such knowledge representation is structural in brains and could include or expand existing knowledge network.

Chen (2014) regarded three professional elements of successful comprehension, namely 1. conceptual understanding, which was the knowledge in the read topic, textual schemata, and glossaries, 2.automated basic skills, containing word decoding skills and the ability of proposition with strings of words, and 3.strategy, containing readers' personal approaches, which depended on personal purposes and the self-comprehension process.

Referring to Ellis et al. (2011), three levels of understanding covered in comprehension are proposed in this study.

(1) Surface understanding: Questions are directly in the article content.

(2) Deep understanding: Answers of questions could be comprehended through the deduction of article clues.

(3) Personal experience: Comprehension is combined with personal experiences.

Learning Effectiveness

Generally, the so-called learning effectiveness is the evaluation of learners proceeded after completing certain learning activity and the expected effect of the learning activity (Cho & Kim, 2013). In other words, it could be the change of learners' knowledge, skills, behaviors, and attitudes after the instruction (Icek, 2011). Chandra & Watters (2012) indicated that the evaluation of learning effectiveness was a series of data and information collection whether students' capability satisfied the curriculum goals. Such an evaluation was preceded during the course and was generally through assignation. Zhu (2012) regarded learning evaluation as collecting correct data related to learners' learning behaviors and the achievement by applying scientific methods and techniques and analyzing, studying, and judging learners' learning performance based on the instructional objectives. Wischow et al. (2013) mentioned that learning effectiveness was the index to measure a student's learning outcome as well as a major item in the teaching quality assessment. Such a performance evaluation could stimulate and guide students' learning, and the evaluation results could have students and teachers understand the learning and teaching outcome to explain or improve teaching effectiveness.

Marković & Jovanović (2011) pointed out learners' self-assessment as the most convincing assessment. Paveret al. (2014) indicated that most research applied self-assessment to measure learners' behavior change after learning. Most researchers assessed learning effectiveness with students' self-assessment on the questionnaire. Referring to the design of Leeet al. (2013), learning effectiveness in this study is measured with the dimensions of curriculum teaching (including curriculum design, teacher qualification, and teaching style), learning environment, and learning outcome (containing professional knowledge, skills, and learning effect).

Research Hypothesis

Cheng & Tsai (2011) found out the significant progress of the experimental group in the research on the effect of Reciprocal Teaching on recognition skills and comprehension capability, and the progress appeared more remarkable with longer experimental period. Doug (2012) observed the effectiveness of natural science teachers applying reciprocal teaching strategy to guide students constructing scientific articles. The result showed that students improved the comprehension with continuous effects and could deepen the concepts when teachers offered beneficial and clear demonstration of reciprocal teaching strategies to guide meaningful dialogues of students through practice, appraisal, encouragement, and feedback. Asgharet al. (2012) also discussed the effect of Reciprocal Teaching on G5 pupils and revealed the immediate and delayed effects of Reciprocal Teaching on comprehension, metacognitive capability, and motivation; besides, 80% pupils agreed with Reciprocal Teaching being able to enhance the comprehension and memory. When comparing the effects of Reciprocal Teaching and Traditional Teaching on pupils' comprehension capability, Zacharis (2011) also discovered that students with grouped Reciprocal Teaching appeared obviously better performance on the reading comprehension test than those receiving Traditional Teaching.

H1: Adventure education presents significant effects on comprehension.
H2: Reciprocal Teaching, under multimedia teaching, could better promote comprehension.

Aiming at senior high school students, Cho & Kim (2013) practiced the strategy instruction to understand the effect of Reciprocal Teaching on the promotion of students' learning effectiveness. The results showed that the experimental group outperformed the control group on the learning effectiveness. Chandra & Watters (2012) regarded Reciprocal Teaching as the best teaching model, which could effectively enhance students' learning effectiveness through the strategy instruction of questioning, clarifying, summarizing, and predicting. Paveret al. (2014) discovered that students in the experimental group notably outperformed those in the control group on the learning effectiveness. Zhu (2012) applied Reciprocal Teaching to adult English courses and concluded that 90% students agreed with Reciprocal Teaching, in comparison with Traditional Teaching, being beneficial to the learning effectiveness. It further indicated that Reciprocal Teaching, which provided space for students' thinking, was a good tool for individual learning of students and concept integration of organizations.

H3: Adventure education shows remarkable effects on learning effectiveness.

H4: Reciprocal Teaching, under multimedia teaching, could better enhance learning effectiveness.

RESEARCH HYPOTHESIS AND DESIGN

Research Object and Research Design

To effectively achieve the research objective and test the research hypotheses, the nonequivalent pretest posttest control group design is utilized for the quasi-experiment research. Total 236 students in two classes each from Xiamen University and Fuzhou University in Fujian Province are selected as the research objects. Two classes, as the experimental classes (118 students), are instructed with Reciprocal Teaching, while the other two classes, as the control classes (118 students), maintain the traditional didactic teaching. The 32-week experimental instruction is proceeded for 3 hours per week (total 96 hours), and the first 16 weeks are the instruction without multimedia teaching, while the last 16-week instruction is integrated with multimedia teaching.

Analysis Method

Analysis of Variance is applied in this study to discuss the effect of Reciprocal Teaching on comprehension and learning effectiveness and further understand the effect of Reciprocal Teaching matched with multimedia teaching on comprehension and learning effectiveness.

ANALYSIS AND RESULT

Analysis of Variance of Reciprocal Teaching Towards Comprehension

In this section, the effect of Reciprocal Teaching on comprehension is discussed based on Analysis of Variance. From **Table 1**, Reciprocal Teaching presents significant differences from Traditional Teaching on surface understanding, and Reciprocal Teaching shows higher surface understanding than Traditional Teaching; Reciprocal Teaching and Traditional Teaching appear remarkable differences on deep understanding, and Reciprocal Teaching reveals higher deep understanding than Traditional Teaching; moreover, Reciprocal

Teaching shows notable differences from Traditional Teaching on personal experience, and Reciprocal Teaching reveals higher personal experience than Traditional Teaching. H1 is therefore supported.

Table 1. Analysis of Variance Between Reciprocal Teaching And Comprehension

	Variable	F	P	Scheffe post hoc
Reciprocal Teaching	Surface understanding	11.422	0.000**	Reciprocal Teaching>Traditional Teaching
	Deep understanding	13.573	0.000**	Reciprocal Teaching>Traditional Teaching
	Personal experience	12.336	0.000**	Reciprocal Teaching>Traditional Teaching

* stands for p<0.05, ** stands for p<0.01

Analysis of Variance Between Reciprocal Teaching and Learning Effectiveness

According to Analysis of Variance, the effect of Reciprocal Teaching on learning effectiveness is discussed in this section. From **Table 2**, Reciprocal Teaching appears significant differences from Traditional Teaching on curriculum teaching, and Reciprocal Teaching presents higher curriculum teaching than Traditional Teaching; Reciprocal Teaching and Traditional Teaching show remarkable differences on learning environment, and Reciprocal Teaching reveals higher learning environment than Traditional Teaching; finally, Reciprocal Teaching appears notable differences from Traditional Teaching on learning outcome, and Reciprocal Teaching appears higher learning outcome than Traditional Teaching. Accordingly, H3 is supported.

Table 2. Analysis Of Variance Between Reciprocal Teaching And Learning Effectiveness

	Variable	F	P	Scheffe post hoc
Reciprocal Teaching	Curriculum teaching	11.273	0.003**	Reciprocal Teaching>Traditional Teaching
	Learning environment	13.568	0.000**	Reciprocal Teaching>Traditional Teaching
	Learning outcome	10.921	0.000**	Reciprocal Teaching>Traditional Teaching

* stands for p<0.05, ** stands for p<0.01

Effects of Integrating Multimedia Teaching into Reciprocal Teaching

The effect of integrating multimedia teaching into Reciprocal Teaching on comprehension and learning effectiveness is discussed based on Analysis of Variance. Furthermore, the interaction between multimedia teaching and Reciprocal Teaching is discussed with Two-way Analysis of Variance to prove the promotion effect of multimedia teaching. From **Table 3**, multimedia teaching appears the highest comprehension and the highest learning effectiveness that H2 and H4 are supported.

Table 3. Analysis of Variance Between Reciprocal Teaching and Statistic Learning Effectiveness

Variable	Comprehension			Learning effectiveness		
	F	P	Scheffe post hoc	F	P	Scheffe post hoc
Reciprocal Teaching	22.378	0.000**	Reciprocal Teaching>Traditional Teaching	26.551	0.000**	Reciprocal Teaching>Traditional Teaching
Multimedia teaching	18.426	0.000**	Multimedia teaching>Traditional Teaching	19.415	0.000**	Multimedia teaching>Traditional Teaching
Reciprocal Teaching*multimedia teaching	36.207	0.000**	21>11>12>22	44.513	0.000**	21>11>22>12

* stands for $p<0.05$, ** stands for $p<0.01$

CONCLUSION

This study investigates the effect of creative thinking on students' creative thinking ability. The results show that Reciprocal Teaching stresses on common construction and learning through the interaction between teachers and students and among students, the spirit of group cooperation, and group honor so that those with high capability are willing to lead ones with low capability, while those with low capability could automatically learn and enhance the learning effectiveness by applying strategies to the real common practice through the guidance of leaders in the learning process. Teachers inspecting the groups and timely giving guidance could have students fully understand the meaning and application of strategies. In this case, the cooperative practice among groups is an essential route for students getting into independent learning. Students could successfully apply strategies in the learning activity by mastering the strategy application. In the reciprocal teaching process, the student-student and peer dialogues could be internalized to become self-conversation. Teachers should provide scaffolds for students and systematically guide the practice strategy to become mastery. What is more, the inclusion of multimedia materials could effectively enhance students' attention that systematically planning teachers' professional training through multimedia curriculum design and matching with students' learning factors could enhance students' potential development zones and have students effectively develop the function of Reciprocal Teaching, i.e. promoting the process adjusted by others to the self-monitoring process to achieve the active learning.

SUGGESTION

1. Integrating information into instruction: The integration of information into instruction expects to promote students' learning achievement and motivation with the advantages of technology. Although it is to simply place multimedia materials on the network, network learning resources could indeed spread the resources deeper and broader so that researchers and learners could simply browse the Internet to access to the inexhaustible resources. It is therefore expected that teachers could well utilize such a tactic for students' happy and

efficient learn.

2. Reinforcing teaching design: Future research is suggested to precede multiple assessments after unit instruction to offer students with true and effect feedback about students' absorption, the construction and reinforcement of prior knowledge, the adjustment of teaching design, the control of teaching process, and the presentation of research results.

3. Assisting students in the reading process: It is suggested that teachers could assign students, according to the capability, to answer questions and give encouragement and assist students in the successful presentation to establish the confidence and further build personal comprehension model. Concerning about students with imitation situation, teachers are suggested to timely give guidance and monitoring and induce their thinking ability and imagination to give guidance.

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