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THE EFFECTS OF MULTIMEDIA ASSISTED INSTRUCTION AND TRADITIONAL INSTRUCTION ON STUDENTS' LEARNING MOTIVATION AND TABLE TENNIS LEARNING ACHIEVEMENT

Abstract

More recent motivational research focuses on the identification of effective techniques for enhancing instructional design and improving student learning. A general model for motivational design of instruction is described and reviewed in terms of its application to college physical education contexts. Learning-motivation researchers are applying some of the same theories and concepts found to be effective in industry to the development of motivational models that enhance the teaching-learning environment. One such model is the ARCS Model of Motivational Design developed by John M. Keller (Keller, 1983, 1987). An ARCS is a systematic model for designing motivating instruction. This digest will describe the ARCS Model, and will outline some of the ways in which Attention, Relevance, Confidence, Satisfaction components may be applied to instructional design. Therefore, the purpose of this research was to investigate the effects of multimedia assisted instruction (MAI) and traditional instruction (TI) on students' learning motivation and table tennis learning achievement.

Two undergraduate table tennis sessions were selected as the research samples. One session was randomly assigned to be taught by using MAI and the other session was by TI. Based on the result of ARCS Survey for learning motivation, the data was examined the difference on several factors before and after the teaching and across different methods. Basically, four findings were observed. First, for each group, the learning achievement, motivation, attention, confidence, and satisfaction of students are better or higher than untrained. However, the relevance perception about motivation was not significant before or after the teaching. Second, across two control groups, students in the MAI group perform significantly better in forth mentioned factors. Nevertheless, the relevance perception about motivation was not significant between groups. Third, for the MAI group, forth mentioned factors are significantly positively related after the teaching, except the relevance perception about motivation. Lastly, the results pointed out that the satisfaction factor from the ARCS Survey could be used to predict the table tennis learning achievement. In conclusion, the results suggested the ARCS Model of Motivational Design which is an easy-to-apply, heuristic approach to increasing the motivational appeal of instruction in college physical education. An ARCS Model provides a useful framework for both the design and improvement of the motivational quality of table tennis activity increases the likelihood that these entities will be used and enjoyed in college physical education.

Key words: *Multimedia Assisted Instruction, Traditional Instruction, Learning Motivation, Table Tennis*

Introduction

A strong paradigmatic belief can be noted in the benevolent effects of multimedia for a wide variety of application domains, not in the last place Multimedia Assisted Instruction (Heller, 1990). In literature and multimedia projects (Hoogeveen, 1994) one can recognize a set of convictions, based on observations and experimental findings, with regard to the effectiveness of multimedia which is described below in the form of the multimedia paradigm. The multimedia paradigm is the dominant conviction that adding multimedia functionality to information systems leads to improved information and knowledge transfer to people. In other words, the multimedia paradigm is about the vision of computers as effective "tools for the mind" (Marmolin, 1991). The interaction of

independent multimedia variables is supposed to lead to a number of psychological responses:

1. a high level of stimulation of the senses, at least with regard to the auditory and visual perception systems;
2. a high level of involvement, attention, concentration;
3. emotional arousal, e.g., fun; the word arousal is used in the internal arousal, related to arousal of the nervous system;
4. strong recognition effects, using mental reference models.

From those view points, one such model is the ARCS Model of Motivational Design developed by John M. Keller of Florida State University (Keller, 1983, 1987). An ARCS is a systematic model for designing motivating instruction. The ARCS Model of Motivational Design is a well-known and widely applied model of instructional design. Simple, yet powerful, the ARCS Model is rooted in a number of motivational theories and concepts, (Keller, 1983) most notably expectancy-value theory (Vroom, 1964; Porter & Lawler, 1968). The ARCS Model identifies four essential strategy components for motivating instruction (Keller, 1983, 1996) including attention, relevance, confidence, and satisfaction.

Attention: The first and single most important aspect of the ARCS model is gaining and keeping the learner's attention. Keller's strategies for attention include sensory stimuli (as discussed previously), inquiry arousal (thought provoking questions), and variability (variance in exercises and use of media).

Relevance: Attention and motivation will not be maintained, however, unless the learner believes the training is relevant. Put simply, the training program should answer the critical question, "What's in it for me?" Benefits should be clearly stated. For a sales training program, the benefit might be to help representatives increase their sales and personal commissions. For a physical activity program, the benefit might be to reduce the number of people getting poor fitness condition. For a table tennis activity program, the benefit to users could be to make them higher skill performance in game activities.

Confidence: The confidence aspect of the ARCS model is required so that students feel that they should put a good faith effort into the program. If they think they are incapable of achieving the objectives or that it will take too much time or effort, their motivation will decrease. In physical education programs, students should be given estimates of the time required to complete lessons or a measure of their progress through the program.

Satisfaction: Finally, learners must obtain some type of satisfaction or reward from the learning experience. This can be in the form of entertainment or a sense of achievement. A self-assessment game, for example, might end with an animation sequence acknowledging the player's high score. A passing grade on a post-test might be rewarded with a completion certificate. Other forms of external rewards would include praise from a supervisor, a raise, or a promotion. Ultimately, though, the best way for learners to achieve satisfaction is for them to find their new skills immediately useful and beneficial on their job.

However, an area of concern for physical education teachers is the motivation of students to participate in physical activities. Motivation for involvement in physical education is clearly a concern for physical education teachers. Although, motivation has been studied for over thirty years in classroom or competitive sport settings, there is a deficiency of research relating to motivation for participation in school physical education.

Statement of the Problem

The purpose of this study was to investigate the effects of multimedia assisted instruction (MAI) and traditional instruction (TI) on students' learning motivation and table tennis learning achievement. The research question were as follow:

1. Compare the MAI and TI with table tennis on students' attention, relevance, confidence, satisfaction of learning motivation in college physical education.
2. Compare the MAI and TI with table tennis on students' skill of table tennis in college physical education.

3. analyze the effect of students' attention, relevance, confidence, satisfaction of learning motivation on their skill of table tennis in college physical education in the MAI.

Assumptions

The following assumptions were made regarding this study:

- 1. ARCS Survey in Physical Education and Table Tennis Skill Test are valid and reliable measures.**
2. The students have sufficient background in the physical education experience to make meaningful, evaluative responses.
3. The students are capable of understanding and interpreting the ARCS Survey in Physical Education and Table Tennis Skill Test.
4. The students are truthful in responding to the ARCS Survey in Physical Education and Table Tennis Skill Test.

Limitations

The participants in this study were limited to the college students and their physical education instructors in I-Lan City in Taiwan. Therefore, generalizations of the results in this study have to be cautious when applied to the other population of college students located in other cities in Taiwan. Students responding on the ARCS Survey in Physical Education and Table Tennis Skill Test may have been influenced by past experiences, emotion, mood, and social desirability.

Definition of Terms

Attention: Increase perceptual arousal with the use of novel, surprising, incongruous and uncertain events. Increase inquiry arousal by stimulating information seeking behavior; pose or have the learner generate questions or a problem to solve. Maintain interest by varying the elements of instruction.

Relevance: Emphasize relevance within the instruction to increase motivation. Use concrete language and examples with which students are familiar. Provide examples and concepts that are related to learners' previous experiences and values. Present goal orienting statements and objectives. Explain the utility of instruction for both present and future uses.

Confidence: Allow students to develop confidence by enabling them to succeed. Present a degree of challenge that allows for meaningful success under both learning and performance conditions. Show the student that his or her expended effort directly influences the consequences. Generate positive expectations. Provide feedback and support internal attributions for success. Help students estimate the probability of success by presenting performance requirements and evaluation criteria.

Satisfaction: Provide opportunities to use newly acquired knowledge or skill in a real or simulated setting. Provide feedback and reinforcements that will sustain the desired behavior. Maintain consistent standards and consequences for task accomplishments. Manage reinforcement: keep outcomes of learner's efforts consistent with expectations.

Multimedia assisted instruction: Multimedia is used here in the sense of the property of a system or object indicating that multiple information types, such as speech, music, text, graphic, still, animation and video with fundamental skills of table-tennis are used in an integrated manner.

Research Methods

Participants

Two undergraduate table tennis sessions were selected as the research samples. Participants in this study were 87 Physical Education students (50 male, 37 female, age: $M = 20 \pm 1$, 48), and they were characterized as beginners. One session was randomly assigned to be taught by using MAI including 44 students and the other session was by TI including 43 students.

Table 1 Participants

Variables	MAI Group	TI Group	Total
Number	44	43	87

Instruments

1. **The ARCS Survey in Physical Education (ARCSSPE)** was adapted from Keller's ARCS theory (1999) asks students to rate 34 ARCS-related statements in relation to the instructional materials they have just used. The ARCSPE was rated using Likert type scales as 1 = Not True; 5 = Very True. A high degree of internal consistency for the subscales has been demonstrated in several studies (Chiu-Ju Lu, Chien-Chih Chou, Hsiu-Li Tsui, Mei-Chi Cheng, & Kuo-Chuan Tsai, 2005) with coefficients for the factors of attention, relevance, confidence, and satisfaction of .78, .82, .76, & .83. Some examples were:

- (1). These materials are eye-catching (*Attention*).
- (2). It is clear to me how the content of this material is related to things I already know (*Relevance*).
- (3). As I worked on this lesson, I was confident that I could learn the content (*Confidence*).
- (4). Completing the exercises in this lesson gave me a satisfying feeling of accomplishment (*Satisfaction*).

2. **Table Tennis Test:** The Table Tennis Skill Test included the skills of forehand drive, backhand drive, and which was designed by the National Ministry of Education (1997).

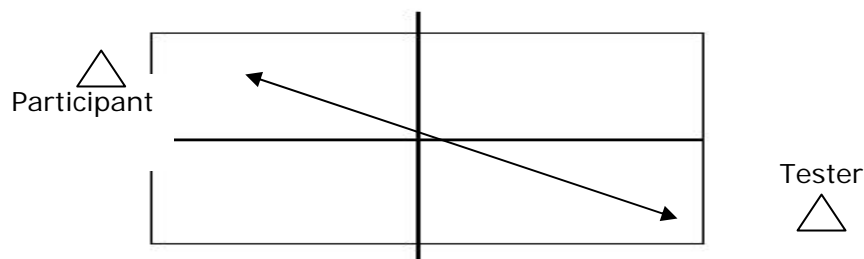


Figure 1. backhand drive

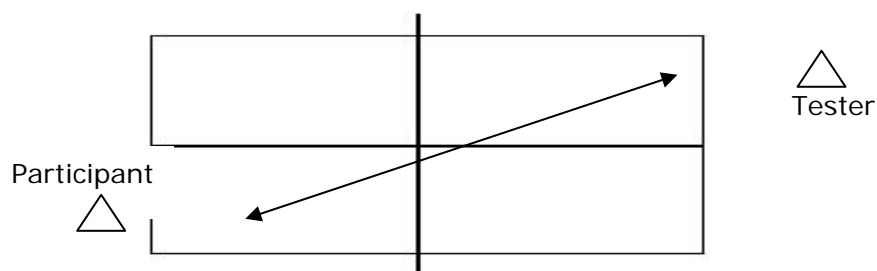


Figure 2. forehand drive

Intervention of the Treatments

1. The college students in the MAI Group received an intervention of multimedia assisted instruction with combination of table tennis. The multimedia

assisted instruction was designed based on the fundamental skills of forehand and backhand skills for 10 minutes long on each class. The following equipment was used for the conduct of the study, desktop computer GIGABYTE, Pentium 4, 2.0 GHz and Mini DV camera Sony Digital Handy cam TRV40. Specific multimedia videos were developed that included the methodology of table-tennis for beginners. Electronic stopwatch (F.I.S. approved) and 42 inches Sony TV with High Definition.



Figure 3. Example of MAI

2. The TI Group received an intervention of traditional instruction with regular table tennis during the teaching.

Procedure of Data Collection

Data were gathered from an introductory 8-week table tennis unit (sixteen introductory lessons of 40 minutes each on table tennis unit) taught to college students by a physical education teacher. The ARCSSE and table tennis skill test were administrated to the students as measuring their skills and learning motivation in the pre-test and post-test.

Interactive Instructional videos with MCI were developed and re-edited for the needs of the study which included all the teaching objectives for beginners' table-tennis according to Level 1 Professional tennis Instructors Association of America and Taiwan. The videos were constructed in hierarchical structure. The demonstration of the drills was made by a member of Taipei Physical Education College Table-Tennis team, and recording was made

by a DV camera (100HZ). Using digital video edit tool unwanted sounds of the environment were deleted and narration was added. Participants of both groups followed for eight weeks exactly the same table-tennis program in college physical education and they were taught by the same instructor. Every participant of the MCI group before every classes teaching was interacting for ten minutes with the Interactive Instructional videos under the guidance of his / hers instructor. Information about the objective of the teaching session was given to the participants by the Interactive Instructional videos in the form of text, photo, video and narration. At the same time participants of the TI were receiving ten minutes lecture, the same information but in the form of oral instructions. Teaching sessions of the MG group were recorded using a Digital Video camera and separate archives were captured for every participant of the MG group. The subjects of the MG group right after every teaching session were interacting with the interactive instructional videos for ten minutes under the guidance of their instructor and watching themselves table-tennis skill. They were receiving feedback from their instructor about their technique and their performance. At the same time participants of the TI in the same way they were receiving feedback in the form of oral instructions. On the eighth week two tests were assessed for both groups: ARCSSPE and table tennis skill test.

Data analysis

Statistical Package for the Social Sciences (SPSS/PC 10.0) was used for statistical analysis, and the .05 level ($P < .05$) was used to determine any significant differences. The statistical methods employed for data processing included independent t-test and paired-sampling t-test.

Results

Homogenous Analysis of MAI Group and TI Group on Learning Motivation in the Pre-test

As seen in Table 2: The learning motivation score before instruction showed no significant variation level, signifying the homology of variables of the two groups ($P > .05$).

Table 2. Homogenous Analysis of MAI Group and TI Group on Learning Motivation in the Pre-test

Statistical Items	Group	Mean	SD	Levene	F	Sig.
Learning Motivation	MAI	2.83	.20	.008	2.20	.929
	TI	2.77	.18			
	Sum Square	Between Group	8.10			
		Within Group	3.14			
		Total	3.22			
	Mean Square	Between Group	8.10			
	Within Group	3.69				

* $p < .05$

As seen in Table 3: The table tennis skill scores before instruction showed no significant variation level, signifying the homology of variables of the two groups ($P > .05$).

Table 3. Homogenous Analysis of MAI Group and TI Group on Table Tennis Skill in the Pre-test

Statistical Items	Group	Mean	SD	Levene	F	Sig.
Table Tennis Skill	MAI	4.31	4.67	.008	.05	.928
	TI	4.53	4.55			
	Sum Square	Between Group	1.02			
		Within Group	1807.03			
		Total	1808.05			
	Mean Square	Between Group	1.02			
		Within Group	21.26			

* $p < .05$ **Comparison of Pre-test and Post-test on Learning Motivation and Table Tennis Skill for MAI Group**

According to table 4, The leaning motivation and table tennis skill results on the pre-test and posttest showed that even if posttest of MAI group was significant different to pre-test, but there was not significant different on the factor of relevance.

Table 4. Comparison of Pre-test and Post-test on Learning Motivation and Table Tennis Skill for MAI Group

Factors	Test	Number	Mean	SD	df	t-value	sig
Leaning Motivation	Pre-test	44	2.83	.20	43	-2.73*	.01
	Post-test	44	2.98	.30			
Attention	Pre-test	44	2.86	.20	43	-2.04*	.05
	Post-test	44	3.02	.47			
Relevance	Pre-test	44	2.81	.23	43	- .66	.51
	Post-test	44	2.83	.26			
Confidence	Pre-test	44	2.95	.34	43	-2.01*	.05
	Post-test	44	3.10	.41			
Satisfaction	Pre-test	44	2.73	.21	43	-3.02*	.00
	Post-test	44	2.98	.51			
Table Tennis Skill	Pre-test	44	4.31	4.67	43	-9.76*	.00
	Post-test	44	31.36	19.61			

 $p < .05$ **Comparison of Pre-test and Post-test on Learning Motivation and Table Tennis Skill for TI Group**

According to table 5, The leaning motivation and table tennis skill results on the pre-test and posttest showed that even if posttest of TI group was significant different to pre-test, but there was not significant different on the factor of relevance.

Table 5. Comparison of Pre-test and Post-test on Learning Motivation and Table Tennis Skill for TI Group

Factors	Test	Number	Mean	SD	df	t-value	sig
Leaning Motivation	Pre-test	43	2.77	.18	42	-2.69*	.01
	Post-test	43	2.85	.22			
Attention	Pre-test	43	2.75	.27	42	-2.38*	.02
	Post-test	43	2.85	.30			
Relevance	Pre-test	43	2.79	.23	42	-1.37	.18
	Post-test	43	2.84	.21			
Confidence	Pre-test	43	2.85	.29	42	-1.99*	.05
	Post-test	43	2.95	.33			
Satisfaction	Pre-test	43	2.71	.16	42	-2.18*	.03
	Post-test	43	2.78	.21			
Table Tennis Skill	Pre-test	43	4.53	4.55	42	-7.90*	.00
	Post-test	43	22.09	15.51			

p < .05

Comparison between MAI Group and TI Group Post-test on Learning Motivation and Table Tennis Skill

According to table 6, the result show that after interfere of MAI group, analysis of independent t-test with posttest of the movement skill, as show in the follow: The results on the posttest showed that even if the MAI group was significant to comparison group on leaning motivation, attention, confidence, satisfaction, and table tennis skill, but there was no significantly different on the factor of relevance.

Table 6. Comparison between MAI Group and TI Group Post-test on Learning Motivation and Table Tennis Skill

Factors	Group	Number	Mean	SD	df	t-value	sig
Leaning Motivation	MAI	44	2.98	.30	85	2.21*	.03
	TI	43	2.85	.22			
Attention	MAI	44	3.02	.47	85	2.07*	.04
	TI	43	2.85	.30			
Relevance	MAI	44	2.83	.26	85	- .18	.86
	TI	43	2.84	.21			
Confidence	MAI	44	3.10	.41	85	1.98*	.05
	TI	43	2.95	.33			
Satisfaction	MAI	44	2.98	.51	85	2.45*	.01
	TI	43	2.78	.21			
Table Tennis Skill	MAI	44	31.36	19.61	85	2.44*	.01
	TI	43	22.09	15.51			

* p < .05

Regression Analysis of Leaning Motivation on Table Tennis for MAI

The results from regression model indicated the factors of satisfaction on the leaning motivation could predict the students' table tennis skill when they were involved participating MAI in physical education(table 7).

Table 7. Regression Analysis of Learning Motivation on Table Tennis for MAI

Group	R	R ²	R ² Change	Variant analysis	Sum of square	F value	β	t-value
				regression	4680.50			
MAI	.53	.28	.27	redual	11849.39	6.11	Satisfaction	0.53
				total	16529.87			4.07*

* p < .05

Independent Variables: attention, relevance, confidence, satisfaction
Dependent variable: Table Tennis Skill

Conclusion

Motivation may come from numerous sources, but learning motivation is particularly important in physical education and sports. MAI with table tennis units offers an approach to diagnosing students' motivational issues while teach PE in college level. As Keller (1996) defined learning motivation as the degree to which an individual chooses to participate in an activity for the pleasure derived rather than for any extrinsic reward that may be forthcoming. When people are intrinsically motivated, they experience interest and enjoyment in an activity as well as feelings of competence and control. However, Keller (1999) has developed a model of motivation that addresses four components of learning. Attention, relevance, confidence, and satisfaction are the components known as the ARCS model of motivation. Both learners and instructors use this model to effectively engage or present learning episodes. Each component is serially related; that is, student attention must be completed before relevance is addressed. Students must find relevance and engage in the learning experience before they can acquire confidence in the knowledge. Gaining confidence allows the student to utilize the task learned. Therefore, the student may feel satisfied that they engaged in the learning experience (Fernández & Dabbagh, 1999). Finally, developing life-long college students, who are motivated, display intellectual curiosity, find learning enjoyable, and continue seeking knowledge after their formal instruction which has always been a major goal of education.

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