DOCUMENT RESUME

ED 427 774 IR 019 431

AUTHOR Guan, Yi; Wang, Jianjun; Gable, Robert K.; Young, Michael F.
TITLE Student Attitudes toward Multimedia Classrooms.
PUB DATE 1998-00-00
NOTE 21p.; Paper presented at the Eastern Educational Research Association Conference (Tampa, FL, February 26, 1998).
PUB TYPE Reports - Research (143) -- Speeches/Meeting Papers (150) -- Tests/Questionnaires (160)
EDRS PRICE MF01/PC01 Plus Postage.
DESCRIPTORS College Students; *Computer Assisted Instruction; *Computer Attitudes; Computer Managed Instruction; Computer Uses in Education; Higher Education; Instructional Materials; *Multimedia Materials; Questionnaires; Sex; *Student Attitudes; Student Motivation

ABSTRACT

The purpose of this study was to develop a valid and reliable instrument to measure students' attitudes toward multimedia classrooms and to investigate students' attitudes toward learning in multimedia classrooms. The research questions examined: (1) whether the instrument of students' attitudes toward multimedia classrooms valid and reliable; (2) students' attitudes toward multimedia classrooms; (3) whether there are differences among various classes with respect to students' attitudes; (4) whether differences exist between male and female students with respect to their attitudes; and (5) whether there is any interaction between types of course and gender with respect to students' attitudes. The study of 166 participants (students at a large university in the northeastern United States) showed that the attitude instrument was moderately reliable and valid. The mean scores of attitude items were high. There were no interactions between types of courses and gender, and there were no significant differences across courses with respect to attitudes. Female participants had significantly higher attitude scores than male participants. Contains 6 tables and "Attitudes towards Multimedia Classroom" questionnaires are appended. (Author/AEF)

Running head: STUDENT ATTITUDES TOWARD MULTIMEDIA CLASSROOMS

Student Attitudes toward Multimedia Classrooms

Yi Guan
Jianjun Wang
Robert K. Gable
Michael F. Young
University of Connecticut

A Research Paper
Presented
at
Eastern Educational Research Association Conference, Tempa, Florida February 26, 1998

Yi Guan
Dept. of Educational Psychology
University of Connecticut
Phone: (860) 887-0832
Fax: (860) 774-7768
E-mail: yig94001@uconnvm.uconn.edu

Jianjun Wang
Dept. of Educational Psychology
University of Connecticut
Phone: (860) 429-1411
FAX: (860) 486 -0195
E-mail: jianjun@uconnvm.uconn.edu

Robert Gable
Dept. of Educational Psychology
University of Connecticut
Phone: (860) 486-0168
FAX: (860) 486 -0195
E-mail: Gable@uconnvm.uconn.edu

Michael Young
Dept. of Educational Psychology
University of Connecticut
Phone: (860) 486-0182
FAX: (860) 486 -0195
E-mail: myoung@uconnvm.uconn.edu

Abstract

The purpose of this study aims to develop a valid and reliable instrument to measure students' attitudes toward multimedia classrooms and to investigate students' attitudes toward learning in multimedia classrooms.

The research questions are: (1) Whether the instrument of students' attitudes toward multimedia classrooms is a valid and reliable instrument? (2) What are the students' attitudes toward multimedia classrooms? (3) Are there any differences among various classes with respect to students' attitudes? (4) Do differences exist between male and female students with respect to their attitudes? (5) Is there any interaction between types of course and gender with respect to students' attitudes?

The study with 166 participants showed that the attitude instrument was moderate ly reliable and valid. The mean scores of attitude items were high, from 3.66 to 4.41. There were no interactions between types of courses and the gender. There were no significant differences across courses with respect to attitudes. Female participants had significantly higher attitude scores than male participants.

Background of the Study

On the campus of a northeastern large university, many classrooms have been newly renovated. Media equipment, such as a document camera, a VCR, a slide projector, and networked computers, are set up in these classrooms. Such multi-formats of media accompanied with lighting, stereo sound, and artistic decorations provide students with a new learning environment.

As Hofstetter (1993) states, multimedia promises to transform our nation's classrooms from a dull and lifeless chalk dust atmosphere into an engaging multimedia environment rich in color imagery, full-motion video, and stereo sound. Computers provide teachers with instant access to every slide they have shown and all their lesson plans, with hypermedia links to audio and video clips for effective teaching and learning (Hofstetter, 1993).

Research relating to multimedia learning environment has been done in recent years. Faculty attitudes toward the use of the multimedia classrooms have been studied (Anderson, J. A. & Cichocki, R. R., 1993). Among these studies, the most comprehensive one to date has been done by Spotts and Bowman (1993). They have investigated factors that influence use of technology in such new classrooms. Several factors were discovered by surveying university faculty. These factors include the certainty that multimedia technology will contribute to improve student learning, availability of equipment, funds to purchase materials, advantages over traditional delivery methods, contribution to improved student interest, time to learn the technology, and university supports (Spotts & Bowman, 1993). These factors can be classified into two categories, contributions to improve student learning and services aiming at faculty utilization of the media.

It became apparent that few studies have been done to examine what students feel about learning in such environment. Therefore, we decided to hear students' voices on learning in multimedia classrooms. According to Fishbein and Ajzen (1975), attitude is defined as "a learned predisposition to respond in a consistent favorable and unfavorable manner with respect to a given object (p. 6)."

In this study, we conceptualized attitudes as student personal feelings about his or her learning activities and about ways of using multimedia equipment by the instructors. Based on these two categories of attitudes, we have developed an instrument with two dimensions.

Prior to making any conclusions of students' attitudes, we first aimed at developing a valid and reliable attitude instrument for this study. We believe that a high quality of an instrument not only helps us to acquire genuine results, but also helps other researchers to

conduct further study with the same instrument. In addition, using a valid and reliable instrument we have developed, university administrators would know what students really feel about their learning in such a multimedia learning environment in order to make right decisions in implementing this new technology in classrooms.

The reliability of an instrument is to measure whether the instrument provides us with an accurate assessment of the measured characteristics (Gable & Wolf, 1993). An accurate assessment signifies that items are internal consistent upon one administration of the instrument, as well as stable over time, given two administrations (Stanley, 1971). In our study, we used Cronbach alpha reliability coefficients to measure internal consistency of attitude items (Cronbach, 1951).

The validity of an instrument refers to the appropriateness, meaningfulness, and usefulness of the specific inferences made from the test scores (American Psychological Association, 1985, p. 9). Arguments for instrument validity are based on judgmental evidence and empirical evidence (Gable & Wolf, 1993). According to Gabble and Wolf (1993), judgmental evidence is acquired before the administration of the instrument to the target group through examining the adequacy of the operational definition of the construct. Empirical evidence should be obtained after the instrument has been administered to the target group. Evidence can be provided by factor analysis, documenting relationships among items within the instrument as well as the relationships to instruments measuring similar and different constructs.

Three common types of validity are content validity, construct validity, and criterion-related validity. According to Cronbach (1971), content validity represents that to what extent the items on the instrument adequately sample the intended universe of content. The evidence of content validity is generally judgmental and is mostly gathered before the administration of the instrument. The conceptual and the operational definitions of the affective characteristics are the focus of the evidence of content validity. The theoretical basis for the conceptual definitions is provided through a comprehensive review of literature done by the instrument developer. It is also suggested that content experts review the adequacy of the conceptual definition of the instrument. Operational definition is the design of items based on the content specified by the conceptual definition. A review of operational definitions should be carried out by the same content experts. Their assessments provide evidence that the sampling of items adequately reflects the intended universe of content (Gable & Wolf, 1993).

Construct validity addresses that to what extent constructs explain covariation in the responses to the items on the instrument. The construct validity argument focuses on response data variation among items to provide evidence that the proposed content

categories actually reflect constructs (Gable & Wolf, 1993). Evidence of construct validity is obtained from administering the instrument to a representative sample of respondents for which the instrument was designed. Many statistical techniques can be conducted to provide evidence of construct validity. Two of the analysis techniques used in this study are exploratory factor analysis (EFA) and confirmatory factor analysis (CFA).

In an exploratory factor analysis, the number of factors is determined by the analysis on the basis of the relationships among items. Once these factors are derived, the instrument developer examines whether they are sufficiently similar to the judgmentally developed content categories in order to support the construct validity (Gable & Wolf, 1993).

In a confirmatory factor analysis, the researcher proposes a theoretical model that the data are expected to fit. The model describes the number of factors to be derived and which variables are related to each factor. The results of the analysis indicate how well the empirical data fit the proposed model. The advantages of CFA over exploratory factor analysis (EFA) include: (1) yielding unique factorial solutions; (2) defining a testable model; (3) indicating the extent to which a hypothesized model fits the data; (4) specifying data on the model parameters to aid in improvement of the model; and (5) testing factorial invariance across groups (Marsh & Hocevar, 1983).

For a confirmatory factor analysis, there are several indexes to justify whether the responses of the data fit the proposed model. These indexes are X^2 goodness of fit, Tucker Lewis Index, and Bentler Bonett Index (Kenny, 1996). The closer its value to 1.00, the better fit the data will be.

Research Questions

For this study, we are addressing five research questions:

1. Whether the instrument of the students' attitudes toward multimedia classroom is a valid and reliable instrument?

2. What are the students' attitudes toward multimedia classrooms?

3. Are there any differences among different classes with respect to students' attitudes?

4. Do differences exist between male students and female students with respect to their attitudes?

5. Is there any interaction between types of courses and student gender with respect to their attitudes?

Methods and Procedure

A pilot study was conducted to collect evidence of the reliability and validity of the instrument. The instrument was initially developed with 13 items and demographic data with student name, gender, course name, and their majors (Appendix A). A five point Liker scale was used to measure student attitude levels. Two additional questions are also asked: (1) *Do you think a multimedia classroom is a cost -effective investment?* and (2) *Do you think UCONN should build more multimedia classrooms?*

The initial attitude instrument of 13 items was sent to four content experts to ensure content validity of the instrument. They are a professor with instrument development expertise, two media experts, and a professor who has extensively used the multimedia classroom for four years. Based on their suggestions, one item was rephrased and divided into two separate items and some items were revised. The same demographic inquiry and two questions were kept.

The instrument was then administered on a sample of 92 students in an undergraduate course and 37 students in a graduate course in the school of education. The classroom where students had their classes features a document camera, a VCR, a slide projector, a laserdisc player, CD player, a Gateway 2000 computer, and an Apple Quadra 900 computer as well as a two-way video-conferencing system, Dynacom.

The exploratory factor analysis on the pilot study extracted two major factors. They were named as: Learning Effects (Domain I) and Utilization Effects (Domain II).

The new version with 18 items (Appendix B) was then examined by six content experts. Four of them are professors who have extensively used the multimedia classrooms in teaching. Two are media specialists who have extensive knowledge of using multimedia classrooms. According to their suggestions, two items were dropped and most items were revised.

The final instrument has 16 items with demographic inquiry of course name and gender, and two same questions as the previous ones (Appendix C). The survey questionnaires were filled out by 166 students from three courses, two undergraduate courses and one graduate course. The two of the three courses are taken place in the same classroom.

The mean score of attitude items was computed to answer question 1. To answer question 2, Cronbach alpha reliability was employed to test the internal consistency of the attitude items. A confirmatory factor analysis was conducted to test whether the students' responses were consistent with the two-dimension model as revealed from the pilot study. A two-way ANOVA by course type and gender was performed to answer question 3, question 4, and question 5.

Data Analysis and Results of the Pilot Study

Initially, the data set was inspected for normality and patterns of missing responses. Although all items showed negative skewed shapes, high means and small variations, they were not transformed to stabilize the variance. This is because the pilot study was exploratory in nature and the main analysis was essentially an exploratory factor analysis. We had no intention to make any inferential assumptions.

Data screening also found two cases with missing data. We decided to drop these cases, and only cases with complete data were used in the analysis. The attrition rate was about 2% resulting in an N:P ratio 9.07:1.

An exploratory factor analysis (SPSS™ 6.1 Principle Axis Analysis) were performed on a group of 14 attitude items. Using the criterion of Eigenvalue = 1 (Rummell, 1970) three factors were extracted. The total item covariation explained by the three factors was 45%. Both orthogonal and oblique rotation yielded the same factor structure solutions with minor differences in loadings (See Table 1 and Table 2).

In both varimax and oblique rotations (See Table 1 and Table 2), the first two extracted factors matched our pre-assigned two dimensions: *learning effects and utilization effects*. The alpha internal consistency estimate for domain I is .85 and for domain II is .63 (See Table 3).

The third factor was an one-item factor. The item stated: A *document camera can display a better image to take notes from than an overhead.* This could result from the fact that subjects had little exposure to the equipment, so they rated the item from their imagination without experience. It could be the fact that comparing the visual quality between a document camera and an overhead projector is still a controversial issue.

Data Analysis and Results of the Second Study

Based upon the results of analysis on the pilot study, the names of the two domains were tentatively derived: Learning Effects (Domain I) and Utilization Effects (Domain II).

Since the reliability of the second factor, Utilization Effect, was only .63, five additional items were then added to improve the reliability of the instrument (Appendix B). This version of the instrument was then examined by six content experts. According to their suggestions, two items were dropped and most of items were revised.

The finalized instrument with 16 items (Appendix C) was administrated on total of 166 students, 33 graduate and 119 undergraduate students, from three courses. Two courses were held in the same classroom and one course was in a different classroom.

We first screened the data patterns for missing responses and normality. There were 13 out of 166 cases with missing responses and they were deleted from the analyses. The attrition rate was 7.83%. There were 16 items and the N : P ratio was 9.56:1. Fourteen out of 16 items were negatively skewed and 10 out of 16 items had peak shapes. Their standard deviations were from .76 to 1.01.

The Cronbach alpha reliability coefficients were obtained using SPSS 6.1. They were 0.84 for Learning Effect items and 0.83 for Utilization Effect items.

A confirmatory factor analysis was conducted with Lisrel 8 on IBM Mainframe. Based on our initial model, the attitude construct had two dimensions and CFA analysis assumed a two-factor model. For the original model, the adjusted X^2 goodness of fit was 0.75. The Bentler Bonett Index was 0.72 and the Tucker Lewis Index was 0.77. The original model had poor fit.

We then respecified the model by correlating error variances among some items. The finalized model with consideration of correlated errors fit our proposed two-factor model. The significance of the X^2 goodness of fit was 0.361 and it was non-significant. The adjusted X^2 goodness of fit was 0.84. The Bentler Bonett Index was 0.92 and the Tucker Lewis Index was 0.99. The loadings on Learning Effect factor were from .55 to .78 (See Table 6). The loadings on Utilization Effect factor were from 0.42 to 0.67 (See Table 6). All the loadings were significant.

The results of the confirmatory factor analysis showed that the respondent data fit the pre-specified two-factor model for the attitude construct. These results provided evidence that the participants' responses were consistent with our proposed two-dimension attitude model. The reliability coefficients were near 0.85. Therefore, the validity and reliability of our instrument were good and the instrument was acceptable for later study.

Mean scores of attitude items were from 3.66 to 4.41 (See Table 4). The maximum score for each item was 5.00. Therefore, these participants had quite positive attitudes toward learning in multimedia classrooms.

Before the ANOVA analysis, data transformation was first employed on those items with non-normal distribution. The transformed data were all normally distributed. The two-way ANOVA by course and gender with SPSS 6.1 was conducted on transformed attitude items (See Table 5). The significant value of the interaction effects between the course type and the gender was 0.86 and it was non-significant. There were no interactions between types of courses and gender. The significant value of course effect was 0.21 ($p > 0.05$) and it was not significant. There were no significant differences across different courses with respect to participants' attitudes. The significant value of gender effect was 0.02 ($p < 0.05$) and it was significant at 0.05 level. There were

significant differences between male participants and female participants with respect to their attitudes. Female respondents (M = 4.17) scored higher than male respondents (M = 4.00) in their attitudes. That is, female students showed more positive attitudes than male students toward multimedia classroom.

Discussions

The reliability coefficients were near 0.85. More items should be included to increase the internal consistency for the two domains. In our study, if we expect 0.90 reliability for our instrument, one more item should be added to each domain using the equation: K = relDEs (1-relEx)/relEx (1- relDEs) (Gable & Wolf, 1993, p. 215).

Although CFA showed that all loadings were significant in Utilization Effect factor, the loadings were within a low range, from 0.42 to 0.67 (See Table 6). There appeared three items which have the lowest loadings: 11 *(Instructors should design presentation materials with appropriate colors)*, 12 (*Well-adjusted temperature is necessary for learning in the multimedia classroom.*), and 15 (*The classroom should be well ventilated to allow fresh air.*). All of these three items did not go along well with other items in the factors.

A careful examination of all item stems made us speculate that there could be some hidden factors in this factor structure. Possibly our inadequate item sampling failed to be representative enough of the entire content universe. However, if more representative items are included and spread out nicely along the content universe, we might find that the higher loading items (above .60) could possibly underlie such a domain relating to student feelings. That is, the use of the multimedia classroom could facilitate their learning and understanding; and that those problematic items with loadings less than .60 might possibly underlie a new domain relating to student emotional and physical comforts in the multimedia classroom.

One more variable, exposure level to media equipment, should be taken into consideration in the studies. We found that instructors from classes we have studied did not use the document camera during their teaching. The participants' opinions on the item about the document camera were based on their guess. The content validity will not be ensured if the instrument is intended to measure their attitudes toward all the available equipment in the multimedia classroom when only part of the equipment was used.

By examining response patterns, we found that 14 items were negative skewed and 10 items were peaked. We also found that the standard deviations of 15 items were less than 1.00. The narrow and non-normal distribution might be due to the inadequate subject sample pool, most of participants were from the school of education. The remaining participants were from a course offered from the department of Psychology. More

participants of target population should be randomly selected from diverse classes of different instructors. This will eventually increase both variation of the data and generalizability of the study.

It was quite interesting that the ANOVA analysis showed significantly higher attitudes in female participants. The significantly higher attitudes could be resulted from unequal sample size, female participants were 55 more than male participants. Another reason might be that in this study female participants showed more positive feeling than male participants toward learning activities in such new environment. This gender difference in viewing multimedia classrooms needs to be further investigated.

As we stated above, our sampling pool was limited to those students who took three different courses in two classrooms. Therefore, our results were not generalizable to all types of multimedia classrooms, all types of courses, and all student populations.

REFERENCES

Anderson, J. A., & Cichocki, R. R. (1993, January). Educational technology classrooms: Re-design based on faculty feedback. Paper presented at the convention of the Association for Educational Communications and Technology, New Orleans.

Cronbach, L. J. (1951). Coefficient alpha and the internal structure of tests. Psychometrika, 16. 297-334.

Cronbach, L. J. (1971). Test validation. In R. L. Thorndike (Ed.), Educational Measurement (2nd ed.). Washington, DC: American Council on Education.

Kenny, D. (1996). Class booklet for Psychology 349: Causal Modeling in Social Psychology.

Gable, R. K. & Wolf, M. B. (1993). Instrument Development in the Affective Domain (2nd ed). Boston: Kluwer Academic Publishers.

Nunnally, J. C. (1978). Psychometric theory (2nd ed.). New York: McGraw-Hill.

Hofstetter, F. T. (1994, Feb). Guest Editorial. THE Journal. 6.

Marsh, H. W. & Hocevar, D. (1983). Confirmatory factor analysis of multitrait-multimethod matrices. Journal of Educational Measurement, 20, 231-248.

Rummel, R. J. (1970). Applied Factor Analysis. Evanston, IL: Northwestern University Press.

Spotts T. H. & Bowman, M. A. (1993). Increasing Faculty Use of Instructional Technology: Barriers and Incentives. The New Multimedia (4) 30.

Stanley, J. C. (1971). Reliability. In R. L. Thorndike (Ed.), Educational Measurement (2nd ed.). pp. 356-442. Washington, DC: American Council on Education.

Table 1

Factor Loading (Oblique Rotation)

Item Stems	F 1	F 2	F3
6. Use of computer generated presentations makes my learning more enjoyable and exciting.	.78		
13. Exposure to lectures using multimedia equipment, helps me to concentrate more on the course content.	.78		
5. The lighting and decoration of a multimedia classroom make me feel more comfortable learning than in a traditional classroom.	.75		
8. Lectures using advanced media are likely to aid my understanding and study.	.70		
2. A document camera can display a better image to take notes.	.58		
1. Having a class in a multimedia classroom is enjoyable.	.53		
7. The media equipment in a multimedia classroom is very useful in assisting instructors to organize their lessons.	.51		
4. Multimedia lectures (showing videos or movies) can help me better understand the content of the course.	.35		
3. Words written on a white board are more readable than those on a chalkboard.	.34		
9. Instructors should spend more time learning to take full advantage of the multimedia classroom.		.71	
10. Instructors need more training to use the media equipment.		.69	
12. Instructional materials should be well developed in order to take full advantage of the multimedia classroom.		.41	
11. Multimedia classrooms are suitable to teach all kinds of courses.		.35	
14. A document camera can display a better image to take notes from than an overhead.			.85

Note.

F 1: First Factor, Cronbach Alpha Reliability Coefficient = .85 (Learning Effects)
F 2: Second Factor, Cronbach Alpha Reliability Coefficient = .63 (Utilization Effects)
F 3: Third Factor

Table 2

Factor Loading (Varimax Rotation)

Item Stems	F 1	F 2	F3
13. Exposure to lectures using multimedia equipment, helps me to concentrate more on the course content.	.76		
6. Use of computer generated presentations makes my learning more enjoyable and exciting.	.73		
5. The lighting and decoration of a multimedia classroom make me feel more comfortable learning than in a traditional classroom.	.69		
8. Lectures using advanced media are likely to aid my understanding and study.	.67		
2. A document camera can display a better image to take notes.	.59		
1. Having a class in a multimedia classroom is enjoyable.	.54		
7. The media equipment in a multimedia classroom is very useful in assisting instructors to organize their lessons.	.53		
4. Multimedia lectures (showing videos or movies) can help me better understand the content of the course.	.36		
3. Words written on a white board are more readable than those on a chalkboard.	.32		
9. Instructors should spend more time learning to take full advantage of the multimedia classroom.		.76	
10. Instructors need more training to use the media equipment.		.66	
12. Instructional materials should be well developed in order to take full advantage of the multimedia classroom.		.41	
11. Multimedia classrooms are suitable to teach all kinds of courses.		.38	
14. A document camera can display a better image to take notes from than an overhead.			.84

Note.

F 1: First Factor, Cronbach Alpha Reliability Coefficient = .85
F 2: Second Factor, Cronbach Alpha Reliability Coefficient = .63
F 3: Third Factor

Table 3

Factor Correlation (Oblique Rotation)

	Factor 1	Factor 2	Factor 3
Factor 1	1.00		
Factor 2	.26	1.00	
Factor 3	.39	.015	1.00

Note.

Cronbach Alpha Reliability Coefficient of factor 1: .85

Cronbach Alpha Reliability Coefficient of factor 2: .63

Table 4

Descriptive Statistics of Attitude Items

Variable	Mean	Std Dev	Kurtosis	S.E. Kurt	Skewness	S.E. Skew	Valid N
ITEM11	3.66	.98	-.24	.39	-.23	.19	156
ITEM4	3.76	.96	-.39	.38	-.36	.19	157
ITEM12	4.00	1.01	.31	.38	-.86	.19	157
ITEM14	4.05	.92	.49	.38	-.86	.19	157
ITEM7	4.11	.85	.86	.38	-.84	.19	157
ITEM2	4.13	.87	.57	.39	-.91	.19	156
ITEM5	4.15	.83	.22	.38	-.71	.19	157
ITEM6	4.15	.86	1.42	.38	-1.09	.19	157
ITEM10	4.15	.82	1.83	.38	-1.07	.19	157
ITEM9	4.18	.77	-.59	.39	-.49	.19	156
ITEM8	4.18	.79	1.30	.39	-.97	.19	155
ITEM3	4.24	.78	.71	.38	-.95	.19	157
ITEM1	4.24	.78	.07	.38	-.78	.19	157
ITEM15	4.27	.87	1.76	.38	-1.28	.19	157
ITEM13	4.27	.76	1.52	.38	-1.03	.19	157
ITEM16	4.41	.78	2.43	.38	-1.44	.19	157

Table 5

The 2-way ANOVA on Attitudes Between Course and Gender (n=135)

	Sum of Squares	Mean Square	F Ratio	P
COURSE	2032.61	1016.30	3.14	0.21
GENDER	3810.78	3810.78	1.59	0.02*
COURSE X GENDER	188.04	94.02	5.96	0.86

Note. *p < .05

	FEMALE	MALE
MEAN SCORE	4.17 (N=95)	4.00 (N=40)

	COURSE1	COURSE2	COURSE3
MEAN SCORE	4.14 (n=33)	4.07 (n=85)	4.27 (n=34)

Table 6

Factor Loadings in Confirmatory Factor Analysis

	F1	F2
14. Lectures using multimedia equipment help me to concentrate on the course content.	.78	
10. Lectures using media equipment aid my understanding of course content.	.75	
3. Lectures with video or movies can help me better understand the content of the course.	.67	
4. The lighting and decoration of a multimedia classroom make me feel more comfortable learning than in a traditional classroom.	.59	
6. Use of computer generated presentations makes my learning more enjoyable.	.59	
13. Instructional materials should be well developed in order to take full advantage of the multimedia classroom.	.57	
1. Having a class in a multimedia classroom is enjoyable.	.57	
2. Displaying a document or an object with a document camera facilitates my learning.	.56	
5. Well-controlled lighting is essential to successful use of media equipment.		.67
9. The media equipment in a multimedia classroom is very useful in assisting instructors to organize their lessons.		.62
16. Instructors should be trained to design instructional materials to effectively present their instruction.		.61
8. Well-controlled speaker volume is necessary to successful use of media equipment.		.58
7. Instructors should use large letters in designing presentation materials.		.54
15. The classroom should be well ventilated to allow fresh air.		.53
11. Instructors should design presentation materials with appropriate colors.		.47
12. Well-adjusted temperature is necessary for learning in the multimedia classroom.		.43

Note.

F1: Learning Effects, Cronbach Alpha Reliability Coefficient = .84
F2: Utilization Effects, Cronbach Alpha Reliability Coefficient = .83

Significance of X^2 = .361
Adjuste X^2 Goodness of fit = .84
Tucker Lewis Index = .99
Bentler Bonett Index = .92

Attitudes Toward Multimedia Classrooms

1. Are you male or female?	Male	Female
2. What is your present status?	Graduate	Undergraduate
3. What is your major?	_____	
4. Do you think a multimedia classroom is a cost-effective investment?	Yes	No
5. Do you think UCONN should build more multimedia classrooms?	Yes	No

On a 5-point scale how would you rate your agreement with the following statements?

1 2 3 4 5

<----------->

Strongly **Disagree** Strongly **Agree**

1. Having a class in a multimedia classroom is enjoyable.	1 2 3 4 5
2. A document camera can display a better image to take notes.	1 2 3 4 5
3. Words written on a white board are more readable than those on a chalkboard.	1 2 3 4 5
4. Multimedia lectures (showing videos or movies can help me better understand the content of the course.	1 2 3 4 5
5. The lighting and decoration of a multimedia classroom make me feel more comfortable learning than in a traditional classroom.	1 2 3 4 5
6. Use of computer generated presentations makes my learning more enjoyable and exciting.	1 2 3 4 5
7. The media equipment in a multimedia classroom is very useful in assisting instructors to organize their lessons.	1 2 3 4 5
8. Lectures using advanced media are likely to aid my understanding and study.	1 2 3 4 5
9. Instructors should spend more time learning to take full advantage of the multimedia classroom.	1 2 3 4 5
10. Instructors need more training to use the media equipment.	1 2 3 4 5
11. Multimedia classrooms are suitable to teach all kinds of courses.	1 2 3 4 5
12. Instructional materials should be well developed in order to take full advantage of the multimedia classroom.	1 2 3 4 5
13. Exposure to lectures using multimedia equipment, helps me to concentrate more on the course content.	1 2 3 4 5
14. A document camera can display a better image to take notes from than an overhead.	1 2 3 4 5

Appendix A

Attitudes Toward Multimedia Classrooms

1. Male or Female 2. Course Name _____
3. Do you think a multimedia classroom is a cost-effective investment? Yes No
4. Do you think UCONN should build more multimedia classrooms? Yes No

On a 5-point scale how would you rate your agreement with the following statements?

1 2 3 4 5

<----------->

Strongly **Disagree** Strongly **Agree**

1. Having a class in a multimedia classroom is enjoyable.	1 2 3 4 5
2. A document camera can display a better image than an overhead projector.	1 2 3 4 5
3. Words written on a white board are more readable than those on a chalkboard.	1 2 3 4 5
4. Lectures with video or movies can help me better understand the content of the course	1 2 3 4 5
5. The lighting and decoration of a multimedia classroom make me feel more comfortable learning than in a traditional classroom.	1 2 3 4 5
6. Controlled lighting is essential to successful use of media equipment.	1 2 3 4 5
7. Use of computer generated presentations makes my learning more enjoyable.	1 2 3 4 5
8. Instructors should use large letters in designing presentation materials.	1 2 3 4 5
9. Instructors should design presentation materials with appropriate colors.	1 2 3 4 5
10. The media equipment in a multimedia classroom is very useful in assisting instructors to organize their lessons.	1 2 3 4 5
11. Lectures using media equipment aid my understanding of course content.	1 2 3 4 5
12. Instructors should design presentation materials with appropriate colors.	1 2 3 4 5
13. Instructors need more training to use the media equipment.	1 2 3 4 5
14. The temperature of the room should be adjusted appropriately.	1 2 3 4 5
15. Multimedia classrooms are suitable to teach all kinds of courses.	1 2 3 4 5
16. The classroom should be ventilated appropriately to allow fresh air.	1 2 3 4 5
17. Instructional materials should be well developed in order to take full advantage of the multimedia classroom.	1 2 3 4 5
18. Lectures using multimedia equipment help me to concentrate on the course content.	1 2 3 4 5

Appendix B

Attitudes Toward Multimedia Classrooms

Male or Female Course Name _____

1. Do you think a multimedia classroom is a cost -effective investment? Yes No
2. Do you think UCONN should build more multimedia classrooms? Yes No

On a 5-point scale how would you rate your agreement with the following statements?

1 2 3 4 5

<---------->

Strongly **Disagree** Strongly **Agree**

1. Having a class in a multimedia classroom is enjoyable.	1 2 3 4 5
2. Displaying a document or an object with a document camera facilitates my learning.	1 2 3 4 5
3. Lectures with video or movies can help me better understand the content of the course.	1 2 3 4 5
4. The lighting and decoration of a multimedia classroom make me feel more comfortable learning than in a traditional classroom.	1 2 3 4 5
5. Well-controlled lighting is essential to successful use of media equipment.	1 2 3 4 5
6. Use of computer generated presentations makes my learning more enjoyable.	1 2 3 4 5
7. Instructors should use large letters in designing presentation materials.	1 2 3 4 5
8. Well-controlled speaker volume is necessary to successful use of media equipment.	1 2 3 4 5
9. The media equipment in a multimedia classroom is very useful in assisting instructors to organize their lessons.	1 2 3 4 5
10. Lectures using media equipment aid my understanding of course content.	1 2 3 4 5
11. Instructors should design presentation materials with appropriate colors.	1 2 3 4 5
12. Well-adjusted temperature is necessary for learning in the multimedia classroom.	1 2 3 4 5
13. Instructional materials should be well developed in order to take full advantage of the multimedia classroom.	1 2 3 4 5
14. Lectures using multimedia equipment help me to concentrate on the course content.	1 2 3 4 5
15. The classroom should be well ventilated to allow fresh air.	1 2 3 4 5
16. Instructors should be trained to design instructional materials to effectively present their instruction.	1 2 3 4 5

Appendix C

U.S. Department of Education
Office of Educational Research and Improvement (OERI)
National Library of Education (NLE)
Educational Resources Information Center (ERIC)

Reproduction Release

(Specific Document)

I. DOCUMENT IDENTIFICATION:

Title: Student Attitudes Toward Multimedia Classrooms	
Author(s): Yi Guan Jianjun Wang Robert K. Gable Michael F. Young	
Corporate Source:	Publication Date:

II. REPRODUCTION RELEASE:

In order to disseminate as widely as possible timely and significant materials of interest to the educational community, documents announced in the monthly abstract journal of the ERIC system, Resources in Education (RIE), are usually made available to users in microfiche, reproduced paper copy, and electronic media, and sold through the ERIC Document Reproduction Service (EDRS). Credit is given to the source of each document, and, if reproduction release is granted, one of the following notices is affixed to the document.

If permission is granted to reproduce and disseminate the identified document, please CHECK ONE of the following three options and sign in the indicated space following.

The sample sticker shown below will be affixed to all Level 1 documents	The sample sticker shown below will be affixed to all Level 2A documents	The sample sticker shown below will be affixed to all Level 2B documents
PERMISSION TO REPRODUCE AND DISSEMINATE THIS MATERIAL HAS BEEN GRANTED BY SAMPLE TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)	PERMISSION TO REPRODUCE AND DISSEMINATE THIS MATERIAL IN MICROFICHE, AND IN ELECTRONIC MEDIA FOR ERIC COLLECTION SUBSCRIBERS ONLY, HAS BEEN GRANTED BY SAMPLE TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)	PERMISSION TO REPRODUCE AND DISSEMINATE THIS MATERIAL IN MICROFICHE ONLY HAS BEEN GRANTED BY SAMPLE TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)
Level 1	**Level 2A**	**Level 2B**
↑ [X]	↑ [ ]	↑ [ ]
Check here for Level 1 release, permitting reproduction and dissemination in microfiche or other ERIC archival media (e.g. electronic) *and* paper copy.	Check here for Level 2A release, permitting reproduction and dissemination in microfiche and in electronic media for ERIC archival collection subscribers only	Check here for Level 2B release, permitting reproduction and dissemination in microfiche only
Documents will be processed as indicated provided reproduction quality permits. If permission to reproduce is granted, but no box is checked, documents will be processed at Level 1.		

I hereby grant to the Educational Resources Information Center (ERIC) nonexclusive permission to reproduce and disseminate this document as indicated above. Reproduction from the ERIC microfiche, or electronic media by persons other than ERIC employees and its system contractors requires permission from the copyright holder. Exception is made for non-profit reproduction by libraries and other service agencies to satisfy information needs of educators in response to discrete inquiries.

Signature:	Printed Name/Position/Title: Yi Guan /	
Organization/Address: University of Connecticut Dept. of Educational Psychology Storrs, CT 06269	Telephone: (860) 887-0832	Fax: (860) 774-7768
	E-mail Address: GV-YGUAN@commvet.edu	Date: 2/23/99

III. DOCUMENT AVAILABILITY INFORMATION (FROM NON-ERIC SOURCE):

If permission to reproduce is not granted to ERIC, or, if you wish ERIC to cite the availability of the document from another source, please provide the following information regarding the availability of the document. (ERIC will not announce a document unless it is publicly available, and a dependable source can be specified. Contributors should also be aware that ERIC selection criteria are significantly more stringent for documents that cannot be made available through EDRS.)

Publisher/Distributor:
Address:
Price:

IV. REFERRAL OF ERIC TO COPYRIGHT/REPRODUCTION RIGHTS HOLDER:

If the right to grant this reproduction release is held by someone other than the addressee, please provide the appropriate name and address:

Name:
Address:

V. WHERE TO SEND THIS FORM:

Send this form to the following ERIC Clearinghouse:

However, if solicited by the ERIC Facility, or if making an unsolicited contribution to ERIC, return this form (and the document being contributed) to:

ERIC Processing and Reference Facility
1100 West Street, 2nd Floor
Laurel, Maryland 20707-3598
Telephone: 301-497-4080
Toll Free: 800-799-3742
FAX: 301-953-0263
e-mail: ericfac@inet.ed.gov
WWW: http://ericfac.piccard.csc.com

EFF-088 (Rev. 9/97)