DOCUMENT RESUME

ED 398 244 TM 025 159

AUTHOR Christensen, Rhonda; Knezek, Gerald
TITLE Constructing the Teachers' Attitudes Toward Computers (TAC) Questionnaire.
PUB DATE 26 Jan 96
NOTE 39p.; Paper presented at the Annual Meeting of the Southwest Educational Research Association (New Orleans, LA, January 1996).
PUB TYPE Reports - Research/Technical (143) -- Speeches/Conference Papers (150) -- Tests/Evaluation Instruments (160)

EDRS PRICE MF01/PC02 Plus Postage.
DESCRIPTORS Cluster Analysis; *Computer Attitudes; *Elementary School Teachers; Elementary Secondary Education; Factor Analysis; Likert Scales; *Secondary School Teachers; *Teacher Attitudes; *Test Construction; Test Items; Test Reliability; Thinking Skills
IDENTIFIERS Teachers Attitudes Toward computer Questionnaire

ABSTRACT

This paper reports on the first stage of the construction and refinement process underway in pursuit of developing a brief composite instrument to measure teachers' attitudes toward computers. Items (n=284) from 14 questionnaires assessing teacher attitudes toward computers were completed by 118 educators in Texas in 1995. Internal consistency reliabilities for the 32 Likert-type and Semantic Differential subscales included in the battery ranged from 0.41 to 0.96, with 27 of the 32 indices falling in the "respectable" range of 0.70 of higher. Forty-five of the correlation indices computed for the subscales were 0.70 or higher, indicating that many subscale pairs shared half their variance or more in common. A higher-order factor analysis of the 32 subscales indicated that 4 higher-order attributes probably exist among the 32 subscales, and a cluster analysis of the subscales produced 6 major clusters. The next step will be to gather data from a greater number of educators to derive a stable factor structure for the original items and an eventual shorter form. Appendix A lists the TAC subscales, and Appendix B presents the test. (Contains 2 figures, 7 tables, and 23 references.) (SLD)

Constructing the Teachers' Attitudes Toward Computers (TAC) Questionnaire

Rhonda Christensen
Texas Center for Educational Technology

Gerald Knezek
University of North Texas

Presented to the Southwest Educational Research Association Annual Conference

January 26, 1996
New Orleans, Louisiana

Constructing the Teachers' Attitudes Toward Computers (TAC) Questionnaire

1. Introduction

Positive teacher attitudes toward computers are widely recognized as a necessary condition for effective use of information technology in the classroom (Woodrow, 1992). At least fourteen instruments with acceptable measurement properties have been reported in the literature over the past decade (Woodrow, 1991; Chu & Spires,1991; D'Souza, 1992; Francis,1993; Gardner et. al,1993; Kay,1993; Knezek & Miyashita 1994; Pelgrum, Janssen Reinen & Plomp, 1993; Loyd & Gressard, 1984). However, few comprehensive studies have been carried out to determine which constructs measured by these instruments are redundant and which are unique. Administration of a battery of the well-validated instruments in this area would include 382 items and could require well over an hour of an educator's time. A more parsimonious instrument is needed to cover the range of areas assessed by currently-existing instruments in this field.

This paper reports on the first stage of the construction-refinement process currently underway in pursuit of the goal of developing a shorter, composite instrument to measure teachers' attitudes toward computers.

2. Theoretical Perspective

From a measurement perspective, the proper procedure for constructing a parsimonius Teachers' Attitudes Toward Computers Questionnaire (TAC) is straightforward: 1) collect all currently-available instruments with good measurement properties, 2) administer a battery of the instruments to a broad representation of the target population, 3) factor analyze the data to determine the common constructs, and 4) select the strongest indicators (best items) for each construct, regardless of source of origin. Some practical problems with this scheme exist within the current context, however. Among the most prominent are a) extensive subject time commitment and probable fatique associated with completion of a very large survey battery, and b) the need for sample sizes 2-4 times the number of items being analyzed in order to derive a meaningful factor structure. As a result, an intermediate item-reduction scheme was implemented to reduce the initial "long form" of the TAC to a manageable length.

3. Item Reduction Procedure

The initial item-reduction procedure for the TAC followed three basic principles: 1) eliminate items not directly related to computers, 2) eliminate weak computer-related items, and 3) eliminate strong but redundant items among the 14 instruments included in the battery. In addition, the CAS and CAQ were selected as "foundation instruments" for which all computer-related items would be included, because they were judged to be the best among the existing instruments for measuring teacher's attitudes (in the case of the CAS) and for potentially relating the effect of teacher's attitudes to those of their students (as measured by the CAQ).

By following this procedure, 37 items were first eliminated from the CAQ under principle #1. Next, under principle #2, and applying the criterion used in the Gardner et. al. study of four computer attitude scales (1993), items from this study and a similar one by Woodrow (1991) were eliminated unless they a) had a factor loading of at least .4 on the intended subscale, and b) did not have a factor loading of .3 or higher on another subscale. We added the stipulation that if there were not at least 4 items selected from each factor with this dual criterion, we took the item with the next highest loading until at least 4 total were included. In addition, a small number of items were

retained because they were judged to be especially useful for the assessment of educators' attitudes toward computers. Finally, under principle #3, more than one dozen items were removed from questionnaires placed later in the battery because they were exact duplicates of items presented earlier.

The resulting 10-part composite instrument includes 284 items spanning 44 subscales from the following 14 computer attitude questionnaires:

Computer Attitude Scale (Gressard and Loyd, 1986)
- •confidence, liking, anxiety, and usefulness

The Computer Use Questionnaire (Griswold, 1983)
- •awareness

Attitudes Toward Computers Scale (Reece & Gable, 1982)
- •general attitudes toward computers

The Computer Survey Scale (Stevens, 1982)
- •efficacy and anxiety

Computer Anxiety Rating Scale (CARS) (Heinssen, et al.,1987)
- •technical capability, appeal of learning and using computers, being controlled by computers, learning computer skills, traits to overcome anxiety

ATC (Attitudes Toward Computers) (Raub, 1981)
- •computer usage, computer appreciation, societal impact

CAIN (Computer Anxiety Index) (Maurer & Simonson, 1983)
- •examines avoidance of, negative attitudes toward, caution with, and disinterest in computers (anxiety and comfort)

BELCAT (Blombert-Erickson-Lowery Computer Attitude Task) (Erickson, 1987)
- •attitudes toward learning about computers and towards computers themselves

Attitude Toward Computer Scale (Francis, 1993)
- •affective domain

Computer Attitude Measure (CAM) (Kay, 1993)
- •cognitive (student, personal, general), affective, behavioral (classroom and home), and perceived control components of computer attitudes

Computer Attitude Questionnaire (CAQ) (Knezek & Miyashita, 1993)
- •computer importance, computer enjoyment, computer anxiety, computer seclusion

Computer Attitude Items (Pelgrum, Reinen, & Plomp, 1993)
- •computer relevance, computer enjoyment

Computer Attitudes Scale for Secondary Students (CASS) (Jones & Clarke, 1994)
- •cognitive, affective and behavioral attitudes

E-Mail (D'Souza, 1992)
- •attitudes toward e-mail

Each of the 44 subscales is described in more detail in Appendix A.

4. Construct (Factor) Validation

The 284-item version of the TAC is currently being administered to a wide range of practicing and preservice K-12 educators in Texas and other states. The goal is to secure at least 600 responses so that a stable factor analysis can be carried out to determine the number of subscales (and items for each subscale) to be included in the final version of the TAC. Post-hoc reliability analyses will also be carried out to aid in final selection of items for each factor.

This paper includes findings from 118 questionnaires completed by educators from four school districts in Texas during the fall of 1995. The sites included two public and two private school districts, two of which were urban and two of which were rural, in three geographic regions of South Texas, West Texas and North Texas. Of the 118 subjects, 48 completed all 284 items in the questionnaire with no missing data.

5. Procedure

The questionnaires were completed in the fall of 1995 by teachers in the four school districts. Approximately 30-40 minutes were required for each educator to complete the 284-item battery of questions (See Appendix B).

Teachers recorded their perceptions to which they 1) strongly disagreed, 2) disagreed, 3) were undecided, 4) agreed or 5) strongly agreed for the Likert items on the questionnaire. Ten questions were arranged in a semantic differential with 7 preference options for each pair of descriptors (ex. tense, calm). In addition, eighteen paired comparisons were used to determine the relationship between using a computer, reading a book, writing, and watching television. The eighteen pairs were divided into three groups. The pairs were used to rank the subject's order of preference, perceived difficulty and perceived amount of learning (Krendl & Broihier, 1992).

6. Data Analysis

SPSS was used to perform the data analyses (SPSS, 1984). 105 items with negative wording were reversed for data analysis. The procedure Descriptives was used to calculate mean and standard deviations, while the SPSS procedure Reliabilities was used to calculate internal consistency reliabilities for the Likert-type items. The procedure Correlations was used to produce Pearson Product Moment correlations among the subscales. The SPSS procedures Factor and Cluster were used for the factor and cluster analyses carried out on the Likert subscales, respectively.

As shown in Table 1, descriptive statistics (mean & SD) were calculated for the 44 subscales. The subscales I (Importance), J (Enjoyment), and Anxiety used the following 4-point rating scale: 1=Strongly Disagree, 2=Disagree, 3=Agree, 4=Strongly Agree. 18 paired comparison items were coded as 1=1st member selected, 2=2nd member selected and were summed so that the total preference score for each item had a possible range from 0 (never chosen) to 3 (always chosen) over the other item in the paired comparison procedure. All the other Likert items used a 5-point rating scale: 1=Strongly Disagree, 2=Disagree, 3=Undecided, 4=Agree, 5=Strongly Agree.

Cronbach's Alpha was computed to determine the internal consistency reliability of each of the 32non-paired comparisons subscales (See Table 2). In addition to these reliabilities, Table 2 also contains the reliabilities for these subscales reported by previous researchers.

Test-Retest reliabilities were also computed for 3 items repeated in the questionnaire. One item, "I get a sinking feeling when I think of trying to use a computer", was repeated three times in the questionnaire (var 16, 79, 263). Pearson-product moment correlations among the pairs were: .67(vars 16 & 79), .64 (vars 16 &263), and .77 (vars 79 & 263). Two other items were repeated once. The first, "Computers make me feel uncomfortable", yielded a correlation coefficient of .79 (vars 71 & 260) while the second, "I feel aggressive and hostile toward computers", yielded a coefficient of .49 (vars 63 & 183). The average value for these test-retest reliability estimates was .65.

An additional analysis included the computation of Pearson Product-Moment correlation coefficients for all pairs of subscales. Due to the large number of highly correlated subscales, Table 3 includes only those correlations reaching the r=.50 level or higher.

7. Results

The theoretical range of means for the 4-point likert items was 1-4. The means for the paired comparisons ranged from 1-3 and the range for the semantic differential was 1-7. The range of means for the remaining likert items was 1-5. As shown in Table 1 the actual means for the 4-point Likert items ranged from 2.96 to 3.10, while those for the paired comparisons preference 'votes' ranged from .58 to 2.20. The semantic differential item mean was 5.40, and the means for the 5-point Likert items ranged from 3.16 to 4.53.

The distribution of the reliabilities for the 32 Likert-type and Semantic Differential subscales (excluding paired comparisons) was:

.90 and above	8
.80-.89	13
.70-.79	6
.60-.69	2
.50-.59	1
.40-.49	2
Below .40	0

According to the guidelines provided by DeVellis (1991,p.5), 27 of the 32 are in the "respectable" (r=.70) or better. Only 3 of the subscales are "unacceptable" (r<=.60). Reliabilities across all subscales ranged from .41 to .96. Most of these reliabilities were consistent with those reported in previous studies.

Many of the subscales were highly correlated with other subscales within the questionnaire. As shown in Table 3, 45 correlation coefficients were .7 or higher. These strong relationships are more easily viewed in context in the factor analysis and cluster analysis results presented later in this section.

A factor analysis (ULS, Oblimin rotation) of the 32 Likert-type subscales was carried out to determine if communalities existed among the subscales on various instruments. This procedure is believed to be roughly equivalent to a higher-order factor analysis, since each variable in the factor procedure was itself a previously-established subscale. A scree plot (see Figure 1) indicated that four higher-order factors probably existed in the data. These account for approximately two thirds of the variance (see Table 4) As shown in Table 5, fourteen subscales are most closely associated with Factor 1 (Perceived Utility of Computers), while 11 subscales are closely associated with Factor 2 (Computer Anxieties). Five subscales seem to be strongly associated with Factor 3 (Accommodating Outlook), while just two are most strongly associated with Factor 4 (Perception of Email and other Information Technologies).

As shown in Table 4, Factor 1, which accounts for 51% of the variance in the data, is highly correlated with Factors 2 and 3 (-.48 and .56 respectively) and somewhat correlated with Factor 4 (r=.-.38) (Table 7). This implies that some third-order phenomena (such as a positive or negative general perception of the role of information technology in education) may be primarily responsible for a large portion of the variance in the data on all four factors. Additional research is planned for this area in the future.

A cluster analysis (SPSS, 1984) was carried out on the 32 subscales in order to explore which subscales are most closely related to each other (see Figure 2a and 2b). Six primary clusters were identified and named. These are shown in Table 6.

Results of the higher-order factor analysis and cluster analysis, taken together, provide a basis for hypothesizing about the number of factors expected to emerge when all 284 items are factor analyzed with 600+ subjects. The upper limit should not exceed 44, the number of individual subscales collected in the battery. The lower limit should not be fewer than the 4-6 found in the higher order factor analysis and cluster analysis, respectively.

8. Summary

Two-hundred eighty-four items from 14 questionnaires assessing attitudes toward computers were completed by 118 educators in Texas during the fall of 1995. Internal consistency reliabilities for the 32 Likert-type and Semantic Differential subscales included in the battery ranged from .41 to .96, with 27 of the 32 indices falling in the "respectable" range of .70 or higher. Forty-five of correlation indices computed for the subscales were .70 or higher, indicating that many subscale pairs shared half their variance ($.7^2$) or more in common. A higher-order factor analysis of the 32 subscales indicated that four higher-order attributes probably exist among the 32 subscales, and a cluster analysis of the subscales produced six major clusters. The next step in the research will be to gather data from a greater number (600+) educators, in order to derive a stable factor structure for the 284 original items. The goal of this endeavor is to produce a shorter questionnaire covering all major areas spanned by the subscales of the original instruments.

References

Chu, P.C. & Spires, E.E. (1991). Validating the computer anxiety rating scale: Effects of cognitive style and computer courses on computer anxiety. Computers in Human Behavior, 7, 7-21.

DeVellis, R.F. (1991). Scale Development. Newbury Park, NJ: Sage Publications

D'Souza, P.V. (Winter, 1992). E-mail's role in the learning process: A case study. Journal of Research on Computers in Education 25(1), 256-264.

Erickson, T. E. (1987). Sex differences in student attitudes towards computers. Paper presentation at the Annual Meeting of the American Educational Research Association.

Francis, L.J. (1993). Measuring attitude toward computers among undergraduate college students: The affective domain. Computers in Education 20(3), 251-255.

Gardner, D.G., Discenza, R. & Dukes, R.L. (1993). The measurement of computer attitudes: an empirical comparison of available scales. Journal of Educational Computing Research, 9(4), 487-507.

Gressard, C.P. & Loyd, B.H. (1986). Validation studies of a new computer attitude scale. Association for Educational Data Systems Journal, 18(4), 295-301.

Griswold, P.A. (1983). Some determinants of computer awareness among education majors. Association for Educational Data Systems Journal, 16(2), 92-103.

Heinssen, R.K, Jr., Glass, C.R. & Knight, L.A. (1987). Assessing computer anxiety: Development and validation of the computer anxiety rating scale. Computers in Human Behavior, 3, 49-59.

Jones, T. & Clarke, V.A. (1994). A computer attitude scale for secondary students. Computers in Education, 22(4), 315-318.

Kay, R. H. (1993). An exploration of theoretical and practical foundations for assessing attitudes toward computers: The computer attitude measure (CAM). Computers in Human Behavior, 9, 371-386.

Knezek, G., & Miyashita, K. (1993). Handbook for the Young Children's Computer Inventory. Denton, TX: Texas Center for Educational Technology.

Knezek, G.A. & Miyashita, K.T. (1994). A preliminary study of the computer attitude questionnaire. Studies on Children and Computers. Denton, TX: Texas Center for Educational Technology.

Krendl, K.A. and Broihier, M. (1992). Student responses to computers: A longitudinal study. J. Educational Computing Research, 8(2), 215-227.

Loyd, B.H. & Gressard, C.P. (1984). Reliability and factoral validity of computer attitude scale. Educational and Psychological Measurement, 44(2), 501-505.

Maurer, M. & Simonson, M. (1984). Development of validation of a measure of computer anxiety, in Proceedings of Selected Research Paper Presentations, annual Meeting of the Association for Educational Communications and Technology, M. Simonson (ed.), Dallas, Texas.

Pelgrum, W.J., Janssen Reinen, I.A.M. & Plomp, Tj. (1993). Schools, teachers, students, and computers: A cross-national perspective. Twente, Netherlands: I.E.A.

Raub, A.C. (1981). Correlates of computer anxiety in college students. Unpublished Ph.D. dissertation, University of Pennsylvania.

Reece, M.J. & Gable, R.K. (1982). The development and validation of a measure of general attitudes toward computers. Educational and Psychological Measurement, 42, 913-916.

Stevens, D.J. (1982). Educators perceptions of computers in education: 1979 and 1982. Association for Educational Data Systems Journal, 145(1), 1-15.

SPSS (1984). SPSS-x BASICS. New York: McGraw-Hill.

Woodrow, J.R. J. (1991). A comparison of four computer attitude scales. Journal of Educational Computing Research, 7(2), 165-187.

Woodrow, J.E. (1992). The influence of programming training on the computer literacy and attitudes of preservice teachers. Journal of Research on Computing in Education, 25(2), 200-218.

Table 1. Descriptive Statistics

Variable	Description	Mean	Std Dev	N
I	CAQ Importance (Likert:1-4)	3.10	.45	106
J	CAQ Enjoyment (1-4)	3.09	.48	107
Anxiety	CAQ Anxiety (1-4)	2.96	.62	111
PREAD	Preference to read (Pairwise:1 or2)	2.16	1.00	118
PWRITE	Preference to write (1 or 2)	.62	.83	118
PTV	Preference to watch tv (1 or 2)	1.22	1.03	118
PCOMP	Preference to use computer (1 or 2)	1.57	1.03	118
DREAD	Difficulty reading (1 or 2)	.81	.78	118
DWRITE	Difficulty writing (1 or 2)	2.20	.91	118
DTV	Difficulty watching tv (1 or 2)	.58	.86	118
DCOMP	Difficulty using computer (1 or 2)	1.86	1.07	118
LREAD	Learn by reading (1 or 2)	2.18	.92	118
LWRITE	Learn by writing (1 or 2)	.58	.73	118
LTV	Learn by watching tv (1 or 2)	.76	.78	118
LCOMP	Learning by using computer (1 or 2)	1.96	1.00	118
CAM	Computer Attitude Measure (Semantic:1-7)	5.40	1.15	104
CASA	Loyd & Gressard's Anxiety (Likert:1-5)	3.73	.78	111
CASC	Loyd & Gressard's Confidence (Likert:1-5)	3.56	.49	110
CASL	Loyd & Gressard's Liking (Likert:1-5)	3.65	.73	110
CASU	Loyd & Gressard's Usefulness (Likert:1-5)	4.04	.55	112
REL	Pelgrum & Plomp Relevance (Likert:1-5)	4.19	.49	116
ENJ	Pelgrum & Plomp Enjoyment (Likert:1-5)	3.16	.66	114
CA	Computer Anxiety (Likert:1-5)	3.39	.80	109
U	Utility (Likert:1-5)	3.96	.58	102
MD	Male Domain (Likert:1-5)	4.53	.49	111
S	Success (Likert:1-5)	3.81	.69	109
NI	Negative Impact (Likert:1-5)	3.25	.52	115
MOT	Motivation (Likert:1-5)	4.26	.59	116
PI	Productivity Importance (Likert:1-5)	4.04	.62	116
CUQ	Computer Use Questionnaire (Likert:1-5)	3.60	.39	112
CSS	Computer Survey Scale (Likert:1-5)	3.71	.48	114
ATC	ATC- Francis (Likert:1-5)	3.83	.51	110
KS	Kay's CAM Student (Likert:1-5)	3.95	.71	118
KT	Kay's CAM Teacher (Likert:1-5)	4.03	.67	118
CARSA	Technical Capability (Likert:1-5)	3.31	.74	112
CARSB	Appeal of learning /using computers (Lkt:1-5)	4.13	.56	114
CARSC	Being controlled by computers (Likert:1-5)	3.59	.70	113
CARSD	Learning computer skills (Likert:1-5)	4.07	.53	113
CARSE	Traits to overcome anxiety (Likert:1-5)	4.04	.56	113
CASSA	Affective (CASS) (Likert:1-5)	3.66	.71	108
CASSB	Behavioral (Likert:1-5)	3.46	.49	108
CASSC	Cognitive (Likert:1-5)	3.52	.39	108
ATCS	Raub's ATCS (Likert:1-5)	3.94	.58	109
EMAIL	E-mail (D'Souza) (Likert:1-5)	3.23	.70	94

Table 2. Reliabilities for 32 subscales

Scale	No. items	Reliability		
I (Importance)	7	.80	.82#	
J (Enjoyment)	9	.85	.82#	
Anxiety	8	.91	.84#	
CAM (Computer Attitude Measure)	10	.93	.88~	
CASA (Loyd & Gressard Anxiety)	9	.90	.80*	.90^
CASC (Loyd & Gressard Confidence)	10	.72	.86*	.89^
CASL (Loyd & Gressard Liking)	10	.89	.85*	.89^
CASU (Loyd & Gressard Usefulness)	10	.84		.82^
REL (Pelgrum & Plomp Relevance)	7	.78	.64≠	
ENJ (Pelgrum & Plomp Enjoyment)	9	.81	.73≠	
CA (Computer Anxiety)	20	.95		
U (Utility)	7	.86		
MD (Male Domain)	6	.83		
S (Success)	4	.76		
NI (Negative Impact)	6	.40		
MOT (Motivation)	4	.80		
PI (Productivity Importance)	4	.82		
CUQ (Computer Use Questionnaire)	14	.67	.66*	
CSS (Computer Survey Scale)	8	.70	.56*	
ATC (Francis Attitude Toward Computers)	16	.91	.96•	
KS (Kay CAM Student)	5	.88	.73~	
KT(Kay CAM Teacher)	5	.90	.77~	
CARSA (Technical Capability)	6	.81		
CARSB(Appeal of learning about and using computers)	4	.84		
CARSC (Being controlled by computers)	3	.58		
CARSD (Learning computer skills)	3	.72		
CARSE (Traits to overcome anxiety)	2	.41		
CASSA (Affective)	15	.94	.95"	
CASSB (Behavioral)	10	.71	.71"	
CASSC (Cognitive)	14	.66	.88"	
ATCS (Raub Attitude Toward Computer Scale)	8	.89	.87	
EMAIL	11	.96	.81`	

*Woodrow, 1992
^Loyd and Gressard, 1986
Knezek & Miyashita,1994
" Jones & Clarke, 1994
~ Kay, 1993
` D'Souza, 1992
• Francis, 1993
≠Pelgrum & Plomp, 1993

Table 3. Correlation Coefficients

	I	J	anx	CAM	CASA	CASC	CASL	CASU	REL	ENJ	CA	U	MD	S	NI	MOT
I									.58			.56				
J			.89		.79	.72	.67			.57	.71					
anx		.89			.85	.73	.65			.59	.71					
CAM		.66	.63		.59	.54	.68			.50						
CASA		.79	.85	.59		.87	.72			.62	.81					
CASC		.72	.73	.54	.87		.77			.69	.79	.50				.58
CASL		.67	.65	.68	.72	.77			.52	.73	.60	.53				.51
CASU	.58	.53		.50	.51	.67	.66		.70	.56		.74				.56
REL	.58						.52					.68				
ENJ		.57	.59	.50	.62	.69	.73				.50					
CA		.71	.71		.81	.79	.60			.50						.57
U	.56					.50	.53		.68							.50
MD																
S																
NI																
MOT						.58	.51				.57	.50				
PI	.58			.51		.57	.58		.68	.53		.63				.52
CUQ					.55	.64	.61		.72	.60		.67			.52	.58
CSS		.58	.55		.68	.70	.57		.53	.52	.69	.54				.60
ATC		.64	.64	.59	.73	.74	.83		.57	.61	.58	.60				.60
KS	.51						.55		.67			.53				
KT	.53			.55		.52	.64		.65	.59		.68				
CARSA		.57	.60		.68	.72	.54			.53	.87					.53
CARSB	.52	.53		.59	.56	.62	.70		.57	.55		.64				.57
CARSC					.58	.60	.58				.71				.54	.64
CARSD					.58	.67	.57				.54					.65
CARSE					.55	.55	.55									.56
CASSA		.71	.73	.53	.83	.77	.64			.53	.88					.60
CASSB		.62	.58	.53	.69	.68	.71			.72	.61	.56				
CASSC		.55	.53		.57	.59	.57				.68	.57			.51	.63
ATCS		.57	.51	.65	.56	.54	.75		.55	.55		.64				.58
EMAIL							.57									

Table 3. (Continued)

	PI	CUQ	CSS	ATC	KS	KT	carsa	carsb	carsc	carsd	carse	cassa	cassb	cassc	ATCS	EMail
I	.58				.51	.53		.52								
J			.58	.64			.57	.53				.71	.62	.55	.57	
anx			.55	.64								.73	.58	.54	.51	
CAM	.52			.59		.55		.59				.53	.53		.65	
CASA		.55	.68	.73			.68	.56	.58	.58	.55	.83	.69	.57	.57	
CASC	.57	.64	.70	.74		.52	.72	.62	.60	.67	.55	.77	.68	.59	.54	
CASL	.58	.61	.57	.83	.55	.64	.54	.70	.58	.56	.55	.64	.71	.57	.75	.57
CASU	.70	.71	.61	.59	.56	.65		.67		.63				.61	.63	
REL	.68	.72	.53	.57	.67	.65		.57							.55	
ENJ	.53	.60	.53	.61		.59	.53	.55				.53	.72		.55	
CA			.69	.58			.87		.71	.54		.88	.61			
U	.63	.67	.54	.60	.53	.68		.64					.56	.57	.64	
MD																
S																
NI		.52							.54					.51		
MOT	.52	.58		.60			.53	.57	.64	.65	.56	.60			.58	
PI		.70	.56	.55	.60	.73		.69		.51		.50	.55	.50	.55	
CUQ	.70		.67	.60	.66	.70		.67	.54	.56		.55	.58	.62	.63	
CSS	.56	.67		.58	.56	.53	.63	.61	.57	.61	.51	.65	.62	.64	.51	
ATC	.55	.60	.58		.54	.62	.50	.77	.60	.64	.62	.70	.73	.61	.83	
KS	.60	.66	.56	.54		.67		.67			.52	.52	.56		.64	
KT	.73	.70	.53	.62	.67			.72					.56		.71	.56
CARSA			.63	.50					.74	.57		.76		.63		
CARSB	.69	.67	.61	.77	.67	.72				.65	.63	.57	.67	.57	.79	
CARSC		.54	.58	.60			.74			.52	.57	.72	.51	.69	.56	
CARSD	.51	.56	.61	.64			.57	.65	.52		.66	.52		.57	.55	
CARSE			.51	.62	.52			.63	.57	.66		.56		.52	.60	
CASSA	.50	.55	.65	.70	.52		.76	.57	.72	.52	.56		.71	.76	.59	
CASSB	.55	.58	.62	.73	.56	.56		.67	.51			.71		.52	.67	
CASSC	.50	.62	.64	.61			.63	.57	.69	.57	.52	.76	.52		.59	
ATCS	.55	.63	.51	.83	.64	.71		.79	.56	.55	.60	.59	.67	.59		
EMAIL						.56										

Table 4. Factor Analysis Final Statistics

VARIABLE	COMMUNALITY		FACTOR	EIGENVALUE	PCT OF VAR	CUM PCT
I	.51631	*	1	16.45245	51.4	51.4
J	.77114	*	2	2.65161	8.3	59.7
ANXIETY	.84218	*	3	1.47233	4.6	64.3
CAM	.54198	*	4	.80523	2.5	66.8
CASA	.87175	*				
CASC	.79539	*				
CASL	.77782	*				
CASU	.71974	*				
REL	.65755	*				
ENJ	.58199	*				
CA	.92311	*				
U	.66487	*				
MD	.20542	*				
S	.39356	*				
NI	.36401	*				
MOT	.61314	*				
PI	.67130	*				
CUQ	.71039	*				
CSS	.65417	*				
ATC	.77702	*				
KS	.61267	*				
KT	.72743	*				
CARSA	.77874	*				
CARSB	.78979	*				
CARSC	.76065	*				
CARSD	.62323	*				
CARSE	.72588	*				
CASSA	.84522	*				
CASSB	.63250	*				
CASSC	.67807	*				
ATCS	.76553	*				
EMAIL	.38906	*				

Table 5. Higher order factor structure for 32 subscales

Factor 1 Scale	Loading
CASU	.84
PI (Productivity Importance)	.82
CUQ (Computer Use Questionnaire)	.80
REL (Pelgrum & Plomp Relevance)	.80
KT (Kay's CAM Teacher)	.80
U (Utility)	.79
CARSB (Appeal of learning about and using computer)	.77
KS (Kay's CAM Student)	.74
I (CAQ Importance)	.71
ATC (Francis Attitude Toward Computers)	.70
ATCS (Reece & Gable)	.69
CASL (Loyd & Gressard Liking)	.66
ENJ (Pelgrum & Plomp Enjoyment)	.61
NI (Negative Impact)	.49

Factor 2 Scale	Loading
CA (Computer Anxiety)	-.96
CASSA (Affective)	-.92
CASA (Loyd & Gressard Anxiety)	-.88
CARSA (CARS Technical Capability)	-.87
CASC (Loyd & Gressard Confidence)	-.84
ANXIETY (CAQ anxiety)	-.81
CARSC (Being controlled by computers)	-.78
J (Enjoyment)	-.76
CASSC (Cognitive)	-.74
CSS (Computer Survey Scale)	-.71
CASSB (Behavioral)	-.64

Factor 3 Scale	Loading
CARSE (Traits to overcome anxiety)	.79
CARSD (Learning computer skills)	.67
MOT (Motivation)	.64
S (Success)	.52
MD (Male Domain)	.44

Factor 4 Scale	Loading
CAM (CAM semantic differential)	-.58
EMAIL (D'Souza's Email)	-.55

Table 6. Major Clusters for 32 Subscales

Enjoyment/Frustration
- 3 ANXIETY (CAQ Anxiety)
- 2 J (CAQ Enjoyment)

Discomfort/Prestige
- 29 CASSB (Behavioral)
- 19 CSS (Computer Survey Scale)
- 30 CASSC (Cognitive)
- 18 CUQ (Computer Use Questionnaire)
- 6 CASC (Loyd & Gressard's Confidence)
- 28 CASSA (Computer Attitudes of Secondary Students - Affective)
- 5 CASA (Loyd & Gressard's Anxiety)

Comfort & Confidence
- 23 CARSA (Technical Capability)
- 11 CA (Computer Anxiety)

Perceived Utility
- 12 U (Utility)
- 8 REL (Pelgrum & Plomp Relevance)

Caution/Optimism
- 31 ATCS (Raub's Attitudes Toward Computers Scale)
- 20 ATC (Francis' Attitudes Toward Computers)

Openness & Acceptance
- 27 CARSE (Traits to overcome anxiety)
- 26 CARSD (Learning computer skills)

Table 7. Factor Correlation Matrix

	FACTOR 1	FACTOR 2	FACTOR 3	FACTOR 4
FACTOR 1	1.00000			
FACTOR 2	-.48232	1.00000		
FACTOR 3	.55538	-.37808	1.00000	
FACTOR 4	-.37818	.25325	-.10792	1.00000

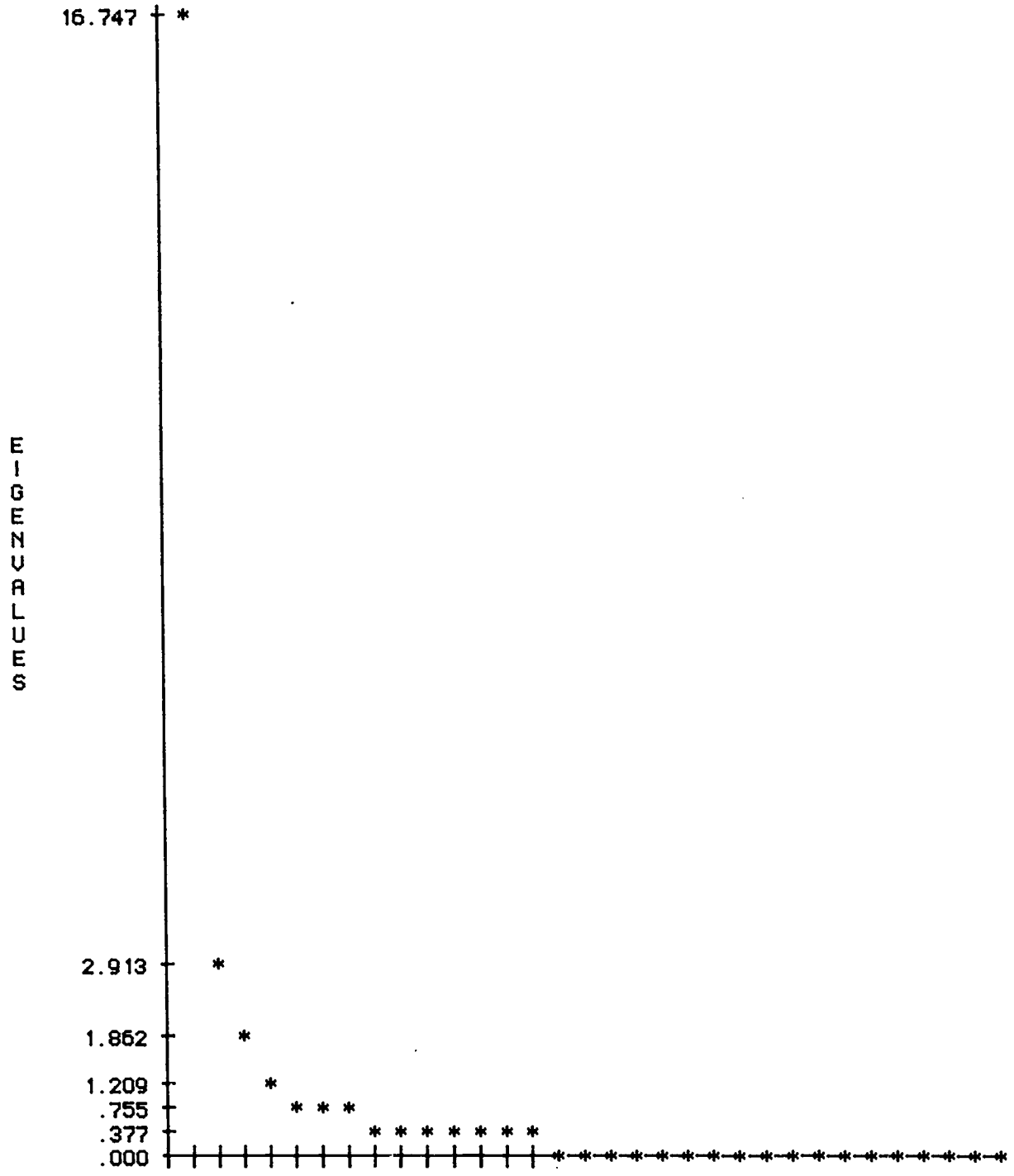
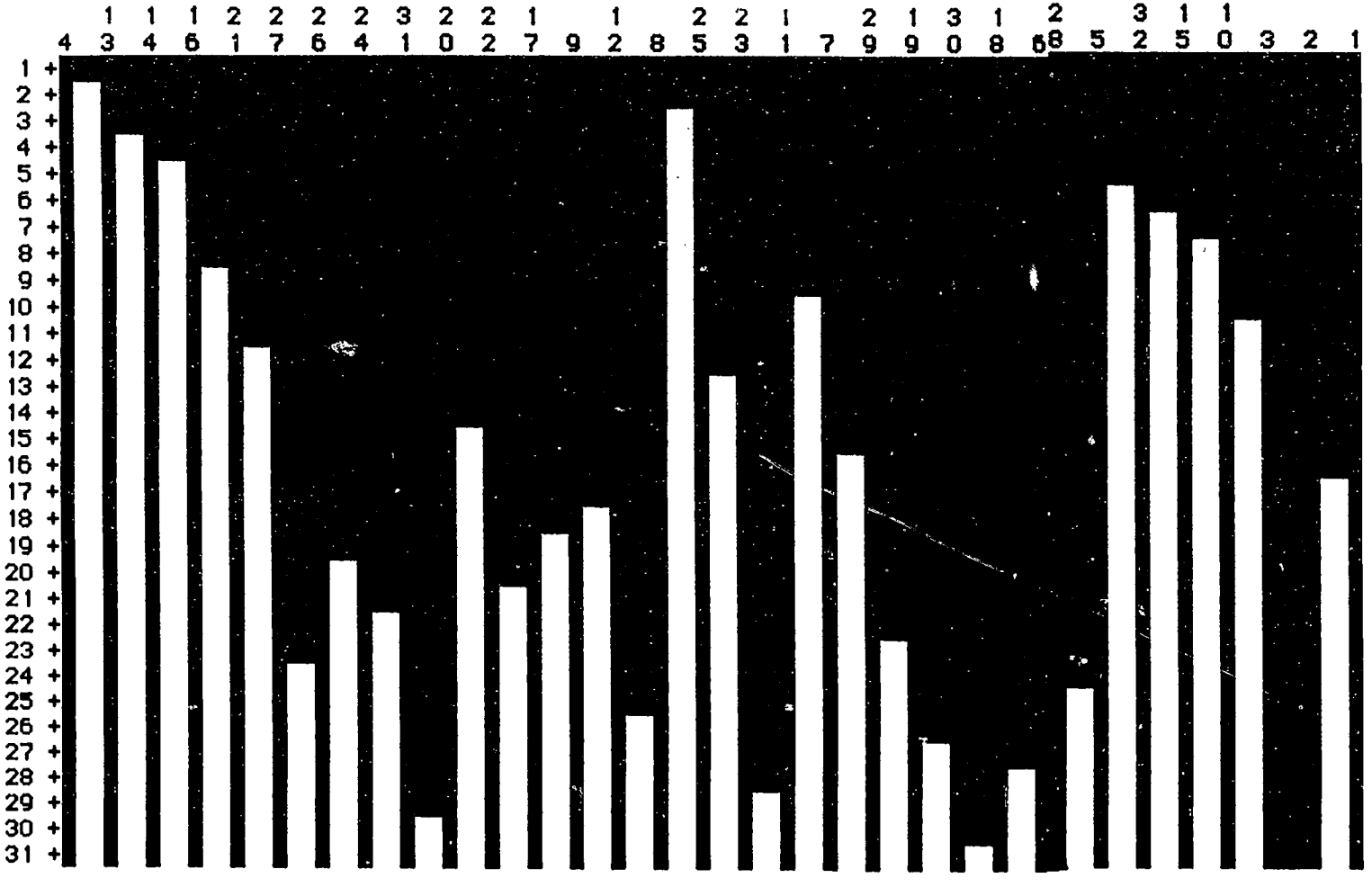


Figure 1. Scree plot of eigenvalues for 32 subscales

Figure 2a.

Vertical Icicle Plot using Average Linkage (Between Groups)

(Down) Number of Clusters (Across) Case Label and number



1	I	CAQ Importance
2	J	CAQ Enjoyment
3	Anxiety	CAQ Anxiety
4	CAM	Computer Attitude Measure (Kay) Semantic Diff
5	CASA	Loyd & Gressard's Anxiety
6	CASC	Loyd & Gressard's Confidence
7	CASL	Loyd & Gressard's Liking
8	CASU	Loyd & Gressard's Usefulness
9	REL	Pelgrum & Plomp Relevance
10	ENJ	Pelgrum & Plomp Enjoyment
11	CA	Computer Anxiety
12	U	Utility
13	MD	Male Domain
14	S	Success
15	NI	Negative Impact
16	MOT	Motivation
17	PI	Productivity Importance
18	CUQ	Computer Use Questionnaire
19	CSS	Computer Survey Scale
20	ATC	Attitudes Toward Computers - Francis
21	KS	Kay's CAM Student
22	KT	Kay's CAM Teacher
23	CARSA	Technical Capability
24	CARSB	Appeal of learning about and using computers
25	CARSC	Being controlled by computers
26	CARSD	Learning computer skills
27	CARSE	Traits to overcome anxiety
28	CASSA	Affective (Computer Attitudes of Secondary Students)
29	CASSB	Behavioral
30	CASSC	Cognitive
31	ATCS	Raub's Attitudes Toward Computer Scale
32	EMAIL	E-mail (D'Souza)

Figure 2b. Legend for cluster analysis

Appendix A TAC Subscales

1	I	CAQ Importance
2	J	CAQ Enjoyment
3	Anxiety	CAQ Anxiety
4	PREAD	Preference to read CAQ paired comparisons
5	PWRITE	Preference to write
6	PTV	Preference to watch tv
7	PCOMP	Preference to use computer
8	DREAD	Difficulty reading
9	DWRITE	Difficulty writing
10	DTV	Difficulty watching tv
11	DCOMP	Difficulty using computer
12	LREAD	Learn by reading
13	LWRITE	Learn by writing
14	LTV	Learn by watching tv
15	LCOMP	Learning by using computer
16	CAM	Computer Attitude Measure (Kay) Semantic Diff
17	CASA	Loyd & Gressard's Anxiety
18	CASC	Loyd & Gressard's Confidence
19	CASL	Loyd & Gressard's Liking
20	CASU	Loyd & Gressard's Usefulness
21	REL	Pelgrum & Plomp Relevance
22	ENJ	Pelgrum & Plomp Enjoyment
23	CA	Computer Anxiety
24	U	Utility
25	MD	Male Domain
26	S	Success
27	NI	Negative Impact
28	MOT	Motivation
29	PI	Productivity Importance
30	CUQ	Computer Use Questionnaire
31	CSS	Computer Survey Scale
32	ATC	Attitudes Toward Computers - Francis
33	KS	Kay's CAM Student
34	KT	Kay's CAM Teacher
35	CARSA	Technical Capability
36	CARSB	Appeal of learning about and using computers
37	CARSC	Being controlled by computers
38	CARSD	Learning computer skills
39	CARSE	Traits to overcome anxiety
40	CASSA	Affective (Computer Attitudes of Secondary Students)
41	CASSB	Behavioral
42	CASSC	Cognitive
43	ATCS	Raub's Attitudes Toward Computer Scale
44	EMAIL	E-mail (D'Souza)

Appendix B. TAC Items

Instructions: Please read each statement and then circle the number which best shows how you feel.

SD = Strongly Disagree D = Disagree A = Agree SA = Strongly Agree

Part I

	from Computer Attitude Questionnaire, Knezek & Miyashita, 1994	SD	D	A	SA
(1)	I enjoy doing things on a computer.	1	2	3	4
(2)	I am tired of using a computer.	1	2	3	4
(3)	I will be able to get a good job if I learn how to use a computer.	1	2	3	4
(4)	I concentrate on a computer when I use one.	1	2	3	4
(5)	I enjoy computer games very much.	1	2	3	4
(6)	I would work harder if I could use computers more often.	1	2	3	4
(7)	I think that it takes a long time to finish when I use a computer.	1	2	3	4
(8)	I know that computers give me opportunities to learn many new things.	1	2	3	4
(9)	I can learn many things when I use a computer.	1	2	3	4
(10)	I enjoy lessons on the computer.	1	2	3	4
(11)	I believe that the more often teachers use computers, the more I will enjoy school.	1	2	3	4
(12)	I believe that it is very important for me to learn how to use a computer.	1	2	3	4
(13)	I think that computers are very easy to use.	1	2	3	4
(14)	I would like to study with a teacher rather than using a computer.	1	2	3	4
(15)	I feel comfortable working with a computer.	1	2	3	4
(16)	I get a sinking feeling when I think of trying to use a computer.	1	2	3	4
(17)	Working with a computer makes me nervous.	1	2	3	4
(18)	Using a computer is very frustrating.	1	2	3	4
(19)	I will do as little work with computers as possible.	1	2	3	4
(20)	Computers are difficult to use.	1	2	3	4
(21)	Computers do not scare me at all.	1	2	3	4
(22)	I can learn more from books than from a computer.	1	2	3	4

Part 1

(23) Which would you rather do? (circle one of each pair):

(1) read a book	or	(2) write	(23)
(1) write	or	(2) watch television	(24)
(1) watch television	or	(2) use a computer	(25)
(1) use a computer	or	(2) read a book	(26)
(1) read a book	or	(2) watch television	(27)
(1) write	or	(2) use a computer	(28)

(24) Which would be more difficult for you (circle one of each pair):

(1) read a book	or	(2) write	(29)
(1) write	or	(2) watch television	(30)
(1) watch television	or	(2) use a computer	(31)
(1) use a computer	or	(2) read a book	(32)
(1) read a book	or	(2) watch television	(33)
(1) write	or	(2) use a computer	(34)

(25) Which would you learn more from (circle one of each pair):

(1) read a book	or	(2) write	(35)
(1) write	or	(2) watch television	(36)
(1) watch television	or	(2) use a computer	(37)
(1) use a computer	or	(2) read a book	(38)
(1) read a book	or	(2) watch television	(39)
(1) write	or	(2) use a computer	(40)

Instructions: Mark one space between each adjective pair.

from The Computer Attitude Measure (CAM), Kay, 1993

Part 2

Computers are:

1.	Unlikable	_____ _____ _____ _____ _____ _____ _____	Likable	(41)
2.	Unhappy	_____ _____ _____ _____ _____ _____ _____	Happy	(42)
3.	Bad	_____ _____ _____ _____ _____ _____ _____	Good	(43)
4.	Unpleasant	_____ _____ _____ _____ _____ _____ _____	Pleasant	(44)
5.	Tense	_____ _____ _____ _____ _____ _____ _____	Calm	(45)
6.	Uncomfortable	_____ _____ _____ _____ _____ _____ _____	Comfortable	(46)
7.	Artificial	_____ _____ _____ _____ _____ _____ _____	Natural	(47)
8.	Empty	_____ _____ _____ _____ _____ _____ _____	Full	(48)
9.	Dull	_____ _____ _____ _____ _____ _____ _____	Exciting	(49)
10.	Suffocating	_____ _____ _____ _____ _____ _____ _____	Fresh	(50)

Instructions: Please read each statement and circle the number that best describes how you feel about that statement.

1 = Strongly Disagree (SD)
2 = Disagree (D)
3 = Undecided (U)
4 = Agree (A)
5 = Strongly Agree (SA)

Part 3

Computer Attitude Scale, Loyd & Gressard, 1984		SD	D	U	A	SA
1. Computers do not scare me at all.	(51)	1	2	3	4	5
2. I'm no good with computers.	(52)	1	2	3	4	5
3. I would like working with computers.	(53)	1	2	3	4	5
4. I will use computers many ways in my life.	(54)	1	2	3	4	5
5. Working with a computer would make me very nervous.	(55)	1	2	3	4	5
6. Generally I would feel OK about trying a new problem on the computer.	(56)	1	2	3	4	5
7. The challenge of solving problems with computers does not appeal to me.	(57)	1	2	3	4	5
8. Learning about computers is a waste of time.	(58)	1	2	3	4	5
9. I do not feel threatened when others talk about computers.	(59)	1	2	3	4	5
10. I don't think I would do advanced computer work.	(60)	1	2	3	4	5
11. I think working with computers would be enjoyable and stimulating.	(61)	1	2	3	4	5
12. Learning about computers is worthwhile.	(62)	1	2	3	4	5
13. I feel aggressive and hostile toward computers.	(63)	1	2	3	4	5
14. I am sure I could do work with computers.	(64)	1	2	3	4	5
15. Figuring out computer problems does not appeal to me.	(65)	1	2	3	4	5
16. I'll need a firm mastery of computers for my future work.	(66)	1	2	3	4	5
17. It wouldn't bother me at all to take computer courses.	(67)	1	2	3	4	5
18. I'm not the type to do well with computers.	(68)	1	2	3	4	5
19. When there is a problem with a computer run that I can't immediately solve, I would stick with it until I have the answer.	(69)	1	2	3	4	5

THIS PAGE INTENTIONALLY LEFT BLANK

			SD	D	U	A	SA
20.	I expect to have little use for computers in my daily life.	(70)	1	2	3	4	5
21.	Computers make me feel uncomfortable.	(71)	1	2	3	4	5
22.	I am sure I could learn a computer language.	(72)	1	2	3	4	5
23.	I don't understand how some people can spend so much time working with computers and seem to enjoy it.	(73)	1	2	3	4	5
24.	I can't think of any way that I will use computers in my career.	(74)	1	2	3	4	5
25.	I would feel at ease in a computer class.	(75)	1	2	3	4	5
26.	I think using a computer would be very hard for me.	(76)	1	2	3	4	5
27.	Once I start to work with the computer, I would find it hard to stop.	(77)	1	2	3	4	5
28.	Knowing how to work with computers will increase my job possibilities.	(78)	1	2	3	4	5
29.	I get a sinking feeling when I think of trying to use a computer.	(79)	1	2	3	4	5
30.	I could get good grades in computer courses.	(80)	1	2	3	4	5
31.	I will do as little work with computers as possible.	(81)	1	2	3	4	5
32.	Anything that a computer can be used for, I can do just as well some other way.	(82)	1	2	3	4	5
33.	I would feel comfortable working with a computer.	(83)	1	2	3	4	5
34.	I do not think I could handle a computer course.	(84)	1	2	3	4	5
35.	If a problem is left unsolved in a computer class, I would continue to think about it afterward.	(85)	1	2	3	4	5
36.	It is important to me to do well in computer classes.	(86)	1	2	3	4	5
37.	Computers make me feel uneasy and confused.	(87)	1	2	3	4	5
38.	I have a lot of self-confidence when it comes to working with computers.	(88)	1	2	3	4	5
39.	I do not enjoy talking with others about computers.	(89)	1	2	3	4	5
40.	Working with computers will not be important to me in my life's work.	(90)	1	2	3	4	5

Part 3

Instructions: Please read each statement and circle the number that best describes how you feel about that statement.

1 = Strongly Disagree (SD)
2 = Disagree (D)
3 = Undecided (U)
4 = Agree (A)
5 = Strongly Agree (SA)

Part 4

from Pelgrum & Plomp, 1989			SD	D	U	A	SA
1.	Computers can help me to learn things more easily.	(91)	1	2	3	4	5
2.	With computers it is possible to do practical things.	(92)	1	2	3	4	5
3.	Knowing how to use computers will help me do well in my career.	(93)	1	2	3	4	5
4.	Knowing how to use computers is a worthwhile skill.	(94)	1	2	3	4	5
5.	All students should have an opportunity to learn about computers at school.	(95)	1	2	3	4	5
6.	It is important for students to learn about computers in order to be informed citizens.	(96)	1	2	3	4	5
7.	Having computer skills helps you get better jobs.	(97)	1	2	3	4	5
8.	I like to talk to others about computers.	(98)	1	2	3	4	5
9.	Computers can be exciting.	(99)	1	2	3	4	5
10.	I like reading about computers.	(100)	1	2	3	4	5
11.	A job using computers would be very interesting.	(101)	1	2	3	4	5
12.	Computer lessons are a favorite subject for me.	(102)	1	2	3	4	5
13.	I want to learn a lot about computers.	(103)	1	2	3	4	5
14.	I like to scan computer journals.	(104)	1	2	3	4	5
15.	When I pass a computer shop, usually I stop for a while.	(105)	1	2	3	4	5
16.	Computers interest me little.	(106)	1	2	3	4	5

Measurement of Computer Attitudes, Comparison by Gardner, Discenza & Dukes, 1993

from BELCAT (Blomberg, Erickson, Lowery Computer Attitude Task), Erickson, 1987

			SD	D	U	A	SA
1.	Computers don't scare me at all.	(107)	1	2	3	4	5
2.	Most things I can handle OK, but I have trouble working on computers.	(108)	1	2	3	4	5
3.	Knowing about computers will help me earn a living.	(109)	1	2	3	4	5
4.	I get a sinking feeling when I think of trying to do something hard with a computer.	(110)	1	2	3	4	5
5.	It's hard to believe that a woman or girl could be a computer genius.	(111)	1	2	3	4	5
6.	A computer test would scare me.	(112)	1	2	3	4	5
7.	I'll need computers for my future work.	(113)	1	2	3	4	5
8.	I don't think I could do advanced programming; it sounds too hard for me.	(114)	1	2	3	4	5
9.	I'm really going to need computer skills after I finish school.	(115)	1	2	3	4	5
10.	I'd be proud to be the outstanding student in a computer class.	(116)	1	2	3	4	5
11.	I have a lot of self-confidence when it comes to using a computer.	(117)	1	2	3	4	5
12.	Girls who enjoy using computers are a little weird.	(118)	1	2	3	4	5
13.	I'm sure I could do advanced work - like a big programming project - on a computer.	(119)	1	2	3	4	5
14.	After I finish school, I can forget about computers.	(120)	1	2	3	4	5
15.	I'd like people to think I was smart with computers.	(121)	1	2	3	4	5
16.	Women certainly are logical enough to use computers.	(122)	1	2	3	4	5
17.	I see the computer as something I will rarely use in my daily life as an adult.	(123)	1	2	3	4	5
18.	I'm not the type to do well with a computer.	(124)	1	2	3	4	5
19.	I would trust a woman just as much as a man to figure out how to operate a computer.	(125)	1	2	3	4	5
20.	I would be just as likely to ask a woman for help on a computer as a man.	(126)	1	2	3	4	5
21.	In general, boys are better than girls at using computers.	(127)	1	2	3	4	5
22.	It would make me happy if people thought I was really good with computers.	(128)	1	2	3	4	5
23.	I don't like people to think I'm smart with computers.	(129)		1	2	3	4

Part 5

from ATC (Attitudes Toward Computers), Raub, 1981

Part 5

			SD	D	U	A	SA
24.	Computer technology sounds like confusing jargon to me.	(130)	1	2	3	4	5
25.	I am confident that I could learn computer skills.	(131)	1	2	3	4	5
26.	I am unsure of my ability to learn a computer programming language.	(132)	1	2	3	4	5
27.	I have avoided computers because they are unfamiliar to me.	(133)	1	2	3	4	5
28.	Computers have the potential to control our lives.	(134)	1	2	3	4	5
29.	Our country relies too much on computers.	(135)	1	2	3	4	5
30.	I have difficulty understanding most technological advances.	(136)	1	2	3	4	5
31.	I will use a computer in my future occupation.	(137)	1	2	3	4	5
32.	Computers dehumanize society by treating everyone as a number.	(138)	1	2	3	4	5
33.	If given the opportunity to use a computer, I'm afraid I might damage it in some way.	(139)	1	2	3	4	5
34.	Computers will create more jobs than they eliminate.	(140)	1	2	3	4	5
35.	I feel apprehensive about using a computer terminal.	(141)	1	2	3	4	5
36.	Computers are changing the world too rapidly.	(142)	1	2	3	4	5
37.	I am unsure of my ability to interpret a computer printout.	(143)	1	2	3	4	5
38.	Computers isolate people by inhibiting normal social interactions among users.	(144)	1	2	3	4	5
39.	I hesitate to use a computer for fear of making mistakes I cannot correct.	(145)	1	2	3	4	5

from CAIN, Maurer, 1983

40.	Having a computer available to me would improve my productivity.	(146)	1	2	3	4	5
41.	If I had to use a computer for some reason, it would probably save me some time and work.	(147)	1	2	3	4	5
42.	If I used a computer, I could get a better picture of the facts and figures.	(148)	1	2	3	4	5
43.	Having a computer available to me would improve my general satisfaction.	(149)	1	2	3	4	5
44.	If I had a computer at my disposal, I would try to get rid of i t.	(150)	1	2	3	4	5
45.	Computers are probably going to be an important part of my life.	(151)	1	2	3	4	5
46.	I am usually uncomfortable when I have to use a computer.	(152)	1	2	3	4	5
47.	I sometimes get nervous just thinking about computers.	(153)	1	2	3	4	5
48.	I will probably never learn to use a computer.	(154)	1	2	3	4	5
49.	Computers are too complicated to be of much use to me.	(155)	1	2	3	4	5
50.	If I had to use a computer all the time, I would probably be very unhappy.	(156)	1	2	3	4	5
51.	I sometimes feel intimidated when I have to use a computer.	(157)	1	2	3	4	5
52.	I sometimes feel that computers are smarter than I am.	(158)	1	2	3	4	5

from Computer Use Questionnaire, Griswold, 1983			SD	D	U	A	SA
1.	A person today cannot escape the influence of computers.	(159)	1	2	3	4	5
2.	Computers will replace low-skill jobs and create jobs needing specialized training.	(160)	1	2	3	4	5
3.	Computers will improve health care.	(161)	1	2	3	4	5
4.	Computers will improve education.	(162)	1	2	3	4	5
5.	If there was a computer in my classroom it would help me to be a better teacher.	(163)	1	2	3	4	5
6.	Someday I will have a computer in my home.	(164)	1	2	3	4	5
7.	Computers can teach mathematics.	(165)	1	2	3	4	5
8.	Computers are beyond the understanding of the typical person.	(166)	1	2	3	4	5
9.	Computers are a tool much like a hammer or lathe.	(167)	1	2	3	4	5
10.	Computers could enhance remedial instruction.	(168)	1	2	3	4	5
11.	Computers will relieve teachers of routine duties.	(169)	1	2	3	4	5
12.	Computers can be used successfully with courses which demand creative activities.	(170)	1	2	3	4	5
13.	I have become familiar with computers through my previous experience.	(171)	1	2	3	4	5
from The Computer Survey Scale, Stevens, 1982							
14.	High school students should understand the role computers play in society.	(172)	1	2	3	4	5
15.	High school students should have some understanding about computers.	(173)	1	2	3	4	5
16.	I feel qualified to teach computer literacy.	(174)	1	2	3	4	5
17.	Computers can be a useful instructional aid in almost all subject areas.	(175)	1	2	3	4	5
18.	Use of computers in education almost always reduces the personal treatment of students.	(176)	1	2	3	4	5
19.	I feel at ease when I am around computers.	(177)	1	2	3	4	5
20.	I feel comfortable when a conversation turns to computers.	(178)	1	2	3	4	5
21.	Teacher training should include instructional applications of computers.	(179)	1	2	3	4	5

Part 6

Part 6

from Attitude Toward Computer Scale, Francis, 1993		SD	D	U	A	SA
22. Learning about computers is boring to me.	(180)	1	2	3	4	5
23. I like learning on a computer.	(181)	1	2	3	4	5
24. Working with a computer would make me very nervous.	(182)	1	2	3	4	5
25. I feel aggressive and hostile toward computers.	(183)	1	2	3	4	5
26. I would feel comfortable using a computer.	(184)	1	2	3	4	5
27. The challenge of solving problems with computers does not appeal to me.	(185)	1	2	3	4	5
28. I think working with computers would be enjoyable and stimulating.	(186)	1	2	3	4	5
29. Learning about computers is interesting.	(187)	1	2	3	4	5
30. I enjoy using a computer.	(188)	1	2	3	4	5
31. Computers are boring.	(189)	1	2	3	4	5
32. Learning about computers is something I can do without.	(190)	1	2	3	4	5
33. Computers are not exciting.	(191)	1	2	3	4	5
34. Studying about computers is a waste of time.	(192)	1	2	3	4	5
35. It is fun to figure out how computers work.	(193)	1	2	3	4	5
36. Learning about the different uses of computers is interesting.	(194)	1	2	3	4	5
37. I enjoy learning how computers are used in our daily lives.	(195)	1	2	3	4	5
from CAM (Computer Attitude Measure), Kay, 1993						
38. Computers would motivate students.	(196)	1	2	3	4	5
39. Computers would significantly improve the overall quality of my students' education.	(197)	1	2	3	4	5
40. Computers would help students improve their writing.	(198)	1	2	3	4	5
41. Computers would stimulate creativity in students.	(199)	1	2	3	4	5
42. Computers would help students work with one another.	(200)	1	2	3	4	5
43. Computers would help me organize my work.	(201)	1	2	3	4	5
44. Computers would increase my productivity.	(202)	1	2	3	4	5
45. Computers would save me time.	(203)	1	2	3	4	5
46. Computers would help me learn.	(204)	1	2	3	4	5
47. Computers would help me organize my finances.	(205)	1	2	3	4	5
48. Computers solve more problems than they cause.	(206)	1	2	3	4	5
49. Computers improve the overall quality of life.	(207)	1	2	3	4	5

CARS, Chu & Spires, 1991

			SD	D	U	A	SA
1.	I feel insecure about my ability to interpret a computer printout.	(208)	1	2	3	4	5
2.	I look forward to using a computer on my job.	(209)	1	2	3	4	5
3.	I do not think I would be able to learn a computer programming language.	(210)	1	2	3	4	5
4.	The challenge of learning about computers is exciting.	(211)	1	2	3	4	5
5.	I am confident that I can learn computer skills.	(212)	1	2	3	4	5
6.	Anyone can learn to use a computer if they are patient and motivated.	(213)	1	2	3	4	5
7.	Learning to operate computers is like learning any new skill - the more you practice, the better you become.	(214)	1	2	3	4	5
8.	I am afraid that if I begin to use computers I will become dependent upon them and lose some of my reasoning skills.	(215)	1	2	3	4	5
9.	I am sure that with time and practice I will be as comfortable working with computers as I am working with a typewriter.	(216)	1	2	3	4	5
10.	I feel that I will be able to keep up with the advances happening in the computer field.	(217)	1	2	3	4	5
11.	I dislike working with machines that are smarter than I am.	(218)	1	2	3	4	5
12.	I feel apprehensive about using computers.	(219)	1	2	3	4	5
13.	I have difficulty in understanding the technical aspects of computers.	(220)	1	2	3	4	5
14.	It scares me to think I could cause the computer to destroy a large amount of information by hitting the wrong key.	(221)	1	2	3	4	5
15.	I hesitate to use a computer for fear of making mistakes that I cannot correct.	(222)	1	2	3	4	5
16.	You must be a genius to understand all the special keys contained on most computer terminals.	(223)	1	2	3	4	5
17.	If given the opportunity, I would like to learn about and use computers.	(224)	1	2	3	4	5
18.	I have avoided computers because they are unfamiliar and somewhat intimidating to me.	(225)	1	2	3	4	5
19.	I feel computers are necessary tools in both educational and work settings.	(226)	1	2	3	4	5

Part 7

CASS, Jones & Clarke, 1994

			SD	D	U	A	SA
1.	Computers intimidate and threaten me.	(227)	1	2	3	4	5
2.	All computer people talk in a strange and technical language.	(228)	1	2	3	4	5
3.	I learn new computer tasks by trial and error.	(229)	1	2	3	4	5
4.	Working with a computer makes me feel tense and uncomfortable.	(230)	1	2	3	4	5
5.	Computers are difficult to understand.	(231)	1	2	3	4	5
6.	Other students look to me for help when using the computer.	(232)	1	2	3	4	5
7.	I feel helpless when asked to perform a new task on the computer.	(233)	1	2	3	4	5
8.	Boys like computers more than girls do.	(234)	1	2	3	4	5
9.	When I have a problem with the computer, I will usually solve it on my own.	(235)	1	2	3	4	5
10.	I feel important when others ask me for information about computers.	(236)	1	2	3	4	5
11.	Using the computer has increased my interaction with other students.	(237)	1	2	3	4	5
12.	Computers bore me.	(238)	1	2	3	4	
13.	Anything that a computer can be used for, I can do just as well in another way.	(239)	1	2	3	4	5
14.	I develop shortcuts, and more efficient ways to use computers.	(240)	1	2	3	4	5
15.	Working with computers makes me feel isolated from other people.	(241)	1	2	3	4	5
16.	Working with computers will not be important to me in my career.	(242)	1	2	3	4	5
17.	I would like to spend more time using a computer.	(243)	1	2	3	4	5
18.	I do not feel I have control over what I do when I use a computer.	(244)	1	2	3	4	5
19.	People who use computers are seen as being more important than those who don't.	(245)	1	2	3	4	5
20.	If I can, I will take subjects that will teach me to use computers.	(246)	1	2	3	4	5
21.	Computers sometimes scare me.	(247)	1	2	3	4	5
22.	People who work with computers sit in front of a computer screen all day.	(248)	1	2	3	4	5
23.	I would like to learn more about computers.	(249)	1	2	3	4	5
24.	I feel unhappy walking into a room filled with computers.	(250)	1	2	3	4	5
25.	Working with computers means working on your own, without contact with others.	(251)	1	2	3	4	5
26.	If I need computer skills for my career choice, I will develop them .	(252)	1	2	3	4	5

Part 8

			SD	D	U	A	SA
27.	I'm no good with computers.	(253)	1	2	3	4	5
28.	To use computers one has to be highly qualified.	(254)	1	2	3	4	5
29.	If my school offered a computer camp I would like to attend it.	(255)	1	2	3	4	5
30.	Working with a computer makes me feel very nervous.	(256)	1	2	3	4	5
31.	Using a computer prevents me from being creative.	(257)	1	2	3	4	5
32.	I feel threatened when others talk about computers.	(258)	1	2	3	4	5
33.	Computers are confusing.	(259)	1	2	3	4	5
34.	Computers make me feel uncomfortable.	(260)	1	2	3	4	5
35.	You have to be a "brain" to work with computers.	(261)	1	2	3	4	5
36.	Not many people can use computers.	(262)	1	2	3	4	5
37.	I get a sinking feeling when I think of trying to use a computer.	(263)	1	2	3	4	5
38.	Computers frustrate me.	(264)	1	2	3	4	5
39.	People who work with computers make really good money.	(265)	1	2	3	4	5

Attitudes Toward Computers Scale, Reece & Gable, 1982

			SD	D	U	A	SA
1.	I will use a computer as soon as possible.	(266)	1	2	3	4	5
2.	I will take computer courses.	(267)	1	2	3	4	5
3.	Computers can be used to save lives.	(268)	1	2	3	4	5
4.	Computers make my life enjoyable.	(269)	1	2	3	4	5
5.	I enjoy computer work.	(270)	1	2	3	4	5
6.	Having computers in the classroom would be fun for me.	(271)	1	2	3	4	5
7.	I would never take a job where I had to work with computers.	(272)	1	2	3	4	5
8.	If I had the money, I would buy a computer.	(273)	1	2	3	4	5

Part 8 - 9

Instructions: Please circle the appropriate number to indicate your agreement or disagreement with each statement.

1 = Strongly Disagree (SD)
2 = Disagree (D)
3 = Undecided (U)
4 = Agree (A)
5 = Strongly Agree (SA)

from D'Souza, 1992		SD	D	U	A	SA
1. Electronic mail (E-mail) is an effective means of disseminating class information and assignments.	(274)	1	2	3	4	5
2. I prefer E-mail to traditional class handouts as an information disseminator.	(275)	1	2	3	4	5
3. More courses should use E-mail to disseminate class information and assignments.	(276)	1	2	3	4	5
4. E-mail provides better access to the instructor.	(277)	1	2	3	4	5
5. The use of E-mail creates more interaction:						
between students enrolled in the course	(278)	1	2	3	4	5
between student and instructor	(279)	1	2	3	4	5
6. The use of E-mail increases motivation for the course.	(280)	1	2	3	4	5
7. The use of E-mail makes the course more interesting.	(281)	1	2	3	4	5
8. The use of E-mail makes the student feel more involved.	(282)	1	2	3	4	5
9. The use of E-mail helps the student to learn more.	(283)	1	2	3	4	5
10. The use of E-mail helps provide a better learning experience.	(284)	1	2	3	4	5

(End)

Part 10

Thank you!

Ver 2.1
9/95