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ABSTRACT

A questionnaire survey was developed to measure the attitudes of students toward the Air Force Traffic Safety Course. Mandatory for virtually all personnel entering the Air Force, this course was taught in a standardized multimedia format at more than 140 locations . It was a 10-hour course of instruction covering environmental hazards, vehicle control, and emergency situations. Attitudes toward instructor, course, and media effectiveness, and opinions about various environmental features (such as noise and temperature) were measured. Attitudes were measured at the unit level and for the course as a whole. It was concluded that: reliability and content and constuct validity were acceptable; attitude scales were appropriate; personnel felt all units were fairly effective; and the course was evaluated favorably by the enlisted airmen and generally unfavorably by officers. It was recommended that the questionnaire be adopted, and suggestions were made for data analysis procedures. (The questionnaires are appended.) (Author/MH)

AFHRL-TR-79-5

AIR FORCE HUMAN RESOURCES LABORATORY

MEASURING STUDENT ATTITUDES TOWARD THE AIR FORCE TRAFFIC SAFETY COURSE

By

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Lowry Air Force Base, Colorado 80230

May 1979
Final Report for Period February 1977 – December 1978

AIR FORCE SYSTEMS COMMAND
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This final report was submitted by Technical Training Division, Air Force Human Resources Laboratory, Lowry Air Force Base, Colorado 80230, under project USAS, with HQ Air Force Human Resources Laboratory (AFSC), Brooks Air Force Base, Texas 78235 Dr. Philip J. DeLeo (TTT) was the Principal Investigator for the Laboratory.

This report has been reviewed by the Information Office (OI) and is releasable to the National Technical Information Service (NTIS). At NTIS, it will be available to the general public, including foreign nations.

This technical report has been reviewed and is approved for publication.

MARTY R. ROCKWAY, Technical Director
Technical Training Division

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A questionnaire survey was developed to measure the attitudes of students toward the Air Force Traffic Safety Course. Mandatory for virtually all personnel entering the Air Force, this course was being taught in a standardized multimedia format at more than 140 locations throughout the world. It was a 10 hour course of instruction covering environmental hazards, vehicle control, emergency situations, etc. Dimensions measured by the questionnaire included attitudes toward instructor, course, and media effectiveness and opinions about various environmental features such as noise and temperature. Attitudes were measured both at unit level and to the course as a whole. Reliability was found to be acceptable. Results of a validation study are presented. It was recommended that the questionnaire be adopted for use and suggestions were made for data analysis procedures.

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MEASURING STUDENT ATTITUDES TOWARD THE AIR FORCE TRAFFIC SAFETY COURSE

I. INTRODUCTION

The Air Force Traffic Safety Course (AFTSC) consisted of a 10-hour course of instruction, broken down into 10 units, covering such topics as environmental hazards, vehicle control, common traffic violations, emergency situations, and mature driving behavior. Mandatory for virtually all personnel entering the Air Force, this course was being taught at more than 140 locations in a standardized, multimedia format. Sound/slide presentations and films delivered the instruction much like a programmed text with student responses called for at certain points in the program.

In order to revise the AFTSC as needed, course managers desired a standard method of getting feedback on perceived effectiveness from the student viewpoint. This concern constituted the operational problem. Assistance in the development of measurement procedures was requested of training evaluation specialists in the Air Force Human Resources Laboratory, Technical Training Division.

Given certain constraints imposed by the operational setting, it was proposed that a desirable system for monitoring student attitudes/opinions would possess the following characteristics:

1. Data should come from an objectively scored collection method.

2. Opinions about unit effectiveness should not be measured for each student on every instructional unit, but rather a sampling approach should be taken.

3. A capability for longitudinal analysis should be available so that long-term trends might be detected.

4. Primary emphasis should be given to determining attitudes toward (a) overall course effectiveness, (b) instructional unit effectiveness, (c) media effectiveness, and (d) deficiencies in the study environment (e.g., lighting and temperature).

5. The capability for comparing responses of subpopulations on the basis of certain background/demographic characteristics (e.g., male vs. female) should be included.

6. Simplicity in data collection, tabulation, and analysis should be sought.

To achieve these goals, an approach was recommended consisting of the following steps: (a) questionnaire development and construction, (b) operational tryout of administrative procedures, (c) validation and reliability analysis of the questionnaire, (d) establishment of analysis capability by the user, Air Force Directorate of Aerospace Safety, Ground Safety Division (AFSET).

This report covers work performed in the first three steps mentioned in the preceding paragraph. An implementable decision will depend on the results to be presented here and the extent to which the information gained from the proposed questionnaire satisfies the needs of course management personnel.

The present study focused primarily on establishing questionnaire validity. Thus, a discussion is given of what the questionnaire was intended to measure, the characteristics of the sample, the degree to which the questionnaire was sensitive to differences in attitudes, reliability of the derived scales, and the amount of success encountered with the mechanics of administration. Secondarily, the actual results of the survey are presented as an example of the kind of evaluation report this critique method can produce.

II. METHOD

Rationale. In the context discussed here, an attitude was viewed as a collection of opinion statements (items) with which respondents agreed or disagreed to varying degrees of magnitude. These statements were

designed to cover unitary dimensions of attitude (e.g., attitude toward instructional media and attitude toward instructor competence). Thus, strong agreement with items composing an attitude dimension would result in a high score on that attitude. To the extent that items were found to relate to one another both conceptually and empirically (i.e., through observed correlations), an attitude was said to exist. Attitude was then measured by summing appropriate item responses to derive a scale score. In addition to measuring attitudes, specific statements about certain aspects of training were elicited. These unrelated statements were not conceptualized as attitudes but were treated simply as opinions.

In order to measure attitudes at the course level separately from those at the unit level, two critique forms were produced. For the Course Critique, five dimensions of attitude were defined, and items were written to tap the dimensions. The dimensions of interest in the Course Critique were: (a) instructor personal relations, (b) instructor technical competence, (c) overall course effectiveness, (d) media effectiveness, and (e) environmental factors. Items which support these dimensions appear in Appendix A. Three more items, plus an open-ended section, were added in order to pinpoint specific problem areas.

For the Unit Critique, only one dimension, designed to measure instructional unit effectiveness, was planned. See Appendix B for a listing of these items. Again, three additional items were included to cover specific instructional features, such as adequacy of response time, completeness of coverage, and concreteness of examples.

In addition, eight items of background/demographic information were requested: training base, major command, rank, whether the respondent was an officer trainee, sex, status (student or permanent party), age, and educational level.

Validity and Reliability. To satisfy the customary psychometric requirements, the questionnaire was validated by a demonstration of content and construct validity. The extent to which the questionnaire items addressed a series of dimensions logically related to facets of the course is defined as content validity. Construct validity can be established by citing various types of evidence to check the theory underlying the test. In this instance, the evidence was examined relating to whether the measuring instrument was able to detect attitude differences when they were expected to occur. In addition, factor analysis was used to check whether the intended a priori dimensions were actually found to exist when the questionnaire was administered to a representative sample from the student population. As a necessary pre-condition for validity, reliability of the questionnaire also had to be established empirically. In this case, reliability referred to the internal consistency of the questionnaire scales.

These analysis requirements prompted the design and conduct of a validation study. Moreover, such a study permitted identification of poor items for subsequent revision or elimination. The pilot study also provided a method for testing the mechanics of administration, particularly the unit sampling scheme, which was somewhat complex, and for detecting problems students might have in comprehending either the critique items or the instructions.

Sampling considerations. Since two major subpopulations were required to take the AFTSC (officer trainees and enlisted first-term airmen), it was decided to obtain representation from these two groups. For the sake of convenience and because there was no reason to believe that Lowry airmen were atypical, the entire sample consisted of first-term airmen at Lowry AFB. Officer trainees at Lackland AFB who took the AFTSC as a regular part of their Officer Training School (OTS) curriculum were also given the experimental version of the critique and were considered to be representative of the officer subpopulation. Although USAF Academy graduates constituted another subpopulation of officer respondents, they were not sampled, since the primary intent of this study was not to measure the attitudes of any specific subgroup, but rather to determine whether the measuring device was appropriate for groups with higher levels of education.

Administration. A short pretest was designed and administered for the purpose of detecting changes in attitude toward the course over time. While this procedure would not be recommended for operational use of the questionnaire, it was felt that evidence of attitude change would be useful in establishing validity in the present study. The six item pretest was designed to measure a single dimension—overall course

effectiveness. These items were identical to those on the Course Critique except that, for the pretest, they were changed from the past to the future tense where appropriate. Appendix C contains the pretest in its entirety.

For the enlisted sample, all students who took the AFTSC during a 3-month period at Lowry AFB were given the various experimental questionnaires (i.e., Pretest, Unit Critique, and Course Critique). At Lowry, the traffic safety course was usually completed in 2 days. Student flow through the course was high, and 600 responses were obtained to one or another form of the survey.

Similarly, all officer trainees completing OTS during the 3-month data collection period participated in the study. However, the Traffic Safety Course at Lackland was less concentrated, with units being given 'piecemeal' over a 2- to 3-week period. Student flow was much lower, with only 75 responses collected.

The instructional unit item-sampling procedure was based on a 10 percent per unit concept. The instructor was required to count the number of students in the class, divide by 10, pass out Unit Critiques randomly to one-tenth of the class after each unit, and collect each unit's questionnaires after the students were finished. In this manner, after a substantial number of students had taken the course, enough Unit Critiques would be available to permit valid judgments about the effectiveness of the entire unit. Also, students would not be burdened with the task of completing 10 Unit Critiques.

III. RESULTS

Description of sample. Tables 1 and 2 describe in detail the Lowry and Lackland groups with respect to those background characteristics on which substantial variation was found: sex, age, and educational level. Nearly all the Lowry group held the rank of E-1 (85.5%); the Lackland group typically gave "Officer Trainee" as a response to the rank question. Comparing pretest respondents with those who completed the entire Course Critique showed that the samples were very much alike within a single base. That is, percentages within the various categories of sex, age, and educational level were quite similar. Across bases, comparing the Lowry and Lackland groups showed that, as expected, the Lackland group was older (Lackland mean age = 23.3, Lowry mean age = 19.3) and had more formal education. In addition, females formed a greater proportion of the Lackland sample (36.5% at Lackland vs. 9.8% at Lowry).

Mechanics of administration. The unit sampling procedure was found to be more difficult for instructors to carry out than had been anticipated. Frequently, questionnaires were not distributed or collected according to the plan. The number of unit questionnaires actually collected was considerably smaller than was expected.

One category of educational level was misunderstood by quite a few of the enlisted respondents. The category labeled "some graduate school" was checked by many respondents who also gave their age as less than 21! It appeared that possibly they had misconstrued the required response, assuming that this category meant "graduated from school" (i.e., high school).

Rank was another area somewhat misunderstood. Although they clearly held some official rank in addition to being OTS students, rank was not given by a large number of the officers. The fact that no rank categories were supplied for this item may have contributed to this confusion.

Factorial validity. Factor analysis, which is a technique for reducing a large number of variables to fewer underlying dimensions, permitted a judgement as to whether the intended dimensions of attitude were actually reflected in the responses. Consequently, a series of factor analyses was performed on the first 40 items comprising the Course Critique (20 items pertained to the instructor, and 20 referred to features of the course). These analyses were done separately on the Lowry and Lackland data in order to discover whether similar conclusions would be found in these two disparate groups (Appendix D). The general procedure was to perform first an unconstrained factor analysis where the number of factors to emerge was not specified in advance. Next, the analysis was constrained to a smaller number of factors, depending on

Table 1. Lowry Sample: Background Information

Variable	Category	Pretest (N=300) N	Pretest (N=300) %	Course Critique (N=300) N	Course Critique (N=300) %
Sex	Male	268	89	273	91
	Female	32	11	27	9
Age	17	38	13	39	13
	18	101	34	107	36
	19	54	18	55	18
	20	35	12	35	12
	21	26	9	23	8
	22	16	5	14	5
	23	10	3	8	3
	24	10	3	8	3
	25	5	2	4	1
	26	2	1	3	1
	28 and above	3	1	2	1
	Missing			2	1
Education	Some High School	12	4	7	2
	High School Graduate	199	66	209	70
	Some College	82	27	76	25
	College Graduate	4	1	5	2
	Some Graduate School	2	1	1	
	Missing	1		2	1

Table 2. Lackland Sample: Background Information

Variable	Category	Pretest (N=25) N	Pretest (N=25) %	Course Critique (N=50) N	Course Critique (N=50) %
Sex	Male	17	68	30	60
	Female	8	32	19	38
	Missing data			1	2
Age	20			1	2
	21			1	2
	22	9	36	12	24
	23	6	24	18	36
	24	2	8	7	14
	25	7	28	9	18
	26	1	4	1	2
	Missing			1	2
Education	College Graduate	23	92	44	88
	Some Graduate School	2	8	5	10
	No Data			1	2

the amount of variance explained, so that only the stronger factors remained. Finally, the Lowry solution was rotated to congruence with the Lackland solution.[1]

[1] The authors wish to thank Dr. Roger Pennell (AFHRL/TT) for suggesting this method of analysis.

Prior to factoring the responses, negatively worded items were reverse scored to make all items consistent with respect to favorability. The initial solutions produced nine factors for each student group. While there were some differences between these solutions, they were judged to be minor. At this point, it was apparent that three major factors were present: (a) an instructor general factor, (b) a course effectiveness factor, and (c) a media effectiveness factor (see Tables D1 and D2 of Appendix D). These three factors accounted for 80% of the response variance in the Lackland data. In the Lowry data, the environmental factor failed to emerge as a single entity, but broke out as three separate factors (7, 8, 9) with high loadings on single items. Therefore, it was decided to treat the environmental items as opinion items, rather than as contributors to a scale, and to drop them from future analyses in the investigation of questionnaire dimensionality. Also, Factors 4, 5, and 6 in the Lowry data appeared to be fragmented versions of Factor 2 the course effectiveness factor. In consideration of these results, it was decided to constrain the solution in the next step by specifying that only three factors be extracted.

The three-factor solutions are presented in Tables 3 and 4 for Lowry and Lackland, respectively. It can be seen that Factor 2 overlaps Factor 3 to some extent, but items 30 to 33 provided the clearest definition of Factor 3, namely, attitude toward media effectiveness. Differences still remained between the Lowry and Lackland solutions. For example, in the Lowry data, Factor 2 (course effectiveness) was strong and clearcut, while in the Lackland data, this dimension appeared more weakly as Factor 3.

As an objective check on the severity of these differences, the principal-component Lackland solution was rotated to congruence with the Lowry solution. Coefficients of congruence were .97, .89, and .74 for Factors 1, 2, and 3 respectively. These can be interpreted as excellent, very good, and moderate congruence.

Additional factor analyses. To test the hypothesis that only one factor (perceived course effectiveness) was present in the pretest, the six pretest items were analyzed for the Lowry sample. The results tended to confirm the hypothesis. While two factors emerged in an unconstrained solution, the first factor was predominant and loaded significantly on five of the six items, accounting for 88% of the response variance. Table D3 (Appendix D) presents the obtained loadings on the two factors. For further analyses, it was decided to eliminate the non-contributing item (item 28) from the perceived course effectiveness scale. The results of a similar analysis with the Lackland sample are not presented. In this analysis, the six-item pretest produced three factors rather than one, and loadings did not agree with the Lowry findings. It is felt that this discrepancy occurred because the number of students who took the pretest in the Lackland sample was quite small (N=25), and the observed result was probably unstable.

The unit questionnaires were also factor analyzed. Since so few unit questionnaires were completed by the Lackland group, Lackland cases were added to the Lowry group, and the analysis was completed on a total of 494 cases. With 10 different units represented in the data, it was decided to remove unit differences before factoring; otherwise, the factor solution could be influenced to an unknown degree by variation within units. The alternative approach to perform 10 separate analyses and compare them was rejected as impractical, and also because it was desired that a more general, *overall* assessment be made of the factor structure underlying the unit questionnaire. Therefore, the data were converted to standard scores by a transformation involving the mean and standard deviation of each unit. The results of this analysis failed to confirm unidimensionality of the unit questionnaire. Factor loadings are presented in Table D4. Naming these factors presented some difficulty; however, they appeared to represent (a) attitude toward unit objectives, (b) attitude toward unit questionnaires, and (c) attitude toward level of detail.

In summary, three major factors were found in the Course Critique: (a) an instructor factor, (b) a course effectiveness factor, and (c) a media effectiveness factor. Tables 3 and 4 contain the factor loadings for the Course Critique. These may be interpreted as correlations of the individual items with the factors. Some minor differences between the Lowry and Lackland solutions were found to exist in the Course Critique. The pretest was also analyzed, and one general factor perceived course effectiveness was found. When factoring the Unit Critique, some unexpected factors emerged; however, the most important factor overall lesson effectiveness was present as expected.

Table 3. **Rotated Factor Loadings**
(Lowry Students, N=300)

Item	Factor 1	Factor 2	Factor 3
1	.60		
2	.71		
3	.50		
4	.69		
5	.57		
6	.62		
7	.68		
8	.65		
9	.73		
10	.67		
11	.81		
12	.52		
13	.80		
14	.81		
15	.83		
16	.81		
17	.79		
18	.79		
19	.48		
20	.71		
21		.64	
22		.68	
23		.68	
24		.53	
25		.75	
26		.71	
27		.64	
28			
29			
30		.41	.59
31		.50	.56
32		.45	.59
33		.53	.43
34		.66	
35		.62	
36		.50	

Table 4. Rotated Factor Loadings
(Lackland Students N=[illegible])

Item	Factor 1	Factor 2	Factor 3
1	.72	*	*
2	.78		
3	.70		
4	.57		
5	.81		
6	.85		
7	.84		
8	.81		
9	.90		
10	.80		
11	.65		
12	.62		
13	.77		
14	.80		
15	.85		
16	.92		
17	.78		
18	.84		
19	.72		
20	.92		
21			.65
22		.49	
23			.47
24		.48	
25			.65
26			.81
27			.68
28			
29			
30		.62	
31		.74	
32		.87	
33		.80	
34		.71	
35		.74	
36		.61	

Discriminant validity. As noted by Federico (1971), if certain items are able to discriminate between groups with known attitude differences, these would be more useful items for inclusion in a final version of the questionnaire. To examine this possibility, a discriminant analysis was run on 40 items from the Course Critique. The discriminant function was able to differentiate the officer and enlisted groups quite well, centroids being 2.63 and .64, respectively. In addition, 94% of the cases were correctly predicted as to group membership by the discriminant function. Thirty-seven of the 40 items had significant discriminating power. These are listed in Table 5 along with their standardized coefficients on the discriminant function. These coefficients represent the relative contribution of each item to the discriminant function. Using an absolute value of .15 as an arbitrary cutoff, 18 of the 37 items made relatively strong contributions. Clearly, these would be candidates for retention if a shorter form of the questionnaire were desired.

Other evidence of validity. If the questionnaire was sensitive to differences in attitude which are known to exist, then one could argue that the questionnaire was validly measuring what it was designed to

Table 5. **Standardized Discriminant Function Coefficients**

Item	Coefficient
1	.10
2	.14
3	.33
4	.13
5	.26
6	.17
7	.09
9	.09
10	.20
11	.19
12	.10
13	.49
14	.27
15	.06
16	.09
17	.23
18	.06
19	.23
20	.08
21	.31
22	.33
23	.03
24	.08
25	.24
26	.04
27	.42
28	.34
30	.11
31	.05
33	.07
34	.18
35	.19
36	.40
37	.13
38	.07
39	.17
40	.26

measure. It was widely felt by course managers and instructors that the officer group would dislike the repetitive aspects of the course and, in fact, would perceive the entire course less favorably than the enlisted group. In addition, if the questionnaire was sensitive to changes in attitude over time, this would be further evidence of construct validity. To check these hypotheses, a scale was constructed by summing the five items which had been identified as the primary factor in the pretest. This scale (items 21, 22, 23, 25, and 26 from the Course Critique) can be thought of as measuring perceived course effectiveness. Using perceived course effectiveness as the criterion measure, a two-way factorial analysis of variance was performed with test time as one factor and officer or enlisted group as the other. Twenty-nine subjects were dropped from the analysis because scale scores could not be calculated due to one or more missing responses. Results are depicted graphically in Figure 1. The significant interaction showed that the officer group was less favorable toward the course before taking it and became even more unfavorable after having taken it. Table 6 contains the ANOVA summary table.

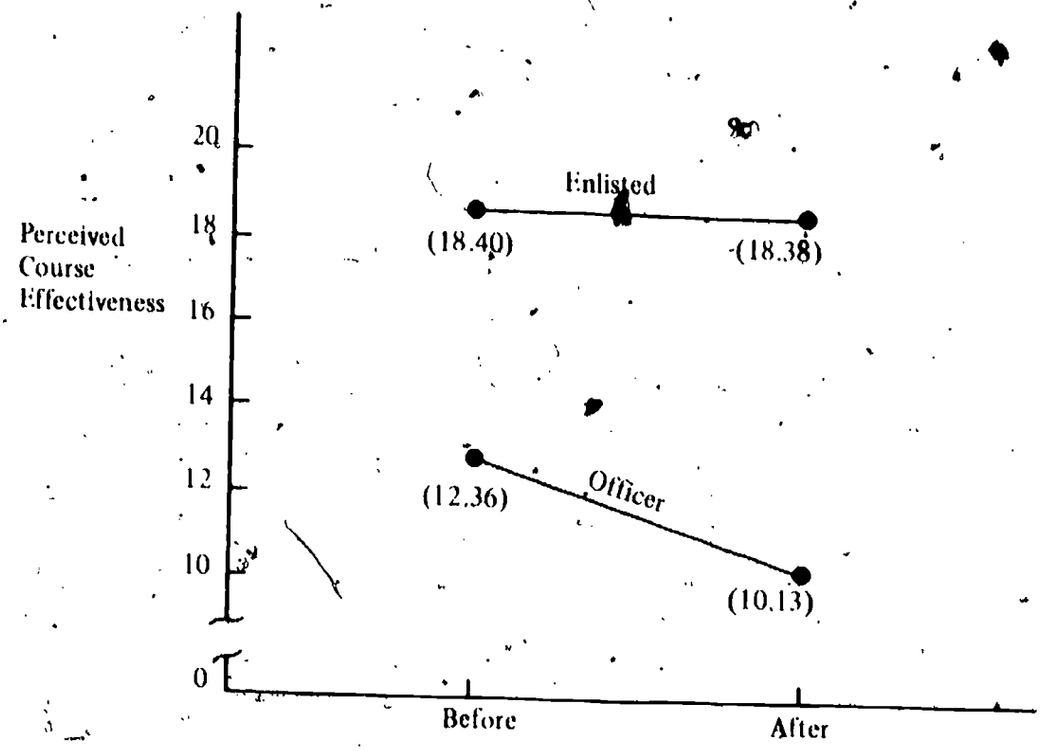

Figure 1. **Perceived course effectiveness: Differences between officers and enlisted personnel.**

Table 6. **Analysis of Variance Summary**

Source of Variation	SS	df	MS	F	p
Time	8.725	1	8.725	.641	.424
Group	3,405.580	1	3,405.580	250.240	.001
Time x Group	70.975	1	70.975	5.215	.023
Residual	8,737.149	642	13.609		
Total	12,285.783	645			

Reliability. Although factor analytic procedures were helpful in identifying items for inclusion on scales and in naming these scales, it was still necessary to check the reliability of the questionnaire. Questionnaire reliability could not be calculated using all items and determining internal consistency, since the instruments were not intended to be, nor did they prove to be, measuring only one dimension. A more appropriate method was to compute the reliability of each scale using Cronbach's Alpha to estimate internal consistency reliability. Table 7 presents these results. Low reliabilities were observed for scales within the Unit Critique.

Survey results. In Table 8, means, standard deviations, and values are given for items of the Course Critique, broken down by officer vs. enlisted. Those items which did not fit in the three scales are presented in Table 9, with percentages of respondents in the various response categories. In these instances, chi-square tests were made to determine whether the distribution of responses differed significantly between the two groups. Due to expected cell frequencies less than 5, categories in items 41 to 43 had to be collapsed to meet the statistical requirements of the chi-square test. A number of differences were observed. Scale scores are reported in Table 10.

Table V. **Internal Consistency Reliability Estimates for Various Derived Scales**

Test	Scale	Number of Items	Alpha
Pretest	1. Course Effectiveness	5	.86
Unit Critique	1. Accomplishment of Objectives	4	.68
	2. Question Suitability	3	.51
	3. Level of Technical Detail	2	.42
Course Critique	1. Instructor	20	.95
	2. Course Effectiveness	14	.94
	3. Media Effectiveness	4	.89

Table 8. **Item Differences: Course Critique (Items 1 to 40)**

	Lowry			Lackland			Difference	
Item	Mean	SD	(N)	Mean	SD	(N)	t	
1	4.28	0.95	(204)	3.69	1.13	(48)	3.72	<.001***
2	4.41	0.75	(203)	4.17	0.86	(48)	1.95	.053
3	3.53	1.31	(200)	3.38	1.31	(47)	0.69	.489
4	4.36	0.79	(201)	4.13	0.95	(47)	1.55	.127
5	4.42	0.81	(203)	4.21	0.82	(48)	1.66	.099
6	4.41	0.76	(201)	4.21	0.85	(48)	1.60	.110
7	4.30	0.97	(204)	3.98	0.98	(48)	2.09	.037*
8	4.56	0.62	(203)	4.42	0.77	(48)	1.22	.228
9	4.28	0.90	(204)	4.17	0.89	(47)	0.75	.452
10	4.34	0.82	(205)	4.09	1.08	(47)	1.53	.131
11	4.31	0.92	(199)	3.73	1.14	(48)	3.28	.002**
12	3.77	1.12	(194)	3.52	0.94	(46)	1.41	.160
13	4.47	0.79	(204)	4.38	0.82	(48)	0.75	.454
14	4.40	0.86	(203)	4.13	0.96	(48)	1.94	.053
16	4.45	0.84	(200)	4.17	0.89	(47)	2.00	.047*
17	4.62	0.69	(204)	4.43	0.76	(49)	1.74	.084
18	4.45	0.79	(208)	4.23	0.90	(48)	1.69	.092
19	3.99	1.10	(198)	3.88	0.91	(48)	0.67	.503
20	4.36	0.87	(202)	4.21	0.82	(48)	1.79	.075
21	3.84	0.88	(298)	2.47	1.23	(49)	7.50	<001***
22	3.36	0.99	(298)	1.58	0.93	(50)	11.83	<.001***
23	3.76	1.05	(290)	2.08	1.37	(49)	8.28	<.001***
24	3.84	0.69	(293)	2.98	1.06	(48)	5.43	<.001***
25	3.70	1.01	(294)	2.06	1.08	(48)	10.28	<.001***
26	3.78	0.93	(298)	2.16	1.12	(49)	9.54	<.001***
27	3.80	0.93	(297)	1.90	1.12	(49)	11.23	<.001***
28	3.39	0.92	(292)	3.40	1.05	(50)	0.07	.947
29	3.55	0.87	(297)	2.50	1.17	(50)	6.11	<.001***
30	3.89	0.93	(295)	2.76	1.30	(50)	5.89	<.001***
31	3.93	0.79	(297)	2.96	1.23	(50)	5.40	<.001***
32	3.90	0.78	(294)	2.90	1.25	(50)	5.49	<.001***
33	3.95	0.76	(293)	2.90	1.36	(50)	5.34	<.001***
34	3.41	0.93	(291)	1.98	1.08	(50)	9.78	<.001***
35	3.35	0.91	(296)	1.84	1.03	(49)	10.59	<.001***
36	3.72	0.75	(294)	2.56	1.21	(50)	6.57	<.001***
37	3.51	1.04	(292)	3.04	1.15	(49)	2.85	.005**
38	3.87	1.04	(294)	3.83	0.80	(48)	0.28	.777
39	3.65	1.21	(288)	4.12	0.85	(50)	3.40	.001**
40	4.03	0.86	(294)	4.14	0.73	(50)	0.85	.395

*** $p<.001$
** $p<.01$
* $p<.05$

Table 9. Item Differences: Course Critique (Items 41 to 43)

Lowry

Item						
			Outside	Inside	No Noise	Missing
41			5.3%	5.3%	87.7%	1.7%
	Hot	Warm	Just Right	Cool	Cold	Missing
42	1%	10.7%	56.7%	17.3%	12.7%	1.7%
	Strongly Agree	Agree	No Opinion	Disagree	Strongly Disagree	Missing
43	4.3%	10%	42.7%	34.7%	6%	2.3%

Lackland

			Outside	Inside	No Noise	Missing
41				10%	88%	2%
	Hot	Warm	Just Right	Cool	Cold	Missing
42	6%	30%	52%	2%	2%	8%
	Strongly Agree	Agree	No Opinion	Disagree	Strongly Disagree	Missing
43	24%	16%	40%	12%	4%	4%

Note.

Item	x^2	p
41	4.23	.1205
42	30.64	<.0001
42	32.39*	<.0001

Table 10. Scale Differences: Course Critique

Scale	Lowry Mean	Lowry SD	Lowry (N)	Lackland Mean	Lackland SD	Lackland (N)	Difference t	Difference p
1 (Instructor)	4.32	0.61	(202)	4.07	0.75	(48)	2.22	.030
2 (Course)	3.65	0.62	(298)	2.20	0.69	(50)	15.07	<.001
3 (Media)	3.92	0.66	(297)	2.89	1.11	(50)	6.43	<.001

Item and Scale scores on the Unit Critiques are given in Table 11 for the total sample broken down by unit. Though differences among units were noted for items 8 and 10, no differences were found across the various units for the unit effectiveness scale.

The open-ended portion of the questionnaire produced a number of comments/recommendations which were grouped into categories and listed in Table 12. A much larger percentage of the officer group chose to comment and their comments were predominantly negative.

Table 11. Item and Scale Scores: Unit Critique

Unit	1 (N=60)		2 (N=69)		3 (N=63)		4 (N=68)		5 (N=40)		6 (N=50)		7 (N=48)		8 (N=42)		9 (N=44)		10 (N=9)			
Item	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	F	Sig
1	2.50	0.88	2.48	0.86	2.46	0.93	2.67	0.95	2.85	1.10	2.68	0.94	2.67	1.10	2.60	1.21	2.66	0.94	2.63	0.92	0.74	.6741
2	3.95	0.73	3.85	0.70	3.[illegible]	0.80	3.85	0.65	3.95	0.71	3.90	0.65	3.98	0.73	3.90	0.91	3.89	0.97	4.11	0.60	0.27	.9818
3	3.95	0.78	3.66	0.86	3.70	0.96	4.01	0.68	4.03	0.81	3.94	0.55	3.92	0.79	4.00	0.73	3.95	0.89	4.25	0.89	1.72	.0816
4	3.87	0.66	3.90	0.72	3.92	0.60	3.97	0.73	3.74	0.85	3.70	0.95	3.83	0.69	3.83	0.85	3.79	1.04	4.11	0.60	0.69	.7139
5	3.66	0.87	3.62	0.91	3.62	0.92	3.70	0.91	3.51	0.97	3.62	0.85	3.58	0.77	3.56	1.10	3.31	1.07	4.00	0.71	0.81	.6035
6	2.05	0.84	2.49	1.00	2.41	1.07	2.33	1.02	2.53	1.20	2.52	1.11	2.43	0.97	2.17	1.05	2.30	0.89	2.11	0.60	1.31	.2286
7	1.98	0.75	2.09	0.72	2.07	0.66	2.09	0.87	2.19	1.05	2.31	0.99	2.17	0.89	1.98	0.72	2.00	0.66	2.11	1.17	0.77	.6486
8	2.94	0.47	2.76	0.66	2.67	0.51	2.87	0.64	2.78	0.53	2.90	0.46	2.72	0.62	2.90	0.58	3.02	0.46	3.00		2.07	.0306
9	2.82	0.53	3.00	0.55	2.97	0.59	2.04	0.68	3.03	0.66	2.92	0.73	2.91	0.58	3.00	0.81	2.98	0.63	3.00	0.50	0.61	.7921
10	2.73	0.52	3.03	0.50	2.81	0.62	2.86	0.60	2.95	0.45	2.86	0.67	3.00	0.51	3.14	0.65	3.11	0.65	3.13	0.35	2.90	.0024
Scale	3.86	0.58	3.76	0.53	3.77	0.49	3.88	0.51	3.82	0.60	3.79	0.53	3.83	0.55	3.82	0.70	3.73	0.81	4.13	0.52	.60	.7948

Table 12. **Content Analysis of Recommendations**

Respondent	Comment	Frequency
Officers (N=50)	Very limited intellectual appeal; dry; boring	33
	Should be eliminated because it takes up valuable time	30
	Too long	10
	No comment	6
Enlisted (N=300)	Acquired useful information or enjoyed class	2
	Boring	22
	Too long	28
	Repetitious	18
	Eliminate or shorten course because most people have taken driver's education	11
	Pace too fast to answer questions	6
	Problems with media equipment: slides out of order, sound inadequate	21
	Instructor should have greater role in course	8
	Too many hours per day	11
	Update films	6
	More shocking and dramatic visual presentations of accidents	10
	No comment	166

IV. DISCUSSION

Although the empirically derived factors did not exactly match the a priori intended factors, a usable set of dimensions was found to be present in both the Course and Unit Critiques. While previous research (Kantor, Vitola, & Guinn, 1977) with the two separate Instructor scales (instructor technical competence and instructor personal relations) had indicated that measures could be obtained on both these dimensions, in retrospect, the fact that only one factor emerged from the analysis was understandable. This result can probably be explained by circumstances peculiar to the AFTSC. The relative brevity of the course, coupled with the fact that instructors were not the principal medium for transmitting information, probably hampered the respondents' ability to distinguish two separate facets of the instructor role. Given the relatively minor role of the instructor in providing instructional content in the multimedia AFTSC, little has been lost by restricting measurement to one general instructor factor.

With regard to the course effectiveness factor, most of the items which had been written to measure this dimension were successful. Items 8 and 9 were notable exceptions and could probably be dropped with little loss in information.

Less successful were items designed to measure the media effectiveness dimension. Only four highly stable and interrelated items contributed to measuring this dimension. Such a small number of items approached the lower limit for constituting a scale.

In the Unit Critiques, only one factor had been anticipated unit (or lesson) overall effectiveness—but three were found upon examining the data. However, the intended factor was the strongest and the others may likely be dropped without defeating the purpose of the Unit Critique.

Dissimilarities found in the Lowry and Lackland factor solutions, while large enough to cause some concern, were not viewed as serious enough to warrant separate scale construction or revision to the dimensions as presently conceived. Sampling error and the fact that the Lackland sample was relatively small may have accounted for the obtained differences. Moreover, at least moderate congruence of the factor solutions was achieved in the present samples.

From a psychometric point of view, it is risky, if not improper, to use a single item for assigning a numerical score which is interpreted as an attitude measurement. The reliability of a one-item measure is indeterminate using internal consistency estimation procedures and would be theoretically low in any case. Thus, it is recommended that attitudes toward instructor, course, and media effectiveness be measured by means of multiple item scales. Those developed in this study were shown to have adequate reliability and good construct validity. Unit effectiveness also appeared to be a reliable and valid scale. There is, however, a defensible way of interpreting single item responses. One can obtain a great deal of information by viewing single items as opinion statements and comparing frequency distributions to identify group differences in response patterns. If an unfavorable response category is picked more frequently than could be accounted for by chance among a sufficiently large number of people, this can be taken as evidence that an unfavorable situation exists. Chi-square tests can be used to determine the statistical significance of deviant response patterns.

V. CONCLUSIONS AND RECOMMENDATION

Conclusions

1. The experimental versions of the Course and Unit Critiques demonstrated adequate content and construct validity.

2. Reliability was found to be excellent for all derived scales of the Course Critique and satisfactory for the most important scale of the Unit Critique.

3. Scales were judged to be appropriate for measuring attitudes of two major subgroups who took the AFTSC.

4. Environmental problems can be identified by specific opinion items.

5. Administrative procedures for collecting Unit Critique information were marginally successful.

6. No differences between units with regard to effectiveness were observed in the present sample. That is, in general, personnel participating in the survey felt that all the units were fairly effective.

7. As a whole, the AFTSC was perceived favorably by the airman group and rather unfavorably by the officer group with attitudes in the latter group getting more unfavorable after exposure to the course.

8. While these findings, strictly speaking, do not generalize outside of the content area of Air Force Traffic Safety, many of the questions appear to be appropriate for other subject matter with suitable modifications. When such applications are considered, checks on the reliability and validity of the questionnaire may be advisable.

Recommendations

1. The Unit Critique form should be adopted as presently constructed.

2. The Course Critique form should be adopted after modifications to shorten the instructor scale. The revised instructor scale should contain the following ten items: 2, 4, 5, 10, 11, 13, 14, 15, 16, 17.

3. In future versions, consideration should be given to lengthening the media effectiveness scale by adding similar items.

4. Written instructions for administration of the Unit Critique should include a comprehensive example to clarify the procedure.

5. A procedure for analyzing data should be developed. Analysis capabilities should include as a minimum: (a) calculation of descriptive statistics on any possible breakdown of the population, (b) the ability to produce frequency distributions for the various item response categories, (c) the ability to aggregate data from various administrations of the survey, (d) two-way or higher analysis of variance, (e) cross-tabulations with various statistical measures of association produced as part of the analysis.

6. Personnel who would analyze survey results should be identified and trained, if necessary, to perform desired analyses.

7. In operational use, norms should be calculated and trends monitored.

REFERENCES

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Kantor, J.E., Vitola, B.M., & Guinn, N. *Development and validation of the Air Force Technical Training Student Survey.* AFHRL-TR-77-27(I), AD-A042 967. Brooks AFB, TX: Personnel Research Division, Air Force Human Resources Laboratory, June 1977.

APPENDIX A: QUESTIONS COMPRISING THE COURSE CRITIQUE

Please use the scales below to describe your primary instructor. Check the part of the scale which best expresses your feelings.

1. Ineffective — Effective
2. Knowledgeable — Ignorant
3. Boring — Interesting
4. Dependable — Undependable
5. Disorganized — Organized
6. Unsure — Confident
7. Convincing — Unconvincing
8. Unprepared — Prepared
9. Intelligent — Stupid
10. Inefficient — Efficient
11. Encourages — Discourages
12. Criticizes — Praises
13. Fair — Unfair
14. Impatient — Patient
15. Considerate — Inconsiderate
16. Hinders — Helps
17. Friendly — Unfriendly
18. Supportive — Hostile
19. Ridicules — Compliments
20. Cooperative — Uncooperative

The following items pertain to the program taken as a whole. Circle the response which most nearly fits your opinion.

SD = Strongly Disagree
D = Disagree
N = Neutral, or No Opinion
A = Agree
SA = Strongly Agree

	SD	D	N	A	SA
1. My approach to driving will probably be affected by having taken this course.	1	2	3	4	5
2. I enjoyed the course/program.	1	2	3	4	5
3. Taking this course was a waste of time.	1	2	3	4	5
4. The course objectives were appropriate.	1	2	3	4	5
5. I learned a number of things I did not know.	1	2	3	4	5
6. I have a better understanding of traffic safety (rules, precautions, hazards) since taking this course.	1	2	3	4	5
7. I think others of my general background would profit from taking this course.	1	2	3	4	5
8. This course addresses a real Air Force problem.	1	2	3	4	5
9. The program made me feel more confident about my driving skills.	1	2	3	4	5
10. I liked the automated type of presentation used in this course.	1	2	3	4	5
11. The learning strategy used in this course (rule-example-practice) is a good way to teach.	1	2	3	4	5
12. The slide presentations used in this course were *effective in getting across the material.*	1	2	3	4	5
13. The films used in this course were *effective in getting across the material.*	1	2	3	4	5
14. I found the films entertaining and enjoyable.	1	2	3	4	5
15. I found the slide presentations entertaining and enjoyable.	1	2	3	4	5
16. The way the instructional content was presented was appropriate for this kind of subject matter.	1	2	3	4	5
17. Classroom ventilation was about right.	1	2	3	4	5
18. The classroom was not dark enough for audio-visual presentation.	1	2	3	4	5
19. Seating arrangement allowed me an unobstructed view of the screen.	1	2	3	4	5
20. Noise level did not distract me from the program.	1	2	3	4	5

21. Most of the noise came from:

    a. outside the classroom
    b. inside the classroom
    c. no noise problem

22. Classroom temperature was:

    a. hot
    b. warm
    c. just right
    d. cool
    e. cold

23. This course was given at a bad time of the day (e.g. just after lunch, etc.).

a. strongly agree
b. agree
c. no opinion
d. disagree
e. strongly disagree

If you agree, tell why:

SECTION V – Recommendations for Change

21

APPENDIX B: QUESTIONS COMPRISING THE UNIT CRITIQUE

In this section please answer the questions only with respect to **one** of the units within the course.

Unit you were assigned to rate: _____

SD = Strongly Disagree
D = Disagree
N = Neutral, or No Opinion
A = Agree
SA = Strongly Agree

	SD	D	N	A	SA
1. The questions were so simple that they were an insult to my intellegence	1	2	3	4	5
2. The objectives of this unit were clearly stated.	1	2	3	4	5
3. Most of the time I understood what was being asked by the question slides.	1	2	3	4	5
4. In general, the information presented in this unit was up-to-date.	1	2	3	4	5
5. I feel that this unit clearly achieved its objectives.	1	2	3	4	5
6. This unit was full of needless detail.	1	2	3	4	5
7. This unit contained too many technical terms.	1	2	3	4	5

8. The amount of time provided for responding to the slides was:
   a. far too short
   b. too short
   c. just about right
   d. too long
   e. far too long

9. The amount of coverage in this unit was:
   a. far too little
   b. too little
   c. just about right
   d. too much
   e. far too much

10. The number of concrete examples given in this unit was:
    a. far too few
    b. too few
    c. just about right
    d. too many
    e. far too many

APPENDIX C: QUESTIONS COMPRISING THE PRETEST

The following items pertain to the Traffic Safety Course you are scheduled to attend. Circle the response which most nearly expresses your opinion.

SD = Strongly Disagree
D = Disagree
N = Neutral, or No Opinion
A = Agree
SA = Strongly Agree

	SD	D	N	A	SA
1. My approach to driving will probably be affected as a result of this course.	1	2	3	4	5
2. I am looking forward to taking this course.	1	2	3	4	5
3. I think this course will be a waste of time.	1	2	3	4	5
4. I will learn a number of things from this course.	1	2	3	4	5
5. I will have a better understanding of traffic safety (rules, precautions, hazards) upon completion of the course.	1	2	3	4	5
6. This course will address a real Air Force problem.	1	2	3	4	5

APPENDIX D: ADDITIONAL FACTOR ANALYSES

Table D1. Nine Factor Solution of Course Critique (Lowry)

Items	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5	Factor 6	Factor 7	Factor 8	Factor 9
Instructor									
1	.530	.155	.022	.095	.058	.691	−.113	.092	.119
2	.688	.067	−.039	.032	−.041	.275	.080	.002	−.064
3	.481	.315	.055	.336	.049	.154	.094	.011	−.034
4	.676	.203	−.019	−.028	.044	.108	.038	−.011	.064
5	.516	−.003	.085	.032	.536	.027	−.080	−.085	−.040
6	.556	.036	−.013	.216	.419	.156	.078	.011	.051
7	.692	.255	.047	−.284	−.007	.062	.061	−.168	−.132
8	.613	.015	−.053	−.168	.412	.010	−.047	.075	−.055
9	.745	.169	.059	−.205	.001	.039	.259	.007	−.101
10	.614	.193	.075	−.129	.155	.439	.055	−.074	−.081
11	.805	.142	−.020	−.054	.004	.132	.038	−.019	.076
12	.512	.177	−.050	.187	.092	.010	−.080	.143	.083
13	.811	.118	.031	−.006	−.005	.023	−.111	.113	.046
14	.781	.024	.079	.090	.174	.101	−.033	.065	−.063
15	.860	.109	.050	.086	−.009	−.080	−.032	.056	.074
16	.795	.169	.007	.043	.082	.074	.064	.038	.013
17	.829	.040	.151	−.031	−.043	−.097	−.019	−.010	.021
18	.796	.079	.005	−.131	.104	−.101	.020	.036	.052
19	.446	.161	.008	.291	.222	.114	.150	−.143	.007
20	.745	−.001	.214	.026	−.089	−.016	−.039	.036	.014
Course									
1	.129	.629	.074	.031	.047	.070	.095	−.007	.049
2	.238	.644	.169	.122	−.108	.043	−.076	.108	−.058
3	.222	.680	.069	.005	−.024	−.065	−.024	.172	.048
4	.053	.513	.118	.113	−.033	.118	.096	−.116	.005
5	.090	.754	.010	.050	.021	.083	.084	−.064	.025
6	.209	.742	.069	−.102	.000	−.025	.019	.005	.085
7	.057	.650	.213	−.059	.107	−.040	.013	−.086	.098
8	.013	.265	.181	−.048	−.027	.005	.005	.089	.165
9	.039	.379	.222	−.124	−.035	.101	−.220	.083	.003
10	.160	.321	.683	−.097	.039	.027	−.092	.101	.004
11	.017	.426	.614	−.052	.078	−.072	.118	.054	.073
12	.018	.351	.714	.160	−.013	.063	.121	−.258	.105
13	−.051	.449	.473	.287	−.053	−.041	.129	.043	.132
14	.158	.604	.280	.285	−.018	−.039	.022	.299	−.372
15	.100	.533	.452	.204	−.010	.016	.004	.240	−.354
16	.041	.475	.224	.025	.069	.035	.033	.153	−.057
17	.047	.131	.027	−.005	−.019	.024	.118	.513	.120
18	.044	.080	.095	.030	−.006	.018	.026	.096	.470
19	.031	.065	.051	.049	−.000	−.036	.614	.090	.002
20	.086	.141	.299	−.167	−.082	.086	.323	.093	.198

Table D2. **Nine Factor Solution of Course Critique (Lackland)**

Items	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5	Factor 6	Factor 7	Factor 8	Factor 9
Instructor									
1	.638	.130	.025	.079	.579	-.018	.023	.038	.290
2	.706	.093	.009	.295	.386	.027	.010	.017	-.082
3	.624	.053	.057	.017	.540	.136	.044	.108	.044
4	.479	-.071	.001	.359	.462	.203	.193	.201	-.211
5	.786	.072	.011	.158	.026	.128	.362	.081	-.131
6	.819	.092	.039	.040	.125	.036	.190	.126	-.013
7	.800	.033	.130	.051	.168	.004	.117	.131	.208
8	.784	.135	.100	.089	.038	.021	.299	.092	.058
9	.874	.010	.005	.059	.149	.037	.128	-.064	.044
10	.743	.153	.095	.044	.300	.155	.358	.132	.065
11	.670	.070	.210	.013	.026	.035	-.165	.083	.328
12	.629	.121	.057	.266	.036	.199	.080	.068	.476
13	.812	.110	.021	.190	.095	.002	.103	-.029	-.309
14	.822	.040	.088	.004	.073	-.038	.078	-.053	.249
15	.878	.014	.071	.050	.060	.001	.097	-.035	-.040
16	.923	.010	.018	.027	.125	.070	-.051	-.011	-.057
17	.818	.172	.015	.059	.035	.089	-.126	-.131	-.145
18	.887	.048	.088	.086	.068	.142	-.165	-.016	-.067
19	.761	.008	.081	-.010	-.053	-.046	.203	.279	.394
20	.919	.065	.055	.044	.115	.072	-.046	.022	.010
Course									
1	.170	.113	.665	.053	-.113	.151	.215	.100	.156
2	.184	.239	.312	.057	.267	.127	-.063	.540	.169
3	.030	.118	.462	.127	.262	-.038	-.044	.168	.182
4	.059	.469	.269	.054	.043	.134	.091	.150	.301
5	.060	.198	.741	.305	.150	.189	.146	.039	-.326
6	.013	.126	.825	.150	.064	.029	.010	.103	-.135
7	.053	.056	.781	.291	.042	-.181	.035	.055	.118
8	.309	.072	.065	.028	.012	.123	.637	-.027	-.044
9	.011	.017	.109	.101	.230	.037	.177	.184	.071
10	.008	.607	.178	.125	.031	.348	-.175	.221	.042
11	.181	.781	.105	.123	.113	.198	-.135	.183	-.042
12	.023	.857	.118	.159	.067	.024	.080	.241	-.086
13	.062	.907	.044	.116	-.141	-.064	.208	.121	.004
14	.001	.382	.136	.066	.163	.086	.001	.825	-.048
15	.022	.363	.105	.009	.035	.024	.013	.907	.044
16	.064	.457	.286	.385	.019	.054	.229	.392	-.137
17	.091	.094	.089	.681	.024	.168	.102	.003	-.019
18	.414	.006	.150	.644	.068	.021	.274	-.005	-.097
19	.119	.327	.205	.455	.149	.599	.035	-.025	.110
20	.079	.149	.058	.101	.100	.826	.123	-.040	.003

Table D3. **Factor Analysis of Pretest (Lowry)**

Items	Factor 1	Factor 2
1	.611	.207
2	.765	.050
3	.681	.066
4	.630	.522
5	.560	.642
6	.003	.291

Table D4. **Factor Analysis of Unit Questionnaires (Combined Group)**

Items	Factor 1	Factor 2	Factor 3
1	.082	.575	.000
2	.574	.044	.129
3	.471	.411	−.227
4	.618	.147	.085
5	.664	.233	.051
6	.183	.654	.409
7	.111	.055	.580

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