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AUTHOR Gantt, Judy M.; Terrell, Edward L.
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ABSTRACT

A study examined the impact of the Centers for Disease Control's home study course in community hygiene on the job performance of 45 sanitarians in 30 districts throughout North Carolina. Data were collected from: (1) pre- and post-tests that evaluated the sanitarians' mastery of knowledge in such areas as water supply, sewage disposal, solid waste management, and disease prevention and control, and (2) "before/now" questionnaires for both participants and supervisors administered to assess behaviors and skills comprising job performance before and after the course. Analyses performed on the "before/now" statements revealed significance at the $p < .0001$ level. Besides gaining a large amount of technical knowledge in the area of environmental health, the sanitarians who successfully completed the course developed positive attitudes about the field of environmental health and became better prepared to meet the challenges of their jobs. (Both the sanitarian and supervisor questionnaires are included in the report.) (MN)

External Evaluation of CDC Homestudy Course 3010-G, "Community Hygiene"

Judy M. Gantt, M.Ed.
Chief, Non-resident Instruction Branch
Division of Continuing Education and Training
Center for Professional Development and Training
Centers for Disease Control
Atlanta, GA 30333

Edward L. Terrell
Sanitation Branch
Environmental Health Section
Division of Health Services
North Carolina Department of Human Resources
P.O. Box 2091
Raleigh, NC 27602-2091

External Evaluation of CDC Homestudy Course 3010-G, "Community Hygiene"

Abstract

The purpose of this study was to assess the impact of the Centers for Disease Control's Homestudy Course 3010-G, "Community Hygiene," on North Carolina sanitarians, in terms of subsequent job performance. The major components of the research design were pre- and post-tests to assess changes in course participants' acquired knowledge, and "before/now" questionnaires for both participants and their supervisors, to assess behaviors and skills comprising job performance. The analyses performed on the "before/now" statements (comparing the ratings for each statement for both participants and supervisors) revealed significance at the $p < .0001$ level. This same level of significance was produced from the analysis of pre- and post-test scores. These analyses indicate that both participants and supervisors perceived a significant improvement in job performance after successful completion of the Homestudy course, and both knowledge and skills improved for participants at a significant level.

The impact of training on actual job performance is an evaluation question which is rarely addressed, but is critical if an assessment of learning outcomes is to be complete. In order to answer such an external evaluation question about the Centers for Disease Control's Homestudy Course 3010-G, "Community Hygiene," a study was conducted to determine if successful completion of the course by sanitarians in North Carolina results in measurable changes in acquired knowledge as well as behaviors and skills related to job performance. The research was carried out by the Sanitation Branch, Environmental Health Section, Division of Health Services, North Carolina Department of Human Resources, with technical consultation and assistance provided by Homestudy Services, Non-resident Instruction Branch, Division of Continuing Education and Training, Center for Professional Development and Training, Centers for Disease Control (CDC). Mr. Edward Terrell administers the course to newly employed public health sanitarians in North Carolina each year, and personnel must complete it before they can become registered sanitarians.

Pre- and post-tests were used to assess changes in participants' acquired knowledge, and "before/now" questionnaires, developed using input from sanitarian supervisors throughout North Carolina, were used to assess changes in behaviors and skills as perceived by both the participants and their supervisors. (See Figs. 1 and 2.) A one-way analysis of variance was performed to determine if a difference would be evident in the pre- and post-test mean scores, and the same technique was used with each of the eight behaviors and skills in the questionnaires, with ranked performance before the course compared with ranked performance after the course, as perceived by both students and their supervisors. Additionally, the "before" ranks by

participants were compared with the "before" ranks of the supervisors, and the "now" ranks by participants were compared with the "now" ranks of the supervisors, to see if the initial and subsequent perceptions of performance by both groups were different or alike.

The null hypotheses were that there would be no significant differences between the mean pre- and post-test scores, the "before" and "now" rankings of the eight behaviors and skills as assessed by the participants, or the "before" and "now" rankings of the eight as assessed by the supervisors. The conclusion would therefore be that completion of the course does not affect either acquired knowledge or subsequent job performance. The alternative hypotheses, reflecting the researchers' opinions, were that there would be a significant difference between the pre- and post-test scores, as well as the "before" and "now" rankings of the eight behaviors and skills assessed by both the participants and their supervisors, as the completion of the course should result in improvements in these areas.

No postulation was made concerning the results of the "before" rankings of the participants and the "before" rankings of their supervisors. Similarly, results of the comparison of the "now" rankings of each behavior and skill by the participants with the "now" rankings of their supervisors were not postulated. The researchers simply did not have enough information about the possible ways the two groups perceived job performance.

Method

Subjects

Forty-five sanitarians in 30 districts or counties were enrolled in Homestudy Course 3010-G, "Community Hygiene," when the study began. During the course of the research, four participants changed jobs, and one died. The remaining forty, then, constitute the population of the study, as complete data were available for this group.

All participants were employed as sanitarians, and most had less than one year's experience. Two had five years of experience, and two had 15 years. One participant worked for the North Carolina Department of Human Resources, while all the others worked for local health departments (county or district). All except one sanitarian had at least a bachelor's degree. One had an associate's degree, and three had master's degrees.

Data from 25 supervisors were used in the study. Thirty supervisors initially agreed to participate in the research, but data from supervisors whose employees had resigned were not used.

Materials

CDC Homestudy course. Homestudy Course 3010-G, "Community Hygiene," consists of 17 lessons and a final exam, with broad coverage of the field of environmental sanitation. Lessons are devoted to various areas involved, such as water supply, sewage disposal, solid waste management, and disease

prevention and control. Students complete lessons (multiple-choice and true-false questions based on assigned reading in the text) and a monitored final exam.

In North Carolina, field trips are conducted to sites which illustrate the topic areas discussed. Students also participate in seven supplementary sessions held in two locations--in the eastern and western parts of the State. These one-day seminars provide a forum for students and technical experts to discuss specific topic areas, deal with questions and problems, relate the Homestudy material to North Carolina's laws and regulations, as well as generally open a line of communication with the State Department of Human Resources. Since the course is based on the 1966 reference, *Municipal and Rural Sanitation*, by V. M. Ehlers and E. W. Steel, faculty also take this opportunity to update students on developments and methods which are consistent with current public health practice.

Instruments. The pre-tests and post-tests were identical instruments consisting of 50 multiple-choice questions and 50 true-false questions. These were taken from the individual course lessons and the final exam, and all the topics included in the course were covered.

Two questionnaires were developed, with identical behaviors and skills to be ranked from 1 to 10, with 1 as the lowest. As part of another North Carolina Homestudy course external evaluation project, North Carolina sanitarian supervisors were surveyed, and asked to rank sixteen behaviors and skills related to both vector control and general sanitarian duties. They were also asked for further suggestions as to appropriate behaviors and skills related

to job performance. The National Environmental Health Association's list of attributes was used as a base, along with input from personnel at the North Carolina Department of Human Resources. The supervisor responses were tabulated and analyzed, and no statistical differences were found in mean rankings. The researchers then pulled the items related to environmental health to develop the two questionnaires used in this study.

The questionnaire for participants asks students who completed "Community Hygiene" to rate themselves on each of eight skills before they completed the course and after they completed the course, or now. (See Fig. 1.)

The questionnaire for supervisors asks supervisors to rate a named participant (their employee) on the behaviors and skills for two time periods: before taking the CDC course, and after it, or now. (See Fig. 2.)

An additional questionnaire was administered to supervisors which assesses their provisions for employee training. (See Fig. 3.) The questionnaire was designed to remind supervisors of the importance of district educational meetings, short courses, journals and other professional materials, and in-house training, while gathering information about the extent of commitment to training at the county and district level.

Procedures

The CDC Homestudy course began in September, 1984, and Edward Terrell administered the pre-test to the 1984-1985 participants at that time. In May, 1985, the participants were given the final exam for the course, and at the

same sitting they completed the post-test. They were also given the "before/now" questionnaire at this time, and were asked for a written evaluation of the course.

For this final assessment, Mr. Terrell asked students to state what was good about the course, what was bad about it, and what could be done to improve it. He mentioned that they might want to submit a list of likes and dislikes, and he pointed out that there was a limited amount of time and money that could be spent by the State on any one course. He also said at this time that there was not anything he could do about the textbook.

The supervisors received and returned by mail both questionnaires designed for them. The training provision questionnaire was sent out from the North Carolina Department of Human Resources in October, 1984, and the "before/now" questionnaire was sent out in May, 1985, after all participants had completed the course. The high degree of cooperation the researchers received from North Carolina personnel was indicated by the unusually high response rates: 100% for the training provision questionnaire, and 96% for the "before/now" questionnaire.

Both the pre- and post-tests and the "before/now" questionnaires were analyzed using the SAS ANOVA statistical package, with each behavior and skill analyzed separately. "Before" ratings were compared to "now" ratings for participants; "before" ratings were compared to "now" ratings for supervisors; participant "before" ratings were compared to supervisor "before" ratings; and participant "now" ratings were compared to supervisor "now" ratings. The training provision questionnaires were analyzed to obtain frequency counts and means

using the SAS FREQ and MEANS packages. As the student evaluations constitute qualitative evaluations of the course, they were not formally quantified.

Results

Pre-test and post-test. Results of the analysis of variance revealed a significant difference between the pre- and post-test scores at the $p < .0001$ level. The F ratio was 281.66, with $F(1,80) = 6.96$ at the $p < .01$ level. The mean for the pre-test was 61, and for the post-test, 88.

A post-hoc determination of power was calculated by hand, as was the index of association, for the results of this run. Power ($1-\beta$) was calculated to be .99, with $\phi = 11.8$. The index of association (ω^2) was calculated to be .777.

"Before/now" questionnaire - participants. Results were similar for each of the comparisons between the participants' self-ratings of "before" and "now" job performance, as defined by the eight behaviors and skills on the questionnaire. For each of the eight ANOVA's, ratings were higher for "now," and a significant difference of $p < .0001$ was revealed. F ratios, with $F(1,80) = 6.96$, $p < .01$, ϕ values, power values, and ω^2 values for each procedure are listed in Table 1.

"Before/now" questionnaire - supervisors. Results were again similar for each of the comparisons between the supervisors' ratings of their employees' "before" and "now" job performance, as defined by the eight indicators. For each of the eight ANOVA's, a significant difference of $p < .0001$ was revealed,

with ratings higher for "now." F ratios, with $F(1,70) = 7.01$, $p < .01$, ϕ values, power values, and ω^2 values for each procedure are listed in Table 2.

"Before/now" questionnaire - participants and supervisors. When "before" participant ratings were compared with "before" supervisor ratings for each of the eight job performance indicators, no significant differences were revealed. The F ratios [with $F(1,70) = 3.98$, $p < .05$] ranged from 0.00 to 2.12, with p values from < .9562 to < .1498.

Similarly, when "now" participant ratings were compared with "now" supervisor ratings for each of the indicators, there were no significant differences. The F ratios [with $F(1,70) = 3.98$, $p < .05$] ranged from 0.06 to 1.37, with p values from < .7694 to < .2456.

Training provision questionnaire. The responses to the training provision questionnaire revealed a vital interest in training by sanitarian supervisors. Time and budget considerations were listed as their biggest constraints.

Eighty percent of the supervisors have an ongoing training program for new staff, with an average time per month of about 47 hours, and a range of from three to 160 hours. Other responses were as follows: "varies with individual;" "depending on progress and status of training;" "[sanitarians] receive close supervision and training until reasonably sure they can function independently;" and "as needed following routine monitoring."

The most frequently named type of training provided was "Individual" (36%) with "Individual and Group" accounting for 28% of the responses. "Group" was listed by 4% of the supervisors, and 20% did not answer the question. "Other" responses (12%) were: "one on one type training as well as any appropriate seminars, etc. available for groups;" "on-the-job training with other sanitarians:" and "I work with new sanitarians on a regular basis."

All supervisors encourage new staff to attend professional meetings, for an average of about three times a year, and a range of one to six times a year. Qualifiers given were: "depends on travel budgets;" "more often where necessary;" "as often as meetings available;" "as often as possible;" and one response was: "All professional meetings have representatives attending."

All 25 supervisors encourage staff to attend short courses, with an average of about two times a year, and a range of from one to six times a year. Other responses were: "Training budget is limited;" "We evaluate the short course contents and our training needs and make a decision based on this," and "as available."

All supervisors stated that they encourage new/current staff to attend district educational meetings, with an average of about three times a year, and a range of one to five times a year. Other comments related to this question were: "when requested;" "regularly;" "depending upon monies available;" "Attendance is on a voluntary basis;" "We try to send at least one staff member to each meeting;" "whenever possible;" and "everyone on rotation." Ninety-two percent of the supervisors allow staff time during the day to read journals and professional materials. The average time per week was given as

about three hours, with a range of one to eight hours. "Not enough time," and "no designated time for this purpose," were comments given by supervisors who do not allow staff time. Comments related to the amount of time given were: "May be done during office hours as time permits;" "varies with need;" "as necessary--materials are routed to employees regularly."

Student evaluation. Twenty-three participants completed evaluations, and their comments generally ran about 4 to 1 in a positive vein. Care was taken by many students to point out specific areas of needed improvement, and several common themes were evident.

The textbook was repeatedly cited as being outdated, with suggestions to either replace it, or supplement it with material related to current technical knowledge and public health practices. While the "hands-on" experience provided by field trips was perceived as beneficial, some students felt that more and better field trips should have been included in the course.

The seminar speakers were mentioned in both a positive and negative light. Comments ranged from "very informative" to a suggestion that more speakers should be brought in who have "a definite interest and more enthusiasm in their work."

Several topics were listed by students as needing more emphasis in the course. These were water, current sewage and food sanitation regulations, foodborne disease, specific soil analyses, public relations, and research activity in various areas of public health.

Edward Terrell received kudos from several participants for his inspiring enthusiasm for the subject of environmental health. His contributions to an ideal learning atmosphere were also mentioned.

Discussion

Pre-test and Post-test

The results of the analysis of variance comparing pre-test and post-test scores support the research hypothesis, as a highly significant F ratio was obtained, and the null is therefore rejected. This would indicate that the CDC Homestudy Course 3010-G, "Community Hygiene," along with the seminars given by Mr. Terrell and his faculty, make a significant difference in post-test scores, and account for a significant increase in the acquisition of knowledge related to environmental health.

While the sample size appears to be somewhat small (40), the completed power calculations revealed that the design had a surprisingly high power of .99, providing more argument for the rejection of the null hypothesis. The high index of association, .777, bolsters the conclusion that the sample size is adequate, as the pre-test--post-test design accounts for so much of the variance (78%).

The variables of occupation and education in this study were minimized to an extent, as the subjects were all sanitarians, and had similar educational levels. However, although most were beginning sanitarians, they had a variety of subject backgrounds. Not all had degrees in environmental health, so

familiarity with terms and other material in the course may be a source of variance. Other sources may be different test conditions, and different faculty in the seminars given in the two locations in the State, as well as the Homestudy course itself, including the lessons and the pre- and post-tests. Individual student differences as related to ability (test-taking) or favored learning style (lecture, independent study), motivation, and other training taken may account for another portion of the variance.

The acceptance of these results must be tempered with the realization that several factors may be at work along with the "treatment," or the completion of the CDC Homestudy course. History could be a threat to the internal validity of the design, in the sense that events could have occurred between the pre-test and the post-test which affected the post-test scores. Participants were on the job for at least nine months from the beginning to the end of the course, and the knowledge they gained from this experience may have helped them on the post-test. Other events outside the work setting, (e. g., reading journals, socializing with other sanitarians) could also have increased scores.

Maturation, or simply the fact that the participants grew older, wiser, and more experienced could also be a factor in the results of this design, as could statistical regression. Also, the element of testing, or the fact that the participants had seen the test before, could have inflated the post-test scores to some extent. Students who have taken a test once tend to do better on it if given the opportunity to take it again.

A design incorporating a control group could have minimized the threats to internal validity listed above. A more powerful design would compare job performance of students who did not take the Homestudy course with students who did take it. This possibility was explored for this study, but North Carolina's procedures did not permit such an experiment.

Although one must consider the other factors mentioned, the results of the ANOVA were highly significant, and it should be noted that knowledge and experience gained from the work setting would not be comprehensive enough to cover all the areas included in the Homestudy course. Most of the difference we see is probably because of the course, and these results provide a basis for further research, pointing the way for more elaborate designs.

"Before/Now" Questionnaire - Participants

The highly significant F ratio ($p < .0001$) which resulted from comparing the course participants' ratings "before" and "now," supports the research hypothesis, that the Homestudy course did make a difference in job performance, as defined by the eight behaviors and skills. The null hypothesis is therefore rejected.

Power levels for each of the ANOVA designs were generally fairly high. They ranged from .65 to .94, with an average of .80. A larger sample size is clearly desirable for all the designs with power lower than .90.

The indices of association for all eight designs were low. They ranged from .215 to .382, indicating that each design accounted for not more than 38% of the total variance. Clearly, other factors came into play as the participants rated their job performance. Other sources of variance may have been the obvious bias of self-rating, and the questionnaire itself, with a limited number of behaviors and skills listed. As with the pre- and post-test design, individual differences, such as conditions for completing the questionnaire, different work conditions on the job, different duties performed, the applicability of the behaviors to different duties, as well as differences in understanding the intent of the wording may also be sources.

Several of the threats to internal validity described in the discussion of the pre-test--post-test design are applicable to these designs. Both history and maturation could be factors in the significant increase in rating on the eight behaviors and skills, as just working at a job for nine months could help improve job performance. Again, a control group could have minimized these threats.

"Before/Now" Questionnaire - Supervisors

The research hypothesis is supported by the results of the eight ANOVA's performed on the "before" and "now" ratings by the supervisors of the Homestudy course participants. The highly significant F ratio provides additional evidence that Homestudy Course 3010-G, "Community Hygiene," makes a difference in job performance, and the null is rejected.

As with the participant questionnaire, calculations of power levels were fairly high, with a range of .65 to .91, and an average of .78. A larger sample size is indicated for several of the behaviors, and it is interesting to note that the highest power calculations for both the participant and the supervisor questionnaire were for "3. Utilizes resources - calls other people to solve problems - keeps thinking." One of the objectives of the seminars in North Carolina is to open the line of communication between State expertise and the sanitarians, and as this behavior also had the highest F ratio for both groups, it appears that this goal was achieved.

The indices of association for all eight designs were low, but slightly higher than the participant designs. They ranged from .233 to .380, indicating that each design accounted for no more than 38% of the variance. Other sources of variance may be the range of ability of supervisors to rate their employees, individual supervisor-employee relationships, differences in job duties in the various counties and districts, as well as individual supervisor differences in motivation, conditions under which the forms were completed, and, as stated before, the questionnaire itself.

To qualify the results, we must add that the effects of history and maturation may have influenced the ratings by the supervisors. As stated earlier, on-the-job experience could have contributed to the improvement in job performance, and the inclusion of a control group in the design could have minimized the threats.

"Before/Now" Questionnaire - Participants and Supervisors

The results of the two sets of designs in which participant "before" responses were compared with supervisor "before " responses, and participant "now" responses were compared with supervisor "now" responses, revealed no significant differences for any of the eight behaviors and skills. There was no initial postulation about these results. The researchers did not know if the participants would rate themselves similarly or differently than would their supervisors. There could have been differences in the way the two groups perceived performance: participants could have rated themselves high on "before" performance and higher on "now," and supervisors could have rated participants low on "before" and a bit higher on "now" performance. The differences could have been similar, but on different ends of the rating scale. As it happened, the means for the ratings were very similar for each behavior and skill rated "before" by both groups and for each behavior and skill rated "now."

These results provide evidence of a homogeneity in the assessments by both participants and supervisors. It appears that both groups have similar perceptions about the eight behaviors and skills, which speaks well of the relationship between the two groups and the ability of the questionnaire to elicit similar responses.

Training Provision Questionnaire

As stated before, sanitarian supervisors are intensely interested in training for both new and current staff. They participate in district educational

meetings, professional meetings, and short courses, and are constrained only by their training budgets and the time required. Training provisions are not uniform throughout the State, but North Carolina clearly has a commitment to training, which is an advantage for all employees.

Student Evaluation

Student comments indicate that Homestudy Course 3010-G, "Community Hygiene," as administered by the North Carolina Department of Human Resources, is a positive experience for most newly employed sanitarians. It apparently fosters positive attitudes about the field of environmental health, and besides imparting a large amount of technical knowledge, the course prepares employees to meet the challenges that come with their new jobs.

The suggestions for improvement concerned the textbook, the speakers, field trips, and topics covered. While some students noted the desire for more specific material related to their job duties, it may be that they are not as yet comfortable with the requirements of their jobs, and want more training in areas where they must perform daily. It is the researchers' opinion that these participants may be initially overwhelmed with the comprehensive review of the field, but will come to realize the importance of being exposed to so many aspects of environmental health as they gain maturity and experience on the job.

Conclusions and Recommendations

The results of this study are very encouraging, and indicate that the Homestudy Course not only makes a significant difference in the acquisition of a wide variety of knowledge related to environmental health, but also makes a difference in actual job performance.

The study also provides a basis for further research using external evaluation methods. The technique of assessing actual job performance, rather than simply assessing knowledge acquired, is not often used, as it is expensive, and requires much more time and effort on the part of the researchers and the subjects. However, external evaluation provides stronger indications of the value of the "treatment," or course administration in this case, and is "harder" data in terms of the differences one can see as a result of training.

The estimated total for project expenditures was $9,700. Costs were held down by the use of in-house facilities, such as computer time, printing, and copying.

North Carolina is an exemplary State in terms of training commitment, Homestudy course administration, and cooperation with CDC, and the North Carolina Department of Human Resources can serve as a model for other State and local Homestudy programs. The Department is taking advantage of the flexibility of the materials by supplementing them with lectures, answering students' questions about specific lessons, and providing "hands-on" experience that will help employees on the job.

The responses to the evaluation of the course itself provide valuable information to both North Carolina and the Centers for Disease Control. The textbook is clearly outdated, and the Non-resident Instruction Branch has recommended that the course be revised based on *Environmental Engineering and Sanitation*, by J. A. Salvato, Jr. This revision is overdue, and should be completed quickly. North Carolina may consider taking a look at their speakers to make sure that they convey an appropriate amount of enthusiasm for the subject, as well as technical expertise. North Carolina may also re-evaluate its current site visits, and even add a few, if time permits. Both CDC and North Carolina should note the topics which students listed as needing more emphasis in the course.

A more powerful design should be used for future studies, to compare job performance of students who did <u>not</u> take the Homestudy course with students who did take it. As stated before, this possibility was explored for the present study. In another State, where the Homestudy course is not required, this type of design should be used.

It should be noted that this study was strengthened by the inclusion of two measures (the participants' ratings and the supervisors') of the same critical area--job performance. The fact that significant differences were observed in comparisons performed on both these groups lends credibility to the assertion that Homestudy Course 3010-G, "Community Hygiene," does make a difference in on-the-job performance.

Certainly more in-depth and longitudinal analyses in the future would be desirable, with as many sources of variance as possible included in the design, or simply blocked. The single factor ANOVA designs should be repeated in North Carolina in succeeding years, especially as Homestudy Course 3010-G is revised and improved, but we also need to study other groups, with other methods of utilizing the course, and, of course, we need to study other courses.

While internal evaluation studies have been completed in the past few years in Homestudy Services, this is the first time technical assistance has been provided for an external evaluation study. Both North Carolina and CDC are committed to serving students as best we can, and this is just one means of keeping tabs on their performance, and ours.

Fig. 1

Behaviors and Skills for CDC Community Hygiene Course Graduates

NAME _____

TITLE: _____

DISTRICT/COUNTY: _____

Please rate yourself on a scale from 1 to 10 (1 as the lowest) as to the following behaviors and skills used on the job, both as how you perceived yourself "before" you completed the CDC Community Hygiene course,and "now."

	BEFORE	NOW
1. Demonstrate an appreciation of economic, social and ecological relationships in public health.	_____	_____
2. Able to see relationships between specific details and the broad picture in problem assessment. Don't get out on tangents.	_____	_____
3. Utilize resources - call other people to help in problem areas.	_____	_____
4. Have confidence to try many different ways to solve problems - keep thinking.	_____	_____
5. Use planning as a means of obtaining environmental health objectives and to promote public health.	_____	_____
6. Read professional journals, attend short courses, educational meetings, and professional meetings.	_____	_____
7. Keep up with the latest thinking on environmental health topics.	_____	_____
8. Take time to critique rules and come up with alternates. Can say why something is unacceptable, and am willing to translate ideas into paper documents.	_____	_____

Please make any further comments about your performance (before and now) below. Thank you for your cooperation!

Fig. 2

Behaviors and Skills for CDC Community Hygiene Course Graduates

Please rate the participant listed below from 1 to 10 (1 as the lowest) as to the following behaviors and skills used on the job, both as how you perceived this individual "before" the CDC "Community Hygiene" course was completed, and "now." If you do not have sufficient knowledge of this person in an area, please mark "NA."

NAME: _____

	BEFORE	NOW
1. Demonstrates an appreciation of economic, social and ecological relationships in public health.	_____	_____
2. Ability to see relationships between specific details and the broad picture in problem assessment. Doesn't get out on tangents.	_____	_____
3. Utilizes resources - calls other people to help in problem areas.	_____	_____
4. Has confidence to try many different ways to solve problems - keeps thinking.	_____	_____
5. Uses planning as a means of obtaining environmental health objectives and to promote public health.	_____	_____
6. Reads professional journals, attends short courses, educational meetings, and professional meetings.	_____	_____
7. Keeps up with the latest thinking on environmental health topics.	_____	_____
8. Takes time to critique rules and come up with alternates. Can say why something is unacceptable, and is willing to translate ideas into paper documents.	_____	_____

Please make any further comments about this person's performance (before and now) below. Thank you for your cooperation!

TABLE 1

STATISTICS FOR PARTICIPANT "BEFORE-NOW" QUESTIONNAIRE

Behavior or Skill	F	ϕ	(1-ß)	ω^2
1. Demonstrates an appreciation of economic, social, and ecological relationships in public health.	33.18	4.01	.80	.308
2. Ability to see relationships between specific details and the broad picture in problem assessment.	28.22	3.69	.72	.274
3. Utilizes resources - calls other people to help in problem areas.	45.15	4.71	.91	.380
4. Has confidence to try many different ways to solve problems - keeps thinking.	38.47	4.36	.87	.342
5. Uses planning as a means of obtaining environmental health objectives and to promote public health.	29.70	3.78	.76	.285
6. Reads professional journals, attends short courses, educational meetings, and professional meetings.	22.93	3.31	.65	.233
7. Keeps up with the latest thinking on environmental health topics.	26.75	3.59	.70	.263
8. Takes time to critique rules and come up with alternates. Can say why something is unacceptable, and is willing to translate ideas into paper documents.	37.10	4.30	.86	.333

TABLE 2

STATISTICS FOR SUPERVISOR "BEFORE-NOW" QUESTIONNAIRE

Behavior or Skill	F	ϕ	(1-β)	ω^2
1. Demonstrates an appreciation of economic, social, and ecological relationships in public health.	33.18	4.01	.80	.308
2. Ability to see relationships between specific details and the broad picture in problem assessment.	28.22	3.69	.72	.274
3. Utilizes resources - calls other people to help in problem areas.	45.15	4.71	.91	.380
4. Has confidence to try many different ways to solve problems - keeps thinking.	38.47	4.36	.87	.342
5. Uses planning as a means of obtaining environmental health objectives and to promote public health.	29.70	3.78	.76	.285
6. Reads professional journals, attends short courses, educational meetings, and professional meetings.	22.93	3.31	.65	.233
7. Keeps up with the latest thinking on environmental health topics.	26.75	3.59	.70	.263
8. Takes time to critique rules and come up with alternates. Can say why something is unacceptable, and is willing to translate ideas into paper documents.	37.10	4.30	.86	.333