DOCUMENT RESUME

ED 111 357 IR 002 405

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TITLE	Automated Instruction of Flanders Interaction Analysis.
INSTITUTION	Iowa Univ., Iowa City. Coll. of Education.
PUB DATE	Jun 75
NOTE	12p.; Paper presented at the Conference on Computers in the Undergraduate Curricula (6th, Fort Worth, Texas, June 16-18, 1975); Related document is IR 002 399
AVAILABLE FROM	Entire Proceedings; Ted Sjoerdsma, Treasurer, CCUC, 1248 Lindquist Center for Measurement, Iowa City, Iowa 52242 ($10.00; Checks payable to the University of Iowa)
EDRS PRICE	MF-$0.76 HC-$1.58 Plus Postage
DESCRIPTORS	College Students; *Computer Assisted Instruction; Computer Oriented Programs; Conventional Instruction; Educational Research; Higher Education; *Interaction Process Analysis; Student Teacher Relationship; *Teacher Education
IDENTIFIERS	Flanders Interaction Analysis

ABSTRACT

A series of computer-assisted instruction (CAI) lessons were written for use by students enrolled in a methods course in social studies education at the University of Iowa. Lessons provide instruction in the Flanders Interaction Analysis method which makes classroom verbal communication more effective. An interaction module was designed to help prospective teachers examine their own classroom behavior in terms of factors such as how much they talk versus student participation in discussion. Both authoritative and permissive behavior were explored. Lessons were written using the Instructional Dialogue Facility (IDF) on a Hewlett Packard 2000. An experiment compared the CAI method with traditional instruction. The results indicated that the CAI module proved to be the most effective. (Author/DS)

AUTOMATED INSTRUCTION OF FLANDERS INTERACTION ANALYSIS

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In this project a series of CAI lessons were written for use by students enrolled in a methods course in the division of social studies education at The University of Iowa. The specific lessons presented here provide instruction in the Flanders Interaction Analysis method, a method which makes classroom verbal communication among students and teacher more effective. The interactive module is designed to help prospective teachers examine their own classroom behavior in terms of such factors as how much they talk versus student participation in discussion, authoritative and permissive behavior, and overall teacher influence. The lessons were written using the Instructional Dialogue Facility (IDF) on a Hewlett-Packard 2000 at The University of Iowa. The IDF lessons call over a dozen BASIC programs written for this course. The project both enhances the specific course for which they were written and adds to the general inventory of programs available to all educational users.

Background

The Flanders Interactional Analysis is a method by which teachers learn to categorize teacher-student verbal behavior, which can then be interpreted by the teacher for the purpose of promoting more effective classroom verbal communication. Interaction Analysis looks at ten kinds of things which go on in a classroom, with each of these ten categories of behavior identified by a number. This program presents a technique which permits a close examination of what both teacher and student do in terms of frequency (e.g., How much time

did the teacher spend in lecturing?) as well as in terms of sequence. (e.g., What happened after the teacher asked a question; or what did the teacher do to provoke that student comment?). The importance of looking at student-teacher interaction is simply that, if a teacher for some reason wants to change his/her behavior, he/she must have insight into what is actually going on in the classroom.

Previously students enrolled in the social studies methods course were handed a brief description of the use and function of the Flanders Interaction Analysis and then required to practice the procedure. These various methods included a discussion session in which the different categories were explained and a coding session in which students would actually perform an interaction analysis on a taped segment of teacher-student conversation. This was then followed by another discussion and explanation session of category differences. Under this system it was often difficult to identify specific problem areas encountered by students using the Flanders' categories. Students were reluctant to volunteer information concerning their difficulties, and teachers were equally reluctant to pressure students into disclosing their errors. Under the new arrangement, using the computer, specific students' deficiencies can be easily located and corrected immediately. By accessing response files, it is possible to locate problem areas and branch students to lessons designed to correct specific misunderstandings. This is especially significant since many of the Flanders' categories lack clearly distinguishing features and thus sometimes confuse the beginning student who fails to perceive precise differences. Using the computer, it is possible to simulate actual classroom situations and set down realistic teaching tasks outside the confines of a regular methods classroom. Even more importantly, the student can, at his own pace, receive maximum exposure to specific categories, which is not always possible in a regularly scheduled class meeting.

Objectives

The project's goal was to develop a series of computer lessons based on the following behavioral objectives:

1. Given a definition or example of one of the Flanders' categories, the student will be able to correctly identify the category used in each definition or example.

2. Given a tape recorded segment of an actual classroom interaction, the student will be able to identify and code the appropriate categories achieving a 60% accuracy level.

3. Given a list of category totals, the student will be able to compute an I/D Ratio, a Revised I/D Ratio, a Percentage of Teacher Talk, and a Percentage of Student Talk.

Using these objectives as the basis for the overall lessons, three separate computer lessons were designed to deal with the following aspects of Flanders Interaction Analysis: (1) a description of the various categories, (2) an application of the categories to an audio tape of an actual classroom conversation, and (3) an interpretation of that conversation as categorized via presentation of instructions of evaluative measures. Hewlett-Packard's IDF was used to generate the bulk of the lessons, with BASIC subroutines accessed whenever necessary.

Description of Programs

The first lesson deals with definitions and examples of the Flanders' category system. The student is introduced to each of the categories through text displayed on a CRT and asked to answer a number of questions based on these text sections. By using the keyword feature of IDF, the students' errors are trapped and explained as they occur. Next, a series of examples of actual student-teacher conversation are presented on the screen, and the student is given a multiple-choice question asking him to identify the correct category corresponding to each example. The examples are designed to detect all commonly-made mistakes found when categorizing student-teacher interaction.

In most sections, at least three trials are permitted, with the correct answer given to the student on the third trial. In addition, if a student answers designated "key" questions incorrectly, he/she is branched to a remedial section which clarifies any problems that occur while distinguishing between various categories. There are seven such remedial sections built into the main lesson. Each remedial section is accompanied by a series of BASIC subroutines that increment counters whenever a student enters a remedial section. This prevents a student from entering one of the remedial sections more than twice.

The second lesson proved to be both the most exciting and most difficult part of the lesson. Under normal conditions, a teacher interested in coding his/her classroom interaction would write down a number (corresponding to a category) every three seconds, or, in case the interaction moves more rapidly than that, whenever the behavior changes. In our automated lesson, students enter their code numbers categorizing behavior directly into the computer while listening to an audio tape of teacher-student conversation. The computer then displays the students' score and additional diagnostic material explaining which categories were confused and the number of errors made with respect to a specific category. Early programming attempts proved ineffective, especially in regard to displaying an accurate count of students' answers. Because of the nature of the Flanders' system, the coding process cannot be interrupted by instructions indicating when the student should or should not input answers. On the other hand, because the three-second intervals occur so rapidly, students often miss a beat and consequently type in too few or too many answers. Therefore, it is important to look for correct answers in terms of patterns rather than direct matches. With the help of Dr. Robert Oehmke, Mathematics Professor, The University of Iowa, who developed a theorem which

corrects this particular problem, we designed a program that accurately reflects the students' true score by effectively eliminating extraneous entries and by recognizing positions of omitted entries and thus not treating all subsequent entries as incorrect.

The following example illustrates what occurs when a student codes one of the tape sections on the computer:

THE RECORDING PROCEDURE IS AS FOLLOWS: IMMEDIATELY FOLLOWING THE QUESTION MARK THAT APPEARS ON YOUR SCREEN, TYPE IN A CATEGORY NUMBER FOLLOWED BY A COMMA. CONTINUE TO RECORD YOUR ANSWERS UNTIL THE END OF THE FIRST TAPE SECTION. WHEN YOU FINISH PUTTING IN ALL YOUR ANSWERS, HIT THE RETURN KEY.

NOW GO TO SECTION C OF THE TAPE, HIT THE RETURN KEY AND BEGIN CODING.

(The student then enters his answers in the following manner:)

?4,8,9,3,4,8,8,8,8,9,9,9,8,8,1,4,8,8,9,9,9,9,9,5,4,8,8,8,8,9,8,8,
8,8,8,8,8,3,5,4,5,8,8,8,8,8,4,5,4,10

OUT OF A POSSIBLE 55 YOU GOT 34 CORRECT

LET'S TAKE A CLOSER LOOK AT HOW WELL YOU DID

FIRST OF ALL, YOU WERE 5 NUMBERS SHORT -- YOU MUST HAVE MISSED A THREE-SECOND INTERVAL.

YOU CONFUSED THE FOLLOWING CATEGORIES:
YOU CONFUSED 4 WITH 5
YOU CONFUSED 6 WITH 7
YOU CONFUSED 8 WITH 9
YOU CONFUSED 5 WITH 6

THE FOLLOWING TABLE SHOWS:
1. THE NO. OF TIMES A CATEGORY WAS SUPPLIED CORRECTLY
2. THE NO. OF TIMES A CATEGORY WAS SUPPLIED INCORRECTLY
3. THE PERCENTAGE OF ERRORS MADE USING A SPECIFIC CATEGORY

CAT NO.	SUPPLIED CORRECTLY	SUPPLIED INCORRECTLY	% OF ERRORS
1	1	0	
2	0	0	
3	2	0	
4	3	4	19%
5	1	3	14%
6	0	4	14%
7	0	0	
8	25	0	
9	0	10	48%
10	1		

After completing one of the coding sessions, the student is given the option of reviewing the tape. If the student answers affirmatively, he/she is sent to a section that displays the correct category number while the student again listens to the tape. All the student is required to do is hit the return key every three seconds, or when behavior changes, and the correct answer appears on the screen. This obviously allows the student to understand what is going on during the tape portions of the lesson.

The final lesson in the Flanders' package teaches the student how to analyze the data gathered in the coded segments. There are a number of things which are useful in interpreting the Interaction Analysis. Several of these, together with the means of computing data for them are presented in this lesson. The student is asked to compute four different formulas: an I/D Ratio (ratio of indirect/direct teacher talk), a Revised I/D Ratio, a Percentage of Teacher Talk, and a Percentage of Student Talk. In each section the student is presented the information needed to compute one of the formulas and is asked to supply the correct answer to different problems. Gradually the student masters all four formulas and is called upon to review his progress. As in the two previous lessons, remedial sections are included. In these sections, the formulas are reduced to a series of simplistic steps which enable the student to understand the procedures used to derive the correct answer.

Evaluation

The project's objective was to study and test the effectiveness of computer assisted instruction for a course entitled "Methods of Instruction in Social Studies" in a teacher education program. The hypotheses may be stated as follows: There is no significant difference in student achievement as a result of using a CAI module to teach Flanders Interaction Analysis rather than the

traditional method of instruction. The study was run using students from the methods classes in social studies at The University of Iowa during the first semester of the academic year 1974-75. The specific purpose of the study was to determine which instructional method was more effective in teaching students the skills needed to perform a Flanders Interaction Analysis on a classroom conversation.

The methods students were divided into two groups, one receiving the traditional treatment, the other receiving instruction via computer. The traditional group (Group A) was given four days of in-class instruction on the Flanders Interaction Analysis. Class time was devoted primarily to discussion of problems encountered while using the various categories. During the third class day students were asked to code five taped segments of teacher-student conversation. After each tape portion, students were asked to discuss any problems that they might have encountered while coding the different tape segments. At the end of the fourth class day, students were administered a post-test covering all aspects of the Flanders Interaction Analysis.

Group B received all instruction on the Flanders Interaction Analysis via computer. The students received a brief 20-minute lecture on how to use the computer, after which they were asked to sign up for one two-hour session in the computer lab. All students completed the computer module within a one-week period. Group B students received the same post-test as Group A, only via computer.

The data from the CAI experiment were analyzed using analysis of covariance. This technique takes into account differences between the experimental groups which existed prior to the start of the experiment. The dependent variable scores are adjusted to compensate for individual differences in selected characteristics which, if ignored, would contribute to sampling error.

In this experiment, two control variables were used in the covariance analysis: composite score on the ACT college entrance tests and cumulative college grade point average. Final test scores taken after completion of the unit were adjusted on the basis of the best combination of ACT scores and GPA. This adjustment removes the characteristics measured by ACT and GPA from consideration as "explanatory variables" that might account for the experimental results.

Table 1 presents the means and standard deviations of the two control variables and the adjusted final test scores for each group. The adjusted test score means reflect the status of the groups after differences in ACT score and GPA are taken into account. Despite the fact that individuals were not assigned to the two groups on a strictly random basis, the group averages on GPA and on ACT were very similar. As a consequence, the adjusted test score means were actually very close to the original unadjusted means.

The analysis resulted in a t-ratio of 6.60 for the difference between the adjusted means. Thus, the difference in means is statistically significant well beyond the 1% level. Perhaps equally noteworthy is the contrast between the groups in the proportion of perfect or near perfect test scores. In the traditional group (Group A) the highest score was 20 (out of 22) and the lowest 13. Only two students obtained scores of 20. In the CAI group, six students obtained perfect scores of 22, five others had a score of 21, and no student scored lower than 19. This approach to mastery of the interaction concepts is reflected in the high mean (21.0) and small standard deviation (1.01) of the CAI group. There is little or no doubt then, that the CAI mode of instruction produces superior achievement for the population of Iowa undergraduates.

Table 1

Means and Standard Deviations (in Parentheses) of ACT Scores, GPA, and Final Test Scores

	ACT	GPA	Final Test (Adjusted Scores)
Group A (N = 13)	24.23 (4.11)	3.00 (0.45)	16.77 (2.26)
Group B (N = 14)	24.93 (2.79)	2.96 (0.41)	21.00 (1.00)

In addition to achieving a higher mean score on the test, it was found that the experimental group spent less time in instruction than the control group. When the project was originally conceived, it was designed to offer interaction analysis via a CAI module as a way to save a week of class time for other uses. The results seem to indicate that the project was successful in this area. Completion time for the CAI group averaged 2.1 hours in comparison to 3.3 hours for the control group. Thus, the CAI mode of instruction proved to be both an effective and efficient way of presenting interactive concepts.

Summary

Results indicate that the CAI module proved a more effective method of instruction than the discussion format. It is also apparent that students generally learned more rapidly through CAI than through the traditional method. Although at the moment evidence is inconclusive, students with low GPA's and ACT's generally performed better via CAI than the traditional method.

It is in the area of remediation that CAI seems most productive. Under ideal conditions, the student who fails to achieve an acceptable level of performance on the first trial should be allowed to continue instruction until mastery is complete. In the real world, however, teachers are pressured to adhere to strict schedules that demand that all students move forward at the same rate. It is difficult, therefore, to adjust class schedules to accommodate those students who fail to master the assigned skills. Usually the teacher ignores these problems and hopes that the students will acquire the skills at a later date. By assigning CAI lessons as remedial work outside the regular class period, however, the teacher can be reasonably sure that low-ability students will receive the additional instruction that is needed to maintain an acceptable level of performance and that normal class progress can continue.

Acknowledgements

The author wishes to acknowledge Ms. Theresa Oehmke, graduate student at The University of Iowa, for her assistance with the programming aspects of the project and Professor Leonard Feldt, The University of Iowa, for acting as statistical consultant.