TEACHING OF SURVEY RESEARCH TECHNIQUES IN AN INTERDISCIPLINARY MIDDLE SCHOOL SETTING

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Purpose

Increasingly, over the past two decades, educators have come to recognoze that statistical knowledge is an essential part of the problem solving skills that must be a component of the contemporary middle school curriculum (The Schools Council Project on Statistical Education, 1981). From the European experience in the teaching of statistics at the secondary level, it seems that the greatest successes come from teaching statistical methodology through an interdisciplinary approach rather than as a single course or as a series of statistics - specialized courses (Råde, 1973).

This paper will attempt to trace the development of a unit on statistical methods in an actual inter-disciplinary setting. The last section of this paper will include some suggestions as to how survey research can be instituted into various curricular areas and settings where it has traditionally been limited.

Setting

This unit is currently being taught to eighth grade students in the Basics Plus Program at Kirk Middle School in the Christina School District located in Newark, Delaware. The Christina School District is located in northern New Castle County which desegregated its public schools in September, 1978. Kirk Middle School, while located in suburban Newark, draws its students from both the greater Newark area and the city of Wilmington. The students are from predominately lower to lower-middle income families.

The Basics Plus Program originated at Kirk Middle School in September, 1983 as a result of the dissatisfaction which was experienced by the author and a colleague (Mr. Raymond Kendzierski) with the way in which "team" instruction was being utilized. We believed that at the middle school level students need a much higher degree of reinforcement in basic concepts and skills than was being achieved at the time (Johnson, 1980). The problem seemed to be, not with the team concept of instruction, but with the difficulty of coordinating the efforts of four base (core) subject area teachers working with four sets of curricular demands. Further, with these (sometimes competing) demands, the concepts and skills that needed to be reinforced were largely overlooked. There were many factors which may have led to this state (inadequate communications amongst the base subject area teachers, poor curriculum coordination, and/or a misunderstanding of the reinforcement function of the team teaching approach to instruction), but we concluded that it is essential that a truly inter-disciplinary approach to team teaching be used to provide this necessary reinforcement (Strombis and Howard, 1970). Thus, the Basics Plus Program was implemented at Kirk Middle School (see Appendix A for further details).

The students in the program are highly representative of the general school population in the areas of sex, race, and range of academic abilities. The major difference between the students in the Basics Plus Program and the general school population is that the students in the program are self-selected and are committed to intensified study (see Appendix A).

Survey Research in the Basics Plus Program

The survey research unit to be described presently is not a "unit" as is understood in the traditional sense by most teachers. That is, it is not a block of information taught in a specific period of time without interuptions. Rather, the concepts are taught across a variety of subject matter areas and in places where they are relevant to the curriculum.

The following are the general concepts which are included as a part of the survey research unit in the Basics Plus Program:

1. The variety and uses of surveys;
2. Methodology;
3. Biases;
4. Conducting research;
5. Presentation of research;
6. Evaluation of research.

The Use of Surveys

The students are first formally introduced to the use of surveys in Critical Thinking class. They inductively classify the variety of surveys which they have been presented into categories.

Throughout the year the students are shown additional surveys in other content areas. In their United States History course, articles from USA Today, Time, Newsweek, etc. are used, as well as, examples from their textbook (Bartlett, Keller, Clair, and Carey, 1981). In Language Arts classes the students are taught study skills which enable them to

use additional, relevant surveys for their research papers and consumer reports in their Science classes, their debates in Language Arts, and in United States History as a part of the Junior Achievement Program (Project Business). As examples, students use USA Today and Consumer Reports as sources of information on business and consumer trends. The introduction of these surveys not only provides a large amount of data in the content areas, but also demonstrates the variety of uses to which surveys can be applied.

Methodology

Statistical methodology is first introduced in the Critical Thinking class at the analysis level (for those not familiar with Bloom's cognitive taxonomy, please refer to Appendix B). Probability is taught in the Mathematics classes and then reinforced in the U.S. History classes (for example, when analyzing data from presidential elections). Hypothesis formulation is first introduced in their Science classes as a part of scientific method in problem solving and reinforced in Critical Thinking.

Sampling, randomization, and generalizability are introduced in Critical Thinking. These topics are later developed in their Science and Mathematics classes.

Biases

After the students have seen and analyzed many surveys, new emphasis is placed upon reexamining factors which might be potential sources of biases. In Critical Thinking, as a part of the unit on forms of reasoning, students begin this re-examination.

Initially, the students are introduced to the concept of bias, types of biases, and how biases can effect research. The students then reexamine the surveys which were previously discussed. For example, the students examine a study of the relationship between the 55 mile per hour speed limit and the number of traffic fatalities (which we had previously viewed in Critical Thinking). They now analyze the study looking particularly for interveening variables which were not controlled for in the study (See Appendix C for an example of one students analysis of this study). Other surveys are used to illustrate sampling errors and errors in survey item construction which lead to baises.

Conducting Research

All students are then required to conduct their own survey research projects. The students work in small groups (three to five students per research team) and most students conduct more than one study. For each study the students must prepare a proposal which they present orally in class. Other students and the teacher critique these proposals, offering suggestions and comments before the groups engage in data collection.

In Language Arts, for the unit on debating, several groups conducted surveys on their topics (e.g. A.I.D.S. in public schools, censorship, public support for private schools). For their Health class one group conducted a study on peer presure and adolescent sexual behavior. In Science class student groups conducted surveys on consumer preferences and on product reliability. For U.S. History, student groups used previous research (Bartlett, et al., 1981) as a foundation for developing a study on people's atitudes on the national anthem.

Presentation of Research

After the students have collected their data, the higher level cognitive skills (Appendix B) are reviewed in order to strengthen their abilities to formulate conclusions. In Language Arts classes report writing and the principles of oral presentation are reviewed.

The "unit" on survey research concludes with the group presentations in class. The presentations consist of a written abstract on their project, an oral summary of their methodology and conclusions, a period of questions and answers, and finally an oral and written evaluation of the project by the teacher.

Conclusions

We have found that this inter-disciplinary approach towards the teaching of survey research has been highly successful. In the Basics Plus Program, curriculum objectives are highly coordinated between the subject areas, and this has allowed for a great amount of content reinforcement. Because of this reinforcement the students can readily see the application of survey research skills to problem solving in subject areas other than mathematics. This relevance allows students to see the importance of statistics which in turn promotes greater student motivation and thus greater learning.

Afterword

As was stated in the purpose of this paper, I believe that the Basics Plus Program provides an ideal inter-disciplinary setting in which survey research methods can be taught. Unfortunately, not all schools have the flexibility that allow for the development of such a program. It is the obligation of the author to suggest ways in which survey research skills can be taught in classes that do not or cannot have the high degree of inter-disciplinary re-inforcement which

the Basics Plus Program allows.

In the body of this paper it was suggested how several objectives from the Christina School District's curricula (Mathematics, Science, Language Arts, and Social Science) were satisfied or enhanced by the study and use of survey research methods. Obviously, since every school district and every subject matter area taught within those districts have seperate curricula, it would be impossible for one to make blanket statements on how specific objectives should be met or enhanced. What I will attempt to do, however, is to offer some suggestions as to what procedures might be used to involve statistics in classes where quantitative research was previously little used.

The first step in this process is an examination of the existing curriculum in the teacher's subject matter area. The objectives should be examined to decide which of them could be met or enhanced through the study and/or use of survey research. An excellent reference to be used in helping in this selection is, The Schools Council Project on Statistical Education (1981).

After having identified the possible objectives, the next step is to evaluate them in light of what the prerequisite skills are from other subject matter areas. The teacher can begin this process by examining other subject matter curriculum guides (a comparison and synthesis of core curriculum objectives can be found in Appendix D). As a first step, this can give the teacher valuable background information, but it is limited by the fact that not all of the students' previous teachers may have covered these objectives or, even if they were covered, the students may not have mastered them. In cases where minimum competencies exist, these competencies can be an additional source of information, however, this also has some weaknesses. For example, school districts or states may not have minimum competencies in all subject matter areas, and where competencies do exist, they may not directly coorespond to the research skills that the teacher wishes to promote. At this point,cooperation from other teachers is usually necessary.

Teachers wishing to know the current level of their students must make an effort to contact previous teachers to learn what content is being taught and in what sequence, as well as what knowledge and skills the students already possess. The successful cooperation between subject area teachers can provide a sound basis upon which to build education in quantitative literacy. While the suggestions are no substitute for a highly developed interdisciplinary approach to team teaching, they can help the classroom teacher to meet or enhance their curriculum objectives through the use of statistical methodology.

Author's Footnote

The author wishes to thank Carol Joyce Blumberg for her excellence in teaching and her helpful comments in the preparation of this paper.

Appendix A Exerpted from the parent information letter

"The primary goal of this program is to challenge the students to stretch their capabilities and to go beyond the regular middle school expectations. The program's emphasis is on basic subject plus increased emphasis on the development of critical thinking skills."

"The courses in this program are interrelated. Concepts from one content area are reinforced in another and skills that are learned in one course are utilized and applied in other courses. Application of learned information will be a primary goal of the program."

"Students and parents who choose to participate make a committment to the program and the teachers. Students will be expected to take an active role in their education and in return learn not only the basic subjects, but improve and expand their thought processes."

Appendix B From Bloom's Cognitive Taxonomy (1956)

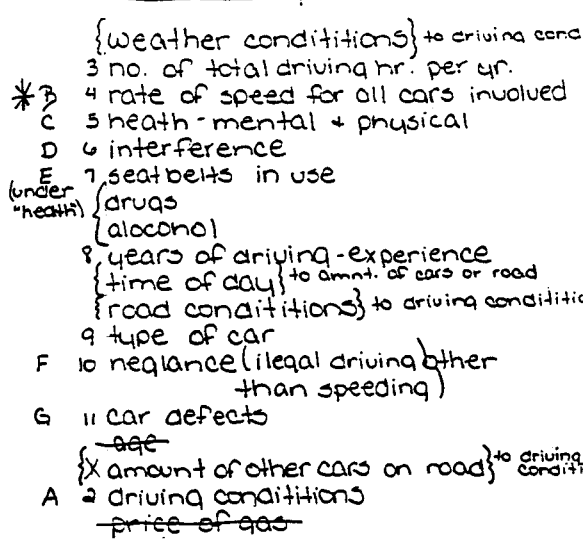
Description of the Major Categories in the Cognitive Domain

1. Knowledge. Knowledge is defined as the remembering of previously learned material. Knowledge represents the lowest level of learning outcomes in the cognitive domain.
2. Comprehension. Comprehension is defined as the ability to grasp the meaning of material. These learning outcomes go one step beyond the simple remembering of material, and represents the lowest level of understanding.
3. Application. Application refers to the ability to use learned material in new and concrete situations. Learning outcomes in this area require a higher level of understanding than those under comprehension.
4. Analysis. Analysis refers to the ability to break down material into its component parts so that its organizational structure may be understood. Learning outcomes here represent a higher intellectual level than comprehension and application because they require an understanding of both the content and the structural form of the material.
5. Synthesis. Synthesis refers to the ability to put parts together to form a new whole. Learning outcomes in this area stress creative behaviors,

with the major emphasis on the formulation of new patterns or structures.

6. Evaluation is concerned with the ability to judge the value of a material (statement, novel, poem, research report, etc.) for a given purpose. Learning outcomes in this area are highest in the cognitive hierarchy because they contain elements of all other categories, plus value judgements based on clearly defined criteria.

Appendix C From a student's notes (the spelling is hers)



Appendix D

Common Statistical Elements in Secondary Core Subject Matter Objectives

In the course of preparing this paper, the author investigated the core curriculums in several public school systems. The objectives of these subject area curriculums were very similar. Below are listed those elements which are common across curriculum lines:

1. Data gathering techniques;
2. Inductive reasoning;
3. Organizing data;
4. Fallacies and biases;
5. Statistical inference;
6. Causality;
7. Oral and written presentations.

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