

Attitudes of Science and Social Studies Teachers Toward Interdisciplinary Instruction

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The fusion of science and social studies has been the recent topic of much discussion in the literature (Bybee 1977, 1979); Hurd *et al.*, 1980; Walsh 1977). In October 1980, a joint science and social studies education conference was held at the University of Manitoba to address this topic. In addition, the United Nations Educational, Scientific, and Cultural Organization (UNESCO) has been instrumental in promoting closer cooperation between the social and natural sciences. UNESCO has reinforced the social studies contributions to scientific and technological problems and has applied the knowledge of the social sciences to a number of worldwide environmental problems (M'Bow 1979). Therefore, it appears that some integration of these two disciplines is viewed nationally and internationally as a major educational goal.

Since this integration appears to be a national trend, a group of Wisconsin science and social studies educators were interested in determining how science and social studies teachers in their state felt about this concept. To obtain this information, science and social studies teachers in Wisconsin were surveyed as to their interest in interdisciplinary instruction, their perception of current interdisciplinary approaches within their schools, and the preferred forms for learning more about interdisciplinary instruction.

Procedure

To begin our investigation, a conference of selected social studies and science public school teachers, Department of Public Instruction consultants, and college methods instructors from throughout the state was held at Wausau, Wisconsin in December 1979. The group consisted of seven individuals with science backgrounds and five with social studies backgrounds.

Identifying areas of potential interaction between the science and social studies was the first goal of the conference. The areas identified were broken into three general categories: persistent and contemporary problems, reflective or inquiry approaches, and values issues. Participants then developed a 29-item questionnaire that addressed these three areas. This questionnaire was mailed with a cover letter to a random sample of 300 science and 300 social studies teachers in grades 6-12 in the state of Wisconsin. [The random sample was generated by the Wisconsin Department of Public Instruction, 126 Langdon St., Madison, WI.]

A total of 198 respondents returned the survey. Table 1 displays the number of individuals in each of the six sub-groups determined by Part 1 of the questionnaire. Statistical treatment of the data involved: 1) a t-test to determine significant differences between science and social studies teachers on any of the items of the questionnaire; and 2) a chi-square analysis of cross tabulations for sub-groups 2-6 to determine if any significant differences existed between these individuals on any of

TABLE 1. Characteristics of the Sample

| Sub-Groups | Number of Individuals in Each Category (Each Category May Not Total 198 Due to Incomplete Scoring of Questionnaire) | |
|---------------------------|--|--------------------------------------|
| | 1. Present Teaching Assignment | Science - 105 Neither - 16 |
| 2. Sex | Males - 163 | Females - 28 |
| 3. Educational Background | B.S. - 75 M.S. - 16 | M.S.+ - 86 |
| 4. Age | 21-30 - 39 31-34 - 107 | Over 45 - 45 |
| 5. School Building Size | 100-500 - 64 500-1,000 - 57 | Over 1,000 - 68 |
| 6. Grade Level Teaching | 6-9 - 72 10-12 - 80 | Combination of 6-9 and 10-12 - 34 |

the questionnaire items. One significant difference was found between science and social studies teachers and 11 significant differences were found between the other five sub-groups (table 2).

Findings

Science vs. Social Studies Teachers—Seventy-seven percent of the respondents support the concept that an integration between science and social studies should be an important goal of education. Social studies teachers largely agree that no efforts at interdisciplinary approaches are currently being made, while science teachers agree to a small extent, but many are undecided. However, despite this support, 68.6% of the respondents were undecided as to their level of commitment in initiating programs to aid in this integration.

Science and social studies teachers do agree on the topics that should form the base for interdisciplinary instruction. Over 90% of both groups agree that an emphasis should be placed on the topics of interaction between science, technology, and society, and the impact of science and technology on the natural and human environment. Over 30% of both groups agreed with the concept of teaching specific societal issues raised by the outcomes of scientific research, while 60% of each group agreed on a base of commonality of inquiry approaches, with many of these responses coming from the 6-9 grade level group.

Nearly three-fourths of the teachers in both groups selected an inservice program during school inservice time as the format for learning more about interdisciplinary teaching. Evening college classes and weekend seminars were not viewed with favor. Both groups were also highly interested in educational material for students that emphasize interdisciplinary content.

Educational Background—Individuals with an M.S. were more unsure or negative toward the integration of science and social studies than those with a B.S. or an M.S. with hours beyond. For example, the respondents with an M.S. did not feel that better multidisciplinary teacher preparation would increase cooperation between science and social studies teachers, nor did they feel that opportunities for joint curriculum development and the availability of more instructional materials would enhance cooperation between science and social studies teachers. In addition, a significantly large percentage of these teachers were undecided as to whether the integration of science and social studies should be based upon the commonality of inquiry approaches and process skills that exist among these two disciplines or the study of specific societal issues raised by the outcomes of scientific research. Those with an M.S. were also in significantly greater disagreement than the respondents with a B.S. and those with hours beyond the M.S. that science and social studies teaching should be based upon the study of scientific approaches to anthropology, psychology, and economics.

Grade Level Taught—A significantly larger percentage of high school teachers (grades 10-12) than teachers at grade levels 6-9 view interdisciplinary lessons in science and social studies as an important goal of instruction. But ironically, more teachers in grades 6-9 reported that cooperative efforts were currently being made in their schools. In addition, these respondents were unique in their view of the base of interdisciplinary approaches. A significantly larger percentage of these teachers than those from high schools agreed that the base should be the commonality of inquiry approaches and process skills. They also felt that the study of history and philosophy of science was an important base

TABLE 2. Comparison of Sub-Groups on Survey Items Where Significant Differences Were Found

| <i>Item Statement</i> | <i>T-Test</i> | | <i>Chi-Square</i> | | | |
|---|--|------------|-------------------------------|------------|--------------------|--------------------|
| | <i>Science vs. Social Studies Teachers</i> | <i>Sex</i> | <i>Educational Background</i> | <i>Age</i> | <i>School Size</i> | <i>Grade Level</i> |
| <i>PART II OF SURVEY</i> | | | | | | |
| I believe it is an important goal of science and social studies education to develop interdisciplinary lessons in science and social studies. | .3973 | .8410 | .9708 | .3750 | .6618 | *.0179 |
| Cooperative educational efforts between social studies teachers and science teachers have been implemented as part of our school district's curriculum. | .3779 | .8907 | .1630 | .1487 | .5261 | *.0163 |
| I would like to see my school district develop cooperative efforts between its science and social studies teachers. | *.0104 | .7697 | .1203 | .2047 | .2356 | .2000 |
| <i>PART III OF SURVEY</i> | | | | | | |
| I believe the following conditions would increase cooperative interactions between science and social studies teachers: | | | | | | |
| Better multidisciplinary preparation of the teachers. | .6625 | .7054 | *.0131 | .3457 | .5591 | .1981 |
| Opportunities for joint curriculum development by staff | .5628 | .3075 | *.0002 | .7041 | .1374 | .4639 |
| Availability of more instructional materials for such cooperative efforts | .5097 | .2676 | *.0000 | .3553 | .7236 | .7118 |
| The opportunity for teachers to learn more about multidisciplinary teaching in science and social studies. | .4982 | .0896 | *.0003 | .1399 | .4675 | .3455 |
| <i>PART IV OF SURVEY</i> | | | | | | |
| I believe interdisciplinary teaching in science and social studies should be based upon: | | | | | | |
| The commonality of inquiry approaches and process skills. | .7370 | .6933 | *.0169 | .0640 | .3340 | .0313 |
| The study of specific societal issues raised by outcomes of scientific research. | .1442 | .0953 | *.0107 | .9590 | .1164 | .5736 |
| The study of the history and philosophy of science. | .2737 | .1882 | .5050 | .1756 | .9429 | *.0180 |
| The study of scientific approaches to Anthropology, Psychology, Economics. | .0673 | .6038 | *.0176 | .0917 | .4490 | .1008 |
| (* denotes significant figures) | | | | | | |

for interdisciplinary teaching. High school teachers agreed that an interdisciplinary approach should emphasize history and philosophy of science, but did not place as much emphasis upon the commonality of inquiry approaches and process skills.

Interpretation of the Data

The information we received from this survey indicates that there is an interest in interdisciplinary efforts between science and social studies teachers in Wis-

consin. However, there seems to be some uncertainty among these teachers as to the extent of their commitment to this approach. Before these teachers will begin efforts in this area, it appears that they need an increased awareness of interdisciplinary issues and teaching materials and techniques related to interdisciplinary instruction.

In the area of curriculum development, our data suggests that in grades 6-9 an emphasis should be placed on the commonality of inquiry approaches between science and social studies and on introducing students to

the history and philosophy of science. At the senior high level, curriculum development should continue to include the history and philosophy of science. The curriculum should also build on the introduction to the commonality of inquiry approaches through the development of students' understanding of the scientific approaches to the behavioral sciences (i.e., sociology, anthropology, psychology, and economics).

Implications for Teaching

Some implications for teaching can be drawn from the information we received from this survey. For example, we believe that the level of awareness of science and social studies teachers with regard to interdisciplinary instruction could be enhanced through more effective communication. At the national and state levels, more attention should be given at conferences and in professional journals to interdisciplinary teaching. At the local level, faculty inservice programs should focus on specific teaching techniques, materials, and specific courses that already use this philosophy. (Refer to the selected references for some materials and literature on interdisciplinary instruction between science and social studies.)

Once science and social studies teachers are introduced to the interdisciplinary concept, and after they have examined literature that demonstrates this approach, we feel it is an opportune time for them to discuss ways to integrate their course material. During this discussion, it is quite possible they will be confronted with the problems of incompatible class scheduling. However, we believe that some initial steps can be taken to begin cooperative efforts despite this obstacle. For example, biology and social studies teachers can coordinate their curricula by identifying certain process skills common to both areas. They could agree to develop these skills simultaneously, although independently. Table 3 lists some process skills which have been recognized by both groups of teachers. (Wisconsin Department of Public Instruction 1968, 1970.)

By agreement, two teachers can plan to stress these skills at certain points in the year, thus reinforcing each other's work. In addition, planning of this type may identify variances in terminology which may be confusing to students, and may also eliminate the need for certain redundancies which might otherwise arise. We feel this initial stage of cooperative planning can do much to improve the teaching of these process skills, and will also provide a basis for future joint planning of topical issues.

A second stage of joint planning could occur if both teachers are able to schedule their classes at the same time. At this level, we see team teaching, small group project work, and other combined class activities as being quite possible.

Project SCATE (Students Concerned About Tomorrow's Environment), an environmental investigation/

TABLE 3. Process skills Identified by Science and Social Studies Teachers

Observing—the process of using one's senses to obtain information about oneself and the world around one.

Classifying—the process of systematically imposing order on collections of objects or events.

Defining—the process of describing a thing or event in terms that provide a classification, a physical description, and/or that which results from conducting a given procedure.

Measuring—the process of using an instrument to estimate a quantitative value associated with some characteristics of an object or event.

Sampling—the process of systematically selecting a part of a whole in order to determine the quality or nature of the whole.

Hypothesizing—the process of stating a tentative general explanation of a large number of events.

Testing—the process of conceiving of counter-examples to a general explanation and gathering data to determine if sufficient numbers of counter-examples exist to determine the explanation inadequate or invalid.

Decisionmaking—the process of using data collected through the other processes to make, interpret and enforce a rule or action.

political participation program for Iowa secondary students, exemplified this potential for interdisciplinary instruction at the high school level (Harshman 1977). In this project, students investigated local environmental problems and participated in action to resolve the problems. The project investigated such problems as thermal pollution of the Des Moines River by an electrical generating plant, maintenance of an abandoned power company dam and lake; development of a state register of critical areas (environmental, historical, or archeological); a restriction on the development of new highway sites; and establishment of the loess hills areas along the Missouri River as a state preserve.

Investigations and participation for the project were organized using four themes: concepts, processes, phenomenon, and problems. Concepts and processes were selected to emphasize the unity of environmental problems and the interaction between science, technology, and social concerns. Concepts selected for the project included energy, conservation, land use, resources, and economics. Processes selected included those listed in table 3.

The project emphasized selection of problems for investigation that related to the real and direct experience of students and aroused students to the point that they desired to learn enough about the problems to be able to do something about them. Thus, investigation of the thermal pollution of the Des Moines River started with an awareness of the phenomenon of mortality among fish in the river and changes in the plant and fish life

TABLE 4. Interdisciplinary Topics for Biology and Social Studies

| <i>Topic</i> | <i>Biological Content</i> | <i>Social Studies Content</i> |
|-------------------------------|--|---|
| Acid rain | effects on soils, plants, animals, lakes, possible biological remedies | causes of acid rain, economic and social consequences in various regions, social remedies |
| Biomass as a fuel alternative | sources of biomass, growth rates, ecological problems of monocultures, energy yields, feasibility, biological trade-offs | harvesting, processing, marketing, economic impacts, social feasibility, societal trade-offs |
| Animal experimentation | procedures, rationale, benefits, controls, alternatives | problems, legal controls, societal attitudes, alternatives, values |
| Genetic engineering | theory, procedures, possible uses on plants, animals, people | economics, regulation and licensing, patenting, marketing, values |
| Evolution | history, theory, research difficulties, nature of science limits of theories | history, controversy, religious values, social mores, social Darwinism, contemporary conflicts, legislation of theories |
| Human biology | prenatal and child development, aggression, territoriality, socio-biology, behavior | social and psychological development, human conflict, emotions |
| Thermal pollution | effects on aquatic organisms, biochemical rate change, ecological imbalances | causes, social system trade-offs, alternatives, limits, economics |

found in the area. The awareness of this phenomenon led to concern among students, an investigation of probable causes, and a proposal to resolve the problem.

Students involved in the investigation were forced to consider both the ecological and social ramifications of the problems. Their efforts to resolve the problems they investigated required accurate reporting of scientific investigations, consideration of economic and social costs, and identification of appropriate channels and procedures for seeking change. In the process, they often were required to identify procedures for communicating the problem to the public and arousing public support.

Project SCATE describes an auxiliary aspect of interdisciplinary study. Interdisciplinary study between science and social studies often involves investigation of problems or phenomena that transcend the classroom. It involves students with some of the most persistent problems of our modern world and prepares them for the issues that will require careful deliberation and decisionmaking during their lifetimes.

Some suggested topical areas of concern to biology and social studies teachers are listed in table 4. This list constitutes a small portion of the many topics upon which joint planning might be conducted. Content related to a specific topic will undoubtedly vary from team to team, by grade level, and by existing curricula. Nevertheless, we feel that such integrative efforts have real potential for both social studies and biology teach-

ers in that they:

1. Serve as a catalyst for continuous course revitalization and personal growth;
2. Provide direction for making secondary school curricula more relevant to the life experiences of students; and
3. Improve cognition of students by virtue of providing a broader context in which to learn social studies and biology content and process skills.

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