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A Comparative Study of Secondary Science and Social Studies Teachers' Attitudes and Behaviors Regarding Recycling and Recycling Education

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By

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Abstract

The purpose of this study was to investigate secondary science and social studies teachers' attitudes and behaviors regarding solid waste recycling and classroom instruction in recycling, moreover, environmental education. The survey's population was randomly selected from St. Louis County secondary schools. The study documented the need for control of solid waste through recycling and the need to educate to improve recycling. It provided an extensive review of the literature on recycling instruction as well as classroom recycling activities and lesson plans.

The study used a 12 item survey-questionnaire to identify groups of teachers with the most interest in and positive attitudes toward including some instruction in recycling in their lessons. Analyses of teachers' responses considered categories of content area taught, age, sex, race, and the teachers' primary life-experience environment as rural, urban, or suburban. Total scores and means of teachers were described as very favorable, favorable, moderately favorable, ambivalent, and unfavorable to recycling and recycling education.

Science teachers, men teachers, urban life-experience teachers, rural life-experience teachers, teachers ages 35 years

or less, white teachers, and teachers of races other than black or white were found to be moderately favorable to recycling and to recycling education. Social studies teachers, women teachers, suburban life-experience teachers, teachers ages 36 years or more, and black teachers were ambivalent to recycling and recycling education. Significant differences were revealed between science and social studies teachers, urban life-experience and suburban life-experience teachers, and teachers ages 35 years or less and teachers ages 36 years or more.

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Chapter I

Although the United Nations, the United States Environmental Protection Agency, the government of Japan, the Worldwatch Institute, the United States National Association of Secondary School Principals, and the United States National Center for Resource Recovery urged secondary schools to include instruction in recycling of solid waste materials, such instruction in secondary education science and social studies curricula is scant (United Nations, 1981). As compared with the general opinion of the public in the United States on this issue, a Gallup poll documented that these prestigious organizations were more favorable toward recycling instruction (1979). Gallup showed that public opinion did not similarly support efforts to include instruction in recycling as well as other specialized topics of instruction in secondary school curricula. Actually, the poll showed a majority supporting few and basic courses, i.e., the "back to basics" philosophy. The Gallup pollsters asked the public:

> Public high schools can offer students a wide variety of courses, or they can concentrate on fewer basic courses such as English, mathematics, history, and science. Which of these two policies do you think the local high school(s) should follow in planning their curriculum--a wide variety of courses or fewer but more basic courses? (p. 231).

Gallup found that forty-nine percent preferred a small number of basic courses while forty-four percent preferred a wide variety. Seven percent had no opinion. Given that support of a wide variety of courses does not necessarily mean support of a course in recycling, this poll showed the public not as convinced as these prestigious groups of the merit of education in recycling.

Nevertheless, as reviewed herein, these notable organizations continued in their support for secondary school instruction in recycling. In response to their recognition of the need for secondary schools to include instruction in recycling, this study surveyed science and social studies teachers to discern their attitudes and behaviors in regard to recycling. In addition to their general opinions on this topic, the survey explored their attitudes and behaviors in response to specific suggestions such as to include some instruction in recycling in their courses. This information was relevant to the process of introducing and implementing instructional programs in recycling in the secondary schools.

The Need for Solid Waste Control through Recycling

In 1984, Japan's population was more than half that of the United States, but within an area one twenty-fifth as large (The World Almanac, 1984). The Japanese people inhabit an area the size of Kansas. The demands for space were extremely important in Japan in light of these conditions of population and area. Given these conditions, Japanese leaders never found

enough space to dispose of more than three hundred million tons of solid waste per year.

Japan initiated a national plan to control solid waste through recycling. Coordinated by government and supported by business, Japanese community organizations and schools mobilized and educated citizenry to solve a major national problem. The Japanese quickly progressed to a fifty percent recycling of solid waste. To achieve this goal, the Japanese practiced recycling of eleven different categories of materials into either reusable resources or energy. Critics praised Japan's national plan and pointed to its relevance to the United States and Europe. American energy consultant and attorney, James Baller said, "During the eighties, Japan may well duplicate in the resource recovery field what it has achieved in the manufacture of automobiles and electronics" (1983, p. 65).

The United Nations recognized the need for solid waste control through recycling. As part of the United Nations Educational, Scientific, and Cultural Organization (UNESCO), the United Nations established the International Environmental Education Program. Japan's resource recovery program answered well to the United Nations call to member nations to begin:

> The establishment on the national level of a programme of action with the aim, on one hand, of familiarizng teachers and educational administrators and planners with different aspects and problems of the environment and, on the other hand, of

> giving them a basis of training which would enable them to incorporate environmental education effectively into their respective activities. This action should take the form of pre-service and in-service training. (Connect, 1981, p. 1)

Within the school, the United Nations stressed the need for increased efforts by secondary science and social studies teachers to develop environmentally sound knowledge, attitudes, and behaviors among themselves and their students. More than one hundred international delegations that worked with the International Environmental Education Program underscored the gravity of global concern about the quality of the ecosystem and educational efforts to improve it.

American environmental educator, Garrett DeBell (1970), emphasized the role of recycling in terms of the ecosystem's quality as well as its ability to support life. "Recycling is a major part of the solution to many environmental problems" (p. 214). American organizations such as Friends of the Earth, the Sierra Club, and the Wilderness Society concluded that recycling is the "only ecologically sound long-term solution to the solid waste problem" (The Environmental Handbook, 1970, p. 214).

This conclusion meant enormous amounts of work for the American population because "some 4.3 billion metric tons of solid waste are generated in the United States annually from all sources" (The National Association of Secondary School Principals and the National Center for Resource Recovery, 1974,

p. 3). This figure has continued to steadily increase since 1974. Even more startling than this statistic, the United States spent an "estimated five billion dollars annually to collect and dispose of solid waste which has an estimated worth in materials and energy of more than one billion dollars" (The National Association of Secondary School Principals and the National Center for Resource Recovery, 1974, p. 9).

In the United States, there were many barriers to the intelligent and efficient use of waste resources. Although the idea of recovering and reusing solid waste was new to many, this idea was familiar to industry. For years, salvaged or secondary materials served as sources of raw materials in many industries. Nevertheless, the fact that such in-house recycling above all reduced production costs qualified this praise of industry. Renowned social critic, Vance Packard (1963) documented the overwhelming impact of increased amounts of solid waste produced by American industry and marketing in the post World War II period through today. His book, the Waste Makers, was a shattering expose of the American philosophy and practice of deliberate waste. Packard analyzed planned obsolescence of quality, desirability, and function. He coined the term "the throwaway mentality". He identified the cultural glorification in the United States of ever-increasing consumption. He defined conspicuous elements of the American character such as pleasure-mindedness, self-indulgence,

materialism, and passivity (p. 211). Packard named outstanding educators, scientists, and policy makers among his collaborators on The Waste Makers. These persons included Harrison Brown, Aldous Huxley, Joseph Wood Krutch, Paul Mazur, Reinhold Neibuhr, Fairfield Osborn, David Potter, Joseph Spengler, Barbara Ward, Colston Warne, and William Whyte, Jr. (pp. vii-viii).

The Waste Makers gave examples which enabled the reader to perceive the philosophy and practices of deliberate waste which permeated the American lifestyle. This work explained the obstacles in American life and economic productivity to solid waste disposal problems as well as resource recovery alternatives. Packard speculated that "historians may allude to this as The Throwaway Age" (p. 7).

Educator and environmentalist Dennis Moore credited the efficient refuse services in the United States as perpetuators of an illusion of invisibility of solid waste. Moore wrote that "although the resurgence or recycling grew out of the belief that a mass-consumer, mass-disposal society simply made no sense, the United States recycles less than ten percent of its municipal solid wastes" (1982, p. 58).

Yet, after all the fanfare about recycling during the seventies, the United States continued to waste in a manner similar to that of the early sixties when The Waste Makers first appeared. As to the eighties, Moore quoted Richard Keller, manager of Procurement and Waste Management for the

Maryland State Energy Office, who said:

> We are still facing the same problems right down the road. We have a growing population, a disposal-oriented society, with per capita consumption increasing. Couple this with our lack of landfill space and our dwindling resources, and we end up like Alice in Wonderland having to run twice as fast to remain in the same place (Moore, p. 58).

Keller noted that his colleagues throughout the United States were beginning to recognize recycling as an effective control of solid waste.

World-renowned economist and educator, Barbara Ward (1982) overviewed several governments's new perspective on recycling:

> For governments, the fundamental change can perhaps best be summed up in a significant readjustment in legislative approach. In addition to regulations and restrictions, government after government has started to pass what can roughly be called national resource recovery acts, in which the chief emphasis is placed not only on keeping wastes--especially toxic wastes--out of the biosphere but on taking a new and creative look at the wastes themselves. The setting up of the EPA in the United States was followed in 1970 by the passing of the Resource Recovery Act and more recently by the Resource Conservation and Recovery Act. In 1971, the German Federal Republic formulated an environmental program and followed it up with a waste disposal law which has as its aim to co-ordinate the collection and re-use of waste materials on a comprehensive basis. In 1974, the British government passed a new and enlarged "control of pollution" bill on the same lines, and it has since set up an over-all Waste Management Advisory Council to help secure an integrated

> approach. Then, in 1975, the French introduced a law on waste disposal and the recovery of materials. Japan has not only decided to devote more than two percent of GNP to the elimination of pollution, but it is concentrating more and more attention--for instance, through its new 'Keep Japan Clean' center--on the latest techniques of waste management and recycling. This tide of legislation does not, inevitably, wash over all the vexed points of jurisdiction and responsibility--who collects the wastes, where do they go, what is the best use to be made of them--but it marks what is probably an irreversible trend among developed governments (pp. 62-63).

Nevertheless, the National Resource Recovery Center of the United States evaluated recycling technology as it now exists as fragmentary and still not ready to answer complex questions of cost and technology (The National Association of Secondary School Principals and the National Center for Resource Recovery, 1974, p. 8). The American bias in favor of private-sector high-technology development as compared with community-based labor-intensive methods delayed national action similar to the Japanese plan. An intense debate surfaced in the past decade as to appropriate technology and methodology for resource recovery. Sociology professor and recycling entrepeneur, David Knapp (1982) attributed the demise of thousands of corner recycling depots in the early 1970's to the refuse industry's guarantee of an oncoming era of mechanized resource recovery. Knapp described how this premise still cripples the mass appeal of source separation and, even more importantly, source reduction plans even though industry has

never produced such a machine. Knapp (1982) noted the only industry-approved resource recovery method is to "burn garbage and sell the heat to industry or use it to generate electricity" (p. 49). The Coalition for the Environment of St. Louis, co-founded by nationally known biologist and ecologist, Barry Commoner, documented that such trash-to-energy plants forfeit up to seventy-five percent of solid waste which could be reclaimed as secondary materials through source separation (p. 3).

Home economist Mary Lou Van Deventer (1982) focused the resource recovery debate on the role of source separation in the home and the involvement of everyone so that recoverable materials do not enter the waste stream in the first place. The National Science Foundation of the United States endorsed such low-technology source separation approaches as the appropriate technology for solid waste control through recycling. The Foundation, as quoted by science writer Bryan (1981), defined appropriate technology in this regard as:

> Approaches to solving problems that do not require large investments of capital resources, use locally available resources, are capable of being managed by their users, conserve resources, and are in harmony with the environment. Most examples of the application of such appropriate technologies in the United States deal with aspects of conservation, waste management by recycling and resource recovery, and small scale agriculture (p. 47).

Lester Brown, a senior fellow at the Worldwatch Institute, found the need for the United States to begin a national recycling program absolutely prerequisite for a secure global future. Brown (1979) stated that because the American population consumes more than half of the world's resources annually while it is only six percent of the world's population, a sustainable global economy can only come through the American recognition and practice of recycling as a primary and appropriate control of solid waste (pp. 55-56).

In addition to Brown's comments, another contributor from Worldwatch stressed recycling of basic materials such as paper, iron, steel, glass, plastic, and aluminum. William U. Chandler (1983) found recycling saves energy, protects the environment, cuts waste disposal costs, conserves natural resources, and creates jobs if it is done according to low-technology labor-intensive methods. His study, Materials Recycling: The Virtue of Necessity, stated that "conservation of natural resources can mean the difference between life and death for the borderline economies of developing countries" (p. 45). In developed economies, Chandler cited recycling's energy savings which otherwise increase production costs of basic materials. To various extents, these developed economies such as Japan, the Netherlands, Denmark, Sweden, and the United States discovered that recycling waste materials makes economic sense as well as serving environmental interests.

Chandler noted that in the steel industry plants geared to scrap utilization remained profitable despite the depression suffered by the rest of the industry. His report credited the public's recycling of aluminum beverage containers as a primary reason that kept the United States aluminum industry competitive on the world market. Chandler and his colleagues at Worldwatch, a highly-regarded global issues thinktank and research center, stated that recycling resources can be an integral, productive, and job-creating part of a prosperous economy in the short-term economic picture. The Worldwatch researchers regarded recycling essential in the long-term economic picture because of projected shortages of metals, fossil fuels, and lumber.

Knapp (1982) summarized the national solid waste debate as:

> The real question--the one that polarizes interest groups and creates intense political controversy--is where to obtain those resources. Traditional industrial interests tend to think of natural resources in their raw form. When faced with the question where to obtain timber, oil, gas, or cobalt, their thoughts turn to wells and mines, which they increasingly (and alarmingly) hope to locate in national forests, wilderness areas, and roadless areas. The very places, in short, that conservationists are most anxious to protect from unnecessary exploitation (p. 47).

According to the Environmental Protection Agency of the United States (1976), the United States generated enough solid waste each day to fill the New Orleans Superdome from floor to ceiling--twice. To effectively recover resources from such

immense amounts of waste, the United States Department of Labor's Dictionary of Occupational Titles described a new job title of "resource recovery engineer" (1980, p. 488). The Labor Department's Dictionary of Jobs and Employment Trends predicted that "this job will be increasingly in demand as resource recovery technology advances as an alternative to landfills" (1981, p. 547). The AFL-CIO News (1983) reviewed William U. Chandler's ideas as to the United State's potential to create jobs and energy through recycling. In its favorable review, this union newsletter advocated a crash program to further recycling. However, in order not to get hopes too high for a windfall of jobs through recycling, the Dictionary of Occupational Titles (1980) put the terms of this method of control of solid waste as tentative since "most resource recovery still depends on the efforts of households, office workers, and others at the source of waste generation; much work remains to be done in the resource recovery field" (p. 489).

The foregoing has shown how many prominent recycling advocates resolved several important questions of the national and global solid waste debate. First, without qualification, these prestigious groups and influential individuals declared that the United States and other nations must recycle. They found waste of recoverable materials unjustifiable especially in our world of limited resources. Secondly, most found labor-intensive low-technology source separation methods of

recycling most effective as well as most promising in terms of vast employment opportunities. Those who advocated high-technology recycling methods were members of the solid waste industry and to various extents were biased by their vested interests in refuse collection. Thirdly, regardless of bias, all emphasized education for improved recycling as essential to change the attitudes and behaviors of all of us who are producers of waste in order to meet the need for solid waste control through recycling.

Education for Improved Recycling

Much work remained to be done to meet the need to control solid waste through recycling. As cited earlier, the United Nations called upon teachers, educational administrators and planners to incorporate environmental education into their respective disciplines. The United Nations (1981) emphasized that much work remained to be done to educate for improved recycling because:

> Environmental education remains a relatively new educational practice and there is a scarcity of professors in teacher's colleges who can conduct environmental education training programs. (p. 3)

Furthermore, the United Nations's research found that:

> Much of the pre-service environmental education of teachers in the United States and the Soviet Union occurs through studies in the traditional disciplines or through visits to nature centers. (p. 3)

A local work entitled, Environmental Education in the St. Louis Area: A Directory (1974), was compiled and published by the Institute for Environmental Studies of St. Louis University. This work supported the United Nations's global research. Specific instructional materials about recycling, however, were absent in area secondary schools's curricula. Instead, most entries directed the educator to learning units in earth study, biology, chemistry, backpacking, canoeing, air pollution, and population growth (pp. vii-viii).

On the state level, former Missouri Energy and Environmental Education Director, Verlin Abbott (1984), stated:

> Recycling of solid wastes or resource recovery is a needed but virtually wide-open area of study for educators. For obvious reasons, our efforts have focused on energy-- conservation and alternative sources thereof. Recycling remains untouched by educators. (personal communication)

As to publishers of educational textbooks, McGraw-Hill Regional Educational Materials Manager, Norman Thompson, underscored Abbott's point. Thompson (1984) recalled only passing reference to recycling in McGraw-Hill's numerous science and social studies textbooks. (personal commmunication)

As to teacher educators, Dr. Doris Troczak (1984), an education professor with an interest in environmental education at the University of Missouri at St. Louis, affirmed Abbott's and Thompson's comments. She stated that there is a scarcity

of recycling information in educational circles. (personal communication)

The appropriate role of the school is at the center of the debate as to how to educate to improve participation in recycling. Throughout the history of the United States, and especially in the last twenty years, the public schools served as an institution both to impart knowledge to generations of students as well as to socialize them according to the society's preferred values, attitudes, and behaviors. Recycling, as part of the entire environmental education movement, seemed to be the type of issue in which the schools not only must teach the facts but also must modify students's attitudes and behaviors in such ways as to effect a significant change in a deeply-entrenched societal behavior pattern--the throwaway mentality. To this challenge of the schools, the National Association of Secondary School Principals and the National Center for Resource Recovery (1974) endorsed the need for education to improve participation in recycling as a matter of their organizations's policies:

> Principals and teachers have an obligation to acquire insight into and knowledge about major issues facing society today in order to be able to teach effectively and to prepare students adequately. One complex issue of growing national interest has to do with the broad area of the management and utilization of both human and natural resources. As we approach the mid-1970's,

> Americans are facing the confounding situation of shortages of many products that have become accepted as necessary ingredients in our advanced life styles. (p. 3)

The National Association of Secondary School Principals collaborated with the National Center for Resource Recovery to create the Resource Recovery Education Program (1974). Though brief, this program provides evidence that one of the most important professional organizations at the secondary school level realized that recycling merited a place in secondary science, social studies, and industrial arts curricula. Owen B. Kiernan (1974), executive secretary of the National Association of Secondary School Principals, stated:

> It seems to me a vital goal is to learn and communicate present efforts to eliminate ill effects from solid waste while exploiting its inherent values. An informed teacher and student citizenry can then assist in shaping enlightened community response to these challenges. This Resource Recovery Education Program is an important step in supplying information and perspective to teacher and student. (p. 3)

To underscore the importance and immediacy of this educational effort within especially the secondary school community, the National Association of Secondary School Principals and the National Center for Resource Recovery assembled a resource recovery educational advisory committee composed of Kiernan and executive secretaries from the National Council for Social Studies, the National

Science Teachers Association, the American Industrial Arts Association, and the National Foundation for the Improvement of Education. The project staff included the National Association of Secondary School Principal's Editor and Director of Publications as well as the National Center for Resource Recovery Director of Information and Manager of Community Services. The involvement of these public relations and communications personnel indicated the intent of participating organizations to disseminate recycling educational materials into the school community across the nation. The project team was coordinated by a former Director of Educational Programs for the National Aeronautics and Space Administration (NASA) who subsequently served as the National Center's for Resource Recovery Chief of Educational Programs. The team had sections dealing with science, social studies, and industrial arts. Notable educators from each of these disciplines served on appropriate sections of the team.

This prestigious group of educators and scientists described their purpose as a necessary recognition of the fact that:

> Because the problem of solid waste--the third pollution--has been recognized only recently, people are less aware of it and of the mounting environmental and social problems caused by it. Now that the problem is beginning to receive attention, it is now essential that students become involved in

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> doing something about it. The Resource Recovery Education Program is designed to meet that need. (National Association of Secondary School Principals and the National Center for Resource Recovery, 1974, p. 5)

The Program's participants delineated several aspects of solid waste disposal and recycling that must be treated by educators in the secondary school curricula. They emphasized that students must become familiar with scientific facts and technological developments related to solid waste disposal and resource recovery. They urged students to become involved in developing public concern about waste. They stressed that students need to consider the implications of waste disposal and resource recovery for themselves as individuals as well as for society as a whole (1974).

This group of professionals stated that understanding teachers's and students's knowledge, attitudes, and behaviors regarding recycling was essential to any significant societal action to remedy the solid waste crisis:

> The factual information and content related to solid waste management are secondary in importance to the more significant basic understandings. One of the more important goals of instruction is the development of desirable attitudes, values, and behavioral patterns. Certainly, the issues of environment, conservation, and management of urban litter and solid waste are closely related to the affective aspects of our lives, and it is impossible to study and discuss these topics without

> concern for values and value conflicts. (National Association of Secondary School Principals and the National Center for Resource Recovery, 1974, p. 6)

The Resource Recovery Education Program's staff (1974) urged secondary science, social studies, and industrial arts teachers to integrate recycling instruction into their current lesson plans because "very little educational focus has been placed on the problem of solid waste caused by the inefficient and improper management of our trash and garbage" (p. 4). They recommended educational research to discern particular problems within school districts that hinder secondary science, social studies, and industrial arts teachers from meeting national and international exhortations to include recycling instruction as part of their students's environmental education.

Because of the need for recycling instruction, secondary education science and social studies teachers's attitudes and behaviors in regard to recycling and recycling instruction were surveyed. The thrust of this research was to identify those teachers most interested in recycling instruction. It was thought such teachers would emerge by means of significant differences between their own attitude and behavior responses as compared with other respondents. In other words, the portrait of the most receptive group of teachers to include some instruction in recycling in their

lessons would take form from such analysis of data gathered according to categories of content area taught; the personal life-experience environment of the teacher as urban, suburban, or rural; the age of the teacher; the sex of the teacher; and the race of the teacher.

Identification of the group of teachers with the most interest in and positive attitudes and behaviors toward including some instruction in recycling in their lessons could be useful to recycling advocates, to curriculum developers, and to educational policymakers in order to implement instructional programs on recycling. If recycling instruction advocates and curriculum developers hope to initiate an instructional unit on recycling at several grade levels of secondary education, then they may do well to particularly address this group of teachers who are most cooperatively disposed to the idea.

Chapter II

The description of a recycling center located at a high school which is cited below was one of the very few examples found demonstrating high school involvement in recycling:

> It's a tidy showplace for wastes. A short driveway leads to a cleanswept, black-topped area on which stand three large, carefully placed metal bins, each designated for a different color glass. Further down, two walk-in containers hold steel cans. At the end of the driveway is a hand-made, wooden-frame bin for aluminum cans. And conveniently close is a large wooden table for sorting materials. The place is the Environmental Resource Center at Niles West High School, located in Skokie, a Chicago suburb, and one of ten neatly maintained sites operated by the North Shore Ecology Center. (The Neighborhood Works, 1981, p. 1)

Yet, even this instance, which could provide the secondary school's students with first-hand application and appreciation of lessons regarding solid waste disposal, energy and resource recovery, the environmental impact of individual behaviors, and orientation to the world of work, was not operated by the secondary school but by a local non-profit firm.

Recycling does not appear to be a topic addressed in most secondary schools. No local secondary schools were found to be active in a comprehensive recycling program. The United Nations's International Environmental Education Program found:

> Most countries in the Europe-North America region have identified in-service teacher education as essential for effective environmental education. However, relatively few efforts have been made to initiate programs that supplement the traditional training of teachers. (Connect, 1981, p. 7)

Conservation educator David Knicely (1984) of the Missouri Department of Conservation taught St. Louis area high school students about environmental topics. He stated that since the early sixties his state department has supplemented classroom teachers's efforts to provide some instruction on environmental education topics. However, Knicely qualified the extent of his department's involvement in the secondary schools. He stated that requests for such conservation education consultation in the classroom almost always came from elementary teachers. Knicely speculated that secondary educators were under great pressure to achieve student competencies according to very specific objectives. These secondary teachers were often scruntinized in terms of accountability and "back to basics" criteria. Thus, secondary science and social studies teachers tended to use approved textbooks exclusively with little time for additional educational experiences. Furthermore, Knicely stated he had never seen any bonafide instructional materials on recycling for secondary educators. He noted that although various degrees of instructional materials exist on pollution,

energy conservation, nature experiences, and population, such materials were not available on recycling.

Science Curriculum Supervisor Ed Ortleb (1984) of St. Louis City Public Schools and a former president of the National Association of Science Teachers, said only a few secondary biology and general science textbooks gave brief attention to the specific topics of ecology and conservation and scant attention to the specific topic of recycling. Likewise, Social Studies Curriculum Supervisor Edna Whitfield (1984) of St. Louis City Public Schools said recycling is not even near what could be called a major focus of social studies instruction. No social studies curriculum objectives dealt with recycling. Sometimes, Whitfield related, the topic of the appropriate use of resources appeared in contemporary issues or economics textbooks, but she pointed out that often even this discussion did not include recycling.

Assistant Director Mark Schaeffer (1984) of the St. Louis Coalition for the Environment stated that recycling of solid waste was an important concern of the Coalition. However, the Coalition was distracted from recycling by environmental crises such as dioxin which is an extremely toxic contaminant found in St. Louis area soil, the Callaway nuclear power plant which it opposed, urban sprawl, and water pollution. Schaeffer stated that the Coalition had served as a clearinghouse of information for several local recycling depots to attract participants.

In this effort, Schaeffer predicted that increasing prices for recyclables will influence more people to recycle than simply increased knowledge of recycling through only educational efforts. Schaeffer stated that the Coalition's files on recycling dealt with several other topics at the same time such as hazardous wastes, landfilling, incineration, waste generation sources, waste hauler examinations, and trash-to-energy schemes. Schaeffer commented that it is not that recycling is unimportant; rather, the contrary is true. Nonetheless, the Coalition is overburdened by the need to respond to critical issues. A check of the Coalition's files revealed that under recycling the information dealt with scientific and technological questions and not with instructional materials for classroom teachers.

Instructional Materials on Recycling

The Resource Recovery Education Program (National Association of Secondary School Principals and the National Center for Resource Recovery, 1974) was an interdisciplinary instructional package for secondary school students in science, social studies, and the industrial arts. This program specifically dealt with secondary science and social studies instruction in recycling. The Resource Recovery Education Program was a total treatment of solid waste and resource recovery. It dealt with solid waste as a growing problem, solid waste collection processes, solid waste disposal, resource recovery, and solid waste management systems.

This type of organization helped students and teachers to conceptualize recycling within the large field of solid waste disposal.

The Resource Recovery Education Program contained ideas, approaches, learning aids, and resource materials about solid waste disposal and recycling. Educator input was seen in the use of objectives, student activities, questions for discussion, research activities, and instructional resources for each unit. The Program's staff encouraged team teaching in order to enable students to consider several different aspects of the solid waste challenge as well as to become aware of many social, economic, political, and technological problems in resource recovery.

The objectives of the Program were specific as well as interdisciplinary. Each objective was identified in terms of specific content areas. These objectives emphasized the development of students's understanding that through resource recovery we can use materials from solid waste and thereby conserve depletable resources for the future. They urged teachers to make clear to students that municipal solid waste is a vast national resource of materials and energy and that sufficient technology already exists to recover a much greater segment of these precious resources than are now recovered. The developers of the Program encouraged teachers to keep informed about the most significant resource recovery techniques and systems that are now available or in development. They

stressed that although proper solid waste management can turn a national problem into an economic opportunity, lasting resource recovery was possible only if the monetary value derived from its extended use exceeded the cost of separation and processing.

The Resource Recovery Education Program staff (1974) also produced Resource Recovery in the Industrial Arts (1974). This work was tailored to the needs of students in trade and shop curricula. A characteristic of both of these instructional programs by the National Association of Secondary School Principals and the National Center for Resource Recovery is that they encouraged analytical thinking, discussion, and research as much as concern, involvement, and commitment.

Recycling Activities for the Classroom (Educational Information Resource Clearinghouse's Information Analysis Center for Science, Math, and Environmental Education, 1973) concentrated on eighty action-oriented activities for students in the elementary as well as secondary school classes. This program classified recycling activities by grade level and subject area. It provided forty-two activities for secondary school students and teachers.

A contribution of this entry to the literature was its inventory of fourteen basic concepts of recycling (ERIC, 1973). These concepts enabled science and social studies teachers to identify main ideas in recycling education. These activities

emphasized that most resources are vulnerable to depletion in quantity and quality. They pointed out the need for recycling as related to a society's attitudes toward reusing or extending the use of materials. They showed how the values held by a society determined what are the economic values of resources. They demonstrated that social values and mores influence personal conservation behavior. They clarified how social, economic, and technological changes alter the interrelationships, importance, and need to recycle natural resources. They stated that resource depletion can be slowed by the development and adoption of recycling methods. They urged individual citizens to become well informed about recycling developments, problems, management procedures, and ecological principles. They stressed that solid waste disposal, including reduction of harmful and cumulative effects of various solids, liquids, gases, radioactive wastes, and heat were important if the well being of the environment were to be preserved. They held that maintaining, improving, and in some cases restoring soil productivity through recycling efforts were important to the welfare of the people. They demonstrated that consumption practices were constantly expanded by the ability to produce and create wants and markets which effect the rate of resource use. They showed that economic efficiency did not always result in conservation of natural resources. They documented how conservation policies were often the result

of group action. Finally, they believed that recycling responsibilities should be shared by individuals, businesses and industries, special interest groups, and all levels of government and business.

These concepts were not so much the matter of lecture and demonstration as they were the message embedded in each detailed activity. With concepts such as these in mind, students investigated how they applied in real-life situations. Experiences for secondary students involved examination of factors mitigating against recycling, study of contrasting approaches to recycling, analysis of the importance of group action to promote conservation-recycling legislation, research on the importance of waste reduction in the nation's recycling efforts, and observation of problems caused by improper burial of wastes in sanitary landfills. Recycling Activities for the Classroom developed recycling concepts through action so as to complement the Resource Recovery Education Program's (National Association of Secondary School Principals and the National Center for Resource Recovery, 1974) comprehensive cognitive, affective, and behavioral treatment of resource recovery.

The Do-It-Yourself Guide to a Solid Waste Seminar (Minnesota Southeast Regional Environmental Education Council, 1974) challenged students to become involved in topics concerning solid waste and recycling by researching and assembling one of ten learning station displays. This prepared

the entire class, as well as in conjunction with other classes, to tour each station to learn about several recycling concepts. Students who tour the displays were required to complete data sheets designed to accent the central points.

The Do-It-Yourself Guide to a Solid Waste Seminar (1974) covered concepts creatively. In "Mountains of Waste", students learned about the volume of solid waste generated annually in the United States. This activity initiated discussion of solid waste reduction and recycling. In "Separate and Salvage", students learned that substantial amounts of solid waste are salvageable. Using a simple model, the display showed how large-scale resource recovery methods operate by means of magnetism. The display showed source separation as the preferred practice for households and offices in order to salvage as many of the recyclable materials as possible. In "Nature's Recycling", the activity concentrated upon the time needed for complete decomposition of solid waste materials. Students were surprised to learn that plastics take about 350 years to decompose, aluminum about 500 years, and glass from millions to billions of years. Nature's production of methane gas through decomposition of wastes were displayed in terms of dangerous explosions if not contained properly. In "Our Tired Environment", automobile tires as solid wastes were the focus of several activities. The display related that when our environment is subjected to intense pollution such as tire disposal, it indeed becomes "tired".

In the activity, "Do We Need to Recycle", students were confronted with the need to recycle in terms of the national interest. This activity showed the finite supplies of several important metals. The activity promoted recycling of these metals to prolong available resources. The activity stressed that non-renewable resources are such that once they are gone, there simply are no more supplies of them. "The Throwaway Mentality" activity analyzed the energy costs of producing items from raw materials as compared with producing the same items from recycled materials. In the display's example of a tin soup can, students learned that approximately 563 BTU's of energy can be saved by using reclaimed materials instead of new resources. The activity demonstrated that the throwaway mentality is applicable to resource waste as well as energy waste. In "What is Needed", the activity pointed out that the materials used to package such items as photo supplies, fast foods, and many of the items in the supermarket are used in large amounts and are signficant to the price of an item. Math skills were emphasized as students were challenged to compute the amounts of waste from disposable diapers, razors, and fast-food packaging. "Man's Packaging" further developed the student's perception of superfluous waste. "Composting" showed that most of our organic wastes could be recycled as soil conditioner and fertilizer known as compost.

Students observed several jars in which organic wastes were decomposing or forming compost. Finally, "Disposal Methods" overviewed solid waste disposal methods such as landfills, incineration, composting, and recycling. This activity required the students to look at all aspects of solid waste disposal in terms of environmental costs and benefits.

Trash--Our Only Growing Resource (Missouri State Department of Education's Environmental Ecological Education Project and the Parkway School District, 1975) was a locally developed instructional package for secondary school teachers. This instructional unit, designed especially for senior secondary science teachers and students, focused on the problems of waste disposal and examined the function of recycling, the role of consumers to determine the types of packaging materials, facts about biodegradable and non-biodegradable materials, and the economic reasons for using synthetic materials. The units were designed to include for each concept the behavior objective, teacher background materials, and activities. In this manner, all information necessary to teach a particular concept was kept together. Additional concepts stressed in this unit included that recycling helped to preserve our environment by reusing resources. Humans assumed their role as an integral part of the environment when they returned natural materials and synthetic materials to be reused. Substances which were attacked by living organisms

during the decomposition process were organic and biodegradable. Plastics and other synthetic materials were non-biodegradable because they could not be decomposed by living organisms. Humans imitated nature when they composted biodegradable wastes. The consumer was the major determiner of the types of materials used in packaging and manufacturing. Synthetic materials which were non-biodegradable were often used in packaging for economic reasons. This unit included a six week schedule of instructional sequence. This outline of instructional order helped the science teacher to present the unit.

Solid Waste--Trash or Treasure (Urban Environmental Education Project of Pittsburg, Pennsylvania, Instructional Support Services Intermediate Unit, 1973) was an instructional package that would take approximately one week of classroom time in the science curriculum. This unit provided a brief overview, teacher background information which informed them of the immense size of our collective wasteful habits as it exhorted the teachers to practice recycling behaviors, student pretest and posttest evaluations, and four consciousness-raising activities. These activities challenged students's creativity and imagination. This module was not as detailed as the Resource Recovery Education Program (1974) or Recycling Activities for the Classroom (1973). However, Solid Waste--Trash or Treasure (1973) presented a novel way for students to look at topics of solid waste and recycling through shifting

the instructional emphasis onto their abilities of conceptualization, creativity, independent research, and handling simulated situations. To do this, four games were scheduled during one class period each week for four weeks. This approach gave students the opportunity to apply resource recovery concepts in various situations.

In the first of these games, "Solid Wastes: Where Do They Come From?", students identified sources of solid waste from a personal standpoint, i.e., "What did I throw away today?". The increasing tonnage of solid waste disposal from 1900 to 1975 was compared to promote discussion of the change in product and container uses. In "The Garbage Game", students participated on one of two teams. One team was the garbage production side while the other was the disposal side. The game helped students to perceive how the sources of waste interacted with solid waste disposal methods. This activity developed the student's grasp of the size of the problem in terms of the daily task of disposing solid wastes. Students were encouraged to think about wastes even though they may have considered only the immediate aspects of the trash can to the refuse truck previously. In "Solid Wastes: What Are the Disposal Options?", the teacher provided explanations of recycling, open dumping, incineration, landfilling, chemical treatment, and energy recovery. Environmental criteria were provided and students were asked to rate each disposal method in terms of these criteria.

This activity challenged students to do what they believed best in terms of solid waste disposal. Students were made responsible to choose ways to handle the solid waste problem in their homes and their community. In "One County's Dream for Disposal", students were introduced to the Allegheny County, Pennsylvania, master plan for solid waste disposal. From the information provided, students identified a quality of life goal in terms of appropriate solid waste disposal methods, examined alternative methods, and justified or disagreed with decisions made by planners in Allegheny County. This activity concluded the module. Students applied their accumulated knowledge and judgments to their local community. This final activity urged students to become involved in community issues.

Let's Recycle (Bureau of Solid Waste Management of the United States Environmental Protection Agency, 1976) was produced as part of a grant from the EPA to the city of Somerville, Massachusetts, to determine the feasibility of separating recyclable household wastes from other wastes prior to refuse pick-up. This source separation recycling program was the first of its kind in the United States. Somerville's schools participated in the education effort to inform residents about the importance of their involvement in the program. The school system of Somerville educated students to improve participation

in recycling as part of this program. The students, in turn, educated their parents and neighbors. Thus, the school tried to improve the solid waste disposal problem in Somerville through including appropriate instruction in recycling. Somerville schools served both to impart knowledge to students as well as to socialize students according to preferred values, attitudes, and behaviors.

Let's Recycle (1976) informed students of solid waste disposal problems and options. The activities were designed to help students to understand better the world around them in terms of public health and environmental quality. Specifically, the lesson plans of Let's Recycle (1976) dealt with solid waste and recycling. They included topics which brought together pertinent data from social and economic issues, natural resources, and a variety of pollution problems. The manual treated identical topics at the same point within two instructional sequences--one for grades kindergarten through six, the other for grades seven through twelve. Students's conceptualization of recycling developed through school by means of sequential lessons in resource recovery. The topics included (a) "What is Waste?", (b) "Where Does Waste Go?", (c) "How Does Waste Affect Our Resources?", (d) "Why is There So Much Waste?", and (e) "What Can We Do About Waste?". For example, topic five at the elementary level answered the question, "What can we do about waste?", by introducing students to the idea that recycling

takes old wastes and turns them into new materials. The teacher encouraged students to use the idea of a bicycle wheel as an illustration of recycling. Students were urged to think of examples of what could be made out of discarded materials such as old soup cans or soda bottles. The teacher suggested a homework assignment in which students wrote a short story about finding something valuable that had been discarded. Students then compared this experience with recycling. The teacher listed on the board possible advantages of recycling such as reducing pollution, saving natural resources, saving energy, and saving money. These concepts served as the foundation for brainstorming and discussion sessions. A field trip to a papermill was suggested. Also, students were encouraged to reuse grocery bags at home.

At the secondary level, the same question, "What can we do about waste?", was answered by introducing students to the idea that people who recycle imitate nature which constantly is in the process of giving new life to materials through recycling. The secondary teacher's manual stressed the larger concepts of cycles as compared with simply the concept of recycling at the elementary level in terms of a bicycle tire. The teacher, at the secondary level, gave examples of cycles such as nutrient cycles, water cycles, mineral cycles, and oxygen cycles. Several products found in solid waste from school and home that can be recycled served as the basis of a review of the solid waste

problem. Small research groups investigated recycling processes of several materials. Students learned terms such as shredding, cullet, glasphalt, and disposal costs in order to complete their assignments. Instructors emphasized student responsibility for classroom wastepaper recycling programs. Students interviewed their parents, friends, and neighbors as to whether or not they would be willing to source separate their garbage in order to recycle it.

Resource Unit (Edmonds School District, 1972) was another interdisciplinary recycling instructional program. Resource Unit contained more than one dozen natural resource activities. These activities were accompanied by recommendations for integration with appropriate subject areas and grade levels. Learning objectives, time schedules, and lists of necessary materials accompanied these activities. Recycling was taught in a manner that enabled students to perceive the liveliness of nature through analysis in science and math, through perception in photography, and through expression in language arts. Students were challenged to integrate ideas which heretofore they had not related intentionally.

Science, Technology, and Recycling: Instructional Materials on Aluminum (Aluminum Association of the United States, 1974) is a multi-media unit which concentrated on the manufacturing and recycling of aluminum. Student booklets and brochures supplemented teacher guides and two color filmstrips with cassette

tapes entitled, "Challenge and Change: A Story of Science and Technology" and "Recycling: An Ecology Story". The former filmstrip explained how science developed and its relationship to technology. Examples of this historic progression were drawn from contemporary aluminum manufacturing. The latter filmstrip showed how nature's method of reusing resources served as a model for recycling solid wastes.

This concludes a review of the small number of instructional materials expressly created for and applicable to the secondary science and social studies classroom. The section which follows deals with recycling and solid waste survey-questionnaires.

Recycling Survey-Questionnaires

A study entitled, "Only Thirty-Six Percent of Texans Doing Anything Personally to Fight Pollution" (Beldon Associates, 1970), reported that only thirty-six percent of a sample of more than 950 Texans felt they had done something significant to reduce pollution. Most of the respondents reported that their actions were to reduce littering. This survey found that the higher one's educational level, the greater one's concern about pollution. A survey entitled, "Most Texans Highly Concerned Over Pollution in the United States: Blame Mostly Industry and Public Itself, Beldon Associates, 1970), found the approximately eight out of ten persons sampled considered pollution in the nation to be a

serious problem while more than half of the respondents believed the problem to be extremely serious. However, only about half of this population thought pollution to be a serious problem in their own community. These respondents blamed industry as well as themselves for solid waste and other forms of pollution. College-educated younger adults who lived in large cities and towns were the most concerned about pollution.

"The Public's View of Environmental Problems in the State of Oregon" (Louis Harris and Associates, 1972) reported several findings about solid waste. The public showed a high degree of awareness of pollution as a serious problem. Sixty-five percent of these persons felt that the state should require that deposits be paid on bottles and containers in order to increase their return. Overall, the young and better educated were the most concerned about solid waste and other forms of pollution.

"A Study of Sociological Aspects of the Establishment of Refuse Disposal Sites in Erie County, Pennsylvania" (Great Lakes Research Institute, 1971) used a survey-questionnaire to identify public attitudes toward sanitary landfill sites. This study found that citizen's knowledge of solid waste disposal techniques was fragmented and disorganized. More than two-thirds of the respondents considered solid waste as a matter of immediate national concern. There was a positive correlation between proximity of residents to a landfill site and dissatisfaction with solid waste management methods. Again, it was found that

respondents from lower socioeconomic groups were less knowledgeable than those in higher socioeconomic groups in regard to pollution problems.

"Information on Participants in Ann Arbor, Michigan, Glass Recycling Program" (Owens-Illinois Company's Department of Environmental Control, 1972) found that 53 percent of individuals and 29 percent of groups recycled glass in order to reuse it or to conserve resources and energy. The closer participants lived to the recycling center, the more often they contributed to it. More than two-thirds of the participants held college degrees. This again emphasized the positive correlation between educational level and degree of environmental concern.

"Aspects of Sampling Attitudes towards Solid Waste Programs" (Bureau of Solid Waste Management of the United States Environmental Protection Agency, 1970) reported on an attempt to develop a communications program in order to facilitate public understanding and appreciation of sanitary landfills as a method of solid waste disposal. This study found that the awareness of residents of the existence of a landfill site within close proximity to their homes varied considerably from city to city. Of the ten cities studied, the degree of awareness ranged from 35 to 81 percent. Only 7 percent of these participants in the total sample named one definitional characteristic of sanitary landfills. When the

concept of landfills was explained, 86 percent of the total sample believed it to be an acceptable method of solid waste disposal and 82 percent had a favorable attitude concerning landfills. Nevertheless, attitudes toward landfills varied in relation to distance from the landfill site. Negative attitudes were recorded by 10 percent of the sample who lived within one mile of a landfill site as opposed to 6 percent of those who lived within one to three miles. Respondents in this set of surveys of households were divided into those who had made complaints about a sanitary landfill and those who had not. Of those who had objected, 42 percent of them also were more likely to say that their community had liabilities, were more likely to live close to landfill sites, and were more likely to have lived in the neighborhood before the landfill operation began.

"Citizens's Attitudes toward the Environment: An Appraisal of the Research" (Langowski, 1971) stated that unlike the general concern about air and water pollution, relatively little work has been done in the area of citizen attitudes toward the management of solid waste. He continued that his staff at the Illinois Institute for Environmental Quality found "a dearth of knowledge with respect to all aspects of recycling problems". The Institute's report dealt only with solid waste because there was so little research to evaluate in terms of recycling. The Institute's report recommended

further research to be done in the area of communication between the state and its citizens in order to develop educational programs which could facilitate understanding and cooperation between solid waste managers and individual citizens.

Chapter III

Methodology

Purpose

The purpose of this study was to determine if there were any discernable characteristics of senior secondary science and social studies teachers that indicated an acceptance of environmental education, especially recycling instruction, as part of the curriculum. This was done by analyzing both their responses to a twelve-item survey-questionnaire and by analyzing their personal characteristics such as content area taught, sex, age, life-setting background, and race. Thus, this study's focus was to analyze several aspects of teachers in order to define broad outlines of characteristics of such teachers who are more disposed to accept environmental education, especially recycling instruction, as part of the senior secondary school curriculum. Because this study was descriptive in nature, no hypotheses were stated nor tested as such. Nevertheless, the information gathered from this study could be very useful to curriculum developers and educational planners who hope to make environmental education at least a learning unit course option in the senior secondary schools.

Instrument

This project was a descriptive study using a survey methodology. The survey-questionnaire instrument that was used was a twelve-item rating scale developed by the author. The items were developed from extensive reading of recycling- and environmental education-oriented articles, curriculum guides, and activity descriptions. The first six items dealt with respondents's attitudes toward recycling and environmental education. The second set of six items dealt with the subjects's behaviors toward recycling and environmental education. A copy of the survey instrument and letters directing administration of it can be found in Appendix A.

The survey instrument begins with brief instructions for completing it. The subjects were asked their degree of agreement with the first set of six items which dealt with attitudes and their degree of practice of the second set of six items which dealt with behaviors. The scale has outer limits for the first six attitudinal items of 1 (Strongly Agree) to 5 (Strongly Disagree), and for the second six behavioral items of 1 (Always) to 5 (Never).

The final five questions of the survey asked the subjects to provide demographic information such as content area taught, sex, age, life-experience environment, and race. This information was useful to data analyses.

Sample

A random sampling technique was used to select seven public senior secondary schools in St. Louis County from the entire population of seven public senior secondary schools in St. Louis County.

Each principal of the seven secondary schools selected for this study was contacted initially by telephone. All principals agreed to participate. Then, as per these discussions with these principals, a package containing a cover letter and an ample number of survey-questionnaires was sent to these principals (Appendix A). They were instructed to forward one package of questionnaires to their Science Department chairperson and the other to their Social Studies Department chairperson.

There were two hundred thirty-eight survey-questionnaires distributed. Of these, two hundred five (86%) were returned completed. Science teachers completed 93 questionnaires; social studies teachers completed 112 questionnaires.

Survey Administration

As described in the cover letter sent with questionnaires to each of the schools participating in this study, the department chairpersons were instructed to distribute the surveys to fellow teachers during their next department meeting. A postage-paid pre-addressed large envelope was provided to

return the completed questionnaires after the department meeting. All surveys were administered in this manner.

These packages were sent to the selected schools's principals during the second week of September, 1984. The department chairpersons were asked to return their sets of completed questionnaires by October 5, 1984. By the end of October, 1984, all participating department chairpersons had returned their sets of completed questionnaires. The survey-questionnaires were marked with initials to identify school and department from which they had come in order to determine participation levels since individual teachers's names did not appear on the questionnaire.

Analysis

As the questionnaires were returned, they were divided into several groups in order to analyze them by the characteristics of content area taught, sex, age, life-experience environment, and race. The results for each characteristic were tallied separately. The rating scale was tallied on a five-place grid for responses 1 to 5-- "Strongly Agree" or "Always" to "Strongly Disagree" or "Never" respectively. After tabulating a respondent's questionnaire, a score of 24 points or less indicated favorable attitudes and participatory behaviors in environmental education, recycling, and recycling instruction.

Using the categories of characteristics cited above, t-tests were performed for each such category composed of two groups and analysis of variance tests were performed for each such category composed of three groups. Results of these data analyses are presented in Chapter IV.

Chapter IV

Results

The science and social studies departments of seven public secondary schools were randomly selected from St. Louis County to be included in this survey. A survey-questionnaire was administered to 100 science teachers and to 138 social studies teachers in these schools. Survey-questionnaires were returned by 93% of science teachers and 82% of social studies teachers.

Numerical values were assigned to the Likert scale responses on the survey. As shown in Table 1, a response of "Strongly Agree" to an attitudinal item or a response of "Always" to a behavioral item equaled one point. A response of "Agree" to an attitudinal item or a response of "Often" to a behavioral item equaled two points. A response of "No Opinion" to an attitudinal item or a response of "Sometimes" to a behavioral item equaled three points. A response of "Disagree" to an attitudinal item or a response of "Seldom" to a behavioral item equaled four points. A response of "Strongly Disagree" to an attitudinal item or a response of "Never" to a behavioral item equaled five points.

A total score of less than 30 points indicated favorable attitudes and behaviors regarding recycling. Scores between 30

and 42 points indicated ambivalent attitudes and behaviors regarding recycling. Scores between 30 and 42 points indicated ambivalent attitudes and behaviors regarding recycling. A total score of more than 42 points indicated unfavorable attitudes and behaviors regarding recycling.

Table 1

Numerical Equivalents of Likert Scale Responses

Point Value	Response	
	Attitudinal	Behavioral
1	Strongly Agree	Always
2	Agree	Often
3	No Opinion	Sometimes
4	Disagree	Seldom
5	Strongly Disagree	Never

A respondent who scored less than 30 points or a group of respondents whose mean was less than 30 points would have responded favorably to at least several of the survey's 12 items. Only 8 respondents reported very favorable attitudes and behaviors. This was 3.9% of all respondents. No group reported a mean of 18 points or less which was described as very favorable. A score between 19 and 24 points indicated favorable attitudes and

Table 2

Teachers's Category of
Response Based upon Total Scores

Categories	Ranges of Points	Respondents	
		Number	Percentages
Very Favorable	12 - 18	8	3.9%
Favorable	19 - 24	48	23.4%
Moderately Favorable	25 - 30	63	30.7%
Ambivalent	31 - 42	75	36.6%
Unfavorable	43 - 60	11	5.4%

behaviors in terms of this subdivision of the overall favorable category as shown in Table 2. There were 48 respondents with favorable attitudes and behaviors. This was 23.4% of all respondents. No group reported a mean of 24 points or less. A score between 25 and 30 points indicated moderately favorable attitudes and behaviors. The average of the responses of such a participant would have had to be between 2 points and 2.5 points to be reported as moderately favorable. Likewise, a group whose mean fell between 25 and 30 points indicated that it reported moderately favorable attitudes and behaviors regarding recycling. There were 63 respondents reporting moderately

favorable attitudes and behaviors. This was 30.7% of all respondents. A mean of 30 points or less but more than 24 points was reported by 7 groups. Thus, overall, 119 respondents or 58% of all respondents reported favorable attitudes and behaviors regarding recycling and recycling education.

A respondent who scored 42 points or less but more than 30 points or a group of respondents whose mean was 42 points or less but more than 30 points would have had to respond neutrally to at least several of the survey's 12 items because the average numerical value of responses ranged between 2.5 points and 3.5 points. Ambivalent attitudes and behaviors regarding recycling and recycling education were reported by 75 respondents. This was 36.6% of all respondents. A mean of 42 points or less but more than 30 points was reported by 5 groups.

A respondent who scored more than 42 points or a group of respondents whose mean was more than 42 points would have had to respond unfavorably to at least several of the survey's 12 items because the average numerical value of responses exceeded 3.5 points. Unfavorable attitudes and behaviors regarding recycling and recycling education were reported by 11 respondents. This was 5.4% of all respondents. No group reported a mean of more than 42 points.

Survey items 1 through 6 dealt with respondents's attitudes regarding recycling and recycling education. The percentages and

and numbers of responses to these items are shown in Table 3.

Table 3

Attitude Responses Regarding Recycling

Survey Item	Response				
	Strongly Agree	Agree	No Opinion	Disagree	Strongly Disagree
1. Our society should be recycling oriented.	51% 105*	47% 96	2% 4	0% 0	0% 0
2. Recycling is the most environmentally sound method of solid waste disposal.	38% 78	52% 107	9% 18	2% 2	0% 0
3. The importance of recycling will grow in the near future.	42% 86	47% 96	8% 17	3% 6	0% 0
4. Recycling should be mandated by law.	10% 20	44% 90	24% 50	16% 35	5% 10
5. Recycling education should be included in the secondary science and/or social studies curriculum.	17% 36	60% 123	11% 22	10% 20	2% 4
6. Instruction in environmental education is as important as instruction in the basic skills.	18% 37	39% 79	20% 40	19% 39	5% 10

*Number of respondents.

Table 4 shows percentages and number of responses to items 1 through 6 on the survey in terms of categories of favorable, ambivalent, and unfavorable to recycling and recycling education.

Table 4

Attitude Categories Regarding Recycling

Item	Category		
	Favorable to Recycling	Ambivalent to Recycling	Unfavorable to Recycling
1. Our society should be recycling-oriented.	98% 201	2% 4	0% 0
2. Recycling is the most environmentally sound method of solid waste disposal.	90% 185	9% 18	1% 2
3. The importance of recycling will grow in the near future.	89% 182	8% 17	3% 6
4. Recycling should be mandated by law.	54% 110	24% 50	21% 45
5. Recycling education should be included in the secondary science and/or social studies curriculum.	77% 159	11% 22	12% 24
6. Instruction in environmental education is as important as instruction in the basic skills.	57% 116	20% 40	24% 49

*Number of respondents.

The favorable category combines "Strongly Agree" and "Agree" responses. The ambivalent category consists of "No Opinion" responses. The unfavorable category combines "Disagree" and "Strongly Disagree" responses.

Favorable attitudes were indicated in all of items 1 through 6. More than 89% of all respondents favored items 1, 2, and 3. 1. "Our society should be recycling-oriented." 2. "Recycling is the most environmentally sound method of solid waste disposal." 3. "The importance of recycling will grow in the near future." On item 5, 77% of all respondents reported favorable attitudes. This item stated that "recycling education should be included in the secondary science and/or social studies curriculum". On items 4 and 6, more than half of all respondents reported favorable attitudes. 4. "Recycling should be mandated by law." 6. "Instruction in environmental education is as important as instruction in the basic skills."

Table 5 shows percentages and number of responses to items 7 through 12 on the survey. These items dealt with respondents's behaviors regarding recycling and recycling education.

Table 6 shows percentages and number of responses to items 7 through 12 in terms of categories of favorable, ambivalent, and unfavorable to recycling and recycling education. The favorable category combines "Always" and "Often" responses. The ambivalent category consists of "Sometimes" responses. The unfavorable category combines "Seldom" and "Never" responses.

Table 5

Behavior Responses
Regarding Recycling

Survey Item	Response				
	Always	Often	Sometimes	Seldom	Never
7. I have purchased returnable and reusable products and I have avoided products designed for one-time use.	3% 6*	55% 115	22% 45	12% 25	7% 14
8. I have asked my administrator to provide a recycling program at school.	0% 0	9% 18	19% 39	22% 45	50% 103
9. I contribute to a local recycling center.	11% 22	38% 78	27% 55	14% 28	10% 20
10. I consider a political candidate's record on environmental issues when I vote.	22% 45	41% 85	19% 39	12% 25	5% 10
11. I urge my students to recycle.	9% 18	38% 78	29% 59	15% 32	9% 18
12. I include information on recycling in my courses.	8% 16	37% 74	28% 56	21% 41	9% 18

*Number of respondents.

Table 6

Behavior Categories
Regarding Recycling

Survey Item	Category		
	Favorable to Recycling	Ambivalent to Recycling	Unfavorable to Recycling
7. I have purchased returnable and reusable products and I have avoided products designed for one-time use.	59% 121*	22% 45	19% 39
8. I have asked my administrator to provide a recycling program at school.	9% 18	19% 39	72% 148
9. I contribute to a local recycling center.	49% 100	27% 55	24% 50
10. I consider a political candidate's record on environmental issues when I vote.	64% 130	19% 39	17% 36
11. I urge my students to recycle.	47% 96	30% 61	23% 48
12. I include information on recycling in my courses.	41% 86	28% 56	31% 63

*Number of respondents.

Favorable behaviors were indicated in all but one of items 7 through 12. More than half of all respondents favored items 7 and 10. 7. "I have purchased returnable and reusable products and I have avoided products designed for one-time use." 10. "I consider a political candidate's record on environmental issues when I vote." On items 9, 11, and 12, between 40% and 50% of all respondents reported favorable behaviors. 9. "I contribute to a local recycling center." 11. "I urge my students to recycle." 12. "I include information on recycling in my courses." Only item 8 showed poorly with less than 10% of all respondents reporting favorably. This item stated that "I have asked my administrator to provide a recycling program at school."

A comparison of teachers's responses regarding attitudes with those regarding behaviors revealed that their attitudes were more favorable than their behaviors in practicing and promoting recycling and recycling education.

Statistical analysis of the data yielded additional information. A p equal to or less than .05 was selected as the significance level. Responses of science teachers compared with responses of social studies teachers are shown in Table 7. The mean (30.57) of the social studies group was 1.94 points higher than the mean (28.63) of the science group. The mean of the science group fell within the category of moderately favorable attitudes and behaviors regarding recycling and recycling education whereas the mean of the social studies

Table 7

Comparison of Responses of
Science and Social Studies Teachers

Group	n	Mean	Standard Deviation	df	t	p
Science	93	28.6	7.18	204	1.98	.0459
Social Studies	112	30.6	6.79	---	----	-----

group fell within the category of ambivalent attitudes and behaviors regarding recycling. The t-test revealed a significant p of .0459. Science teachers were more favorable to recycling and recycling education than were social studies teachers.

Responses of women teachers compared with responses of men teachers are shown in Table 8. Men outnumbered women by approximately 3 to 1. The mean (31.1) of women teachers was 1.9 points higher than the mean (29.2) of men teachers. The

Table 8

Comparison of Responses of
Women and Men Teachers

Group	n	Mean	Standard Deviation	df	t	p
Women	52	31.1	6.64	204	1.69	.0878
Men	153	29.2	7.10	---	----	-----

mean of the men's group fell within the category of moderately favorable attitudes and behaviors regarding recycling and recycling education whereas the mean of the women's group fell within the category of ambivalent attitudes and behaviors. The t-test revealed a non-significant p of .0878.

Responses of teachers ages thirty-five years or less compared with responses of teachers ages thirty-six years or more are shown in Table 9. The mean (30.9) of older teachers was 2.7 points higher than the mean (28.2) of younger teachers. The mean of the younger group fell within the category of moderately favorable attitudes and behaviors regarding recycling and recycling education whereas the mean of the older teachers fell within the category of ambivalent attitudes and behaviors. The t-test revealed a significant p of .0067. Thus, it was found that younger teachers were more favorable to recycling and recycling education than were older teachers.

Table 9

Comparison of Responses of Teachers by Age

Group	n	Mean	Standard Deviation	df	t	p
Thirty Five Years or Less	100	28.2	6.37	204	2.77	.0067
Thirty Six Years or More	105	30.9	7.55	---	----	-----

Responses of teachers who had lived in primarily rural surroundings were compared with responses of teachers who had lived primarily in urban surroundings. These results are shown in Table 10. Teachers with urban experience outnumbered teachers with rural experience by almost 5 to 1. The mean (28.64) of rural teachers was 1.71 points higher than the mean (26.93) of urban teachers. The means of both groups fell within the category of moderately favorable attitudes and behaviors regarding recycling and recycling education. The t-test revealed a non-significant p of .6363.

Table 10

Comparison of Responses of Rural and Urban Teachers

Group	n	Mean	Standard Deviation	df	t	p
Rural	14	28.6	6.76	73	.9197	.6363
Urban	60	26.9	6.15	--	-----	-----

Responses of teachers who had lived in primarily rural surroundings were compared with responses of teachers who had lived primarily in suburban surroundings. These results are shown in Table 11. Teachers with suburban experience outnumbered teachers with rural experience by nearly 10 to 1. The mean (31.46) of suburban teachers was 2.82 points higher than the mean

(28.64) of rural teachers. The mean of the rural group fell within the category of moderately favorable attitudes and behaviors whereas the mean of the suburban group fell within the category of ambivalent attitudes and behaviors regarding recycling and recycling education. The t-test revealed a non-significant p of .1865.

Table 11

Comparison of Responses of Rural and Suburban Teachers

Group	n	Mean	Standard Deviation	df	t	p
Rural	14	28.6	6.76	143	1.32	.1865
Suburban	131	31.5	7.69	---	----	-----

Responses of teachers who had lived in primarily urban surroundings were compared with responses of teachers who had lived primarily in suburban surroundings. These results are shown in Table 12. Teachers with suburban experience outnumbered teachers with urban experience by slightly more than 2 to 1. The mean (31.46) of suburban teachers was 4.53 points higher than the mean (26.93) of urban teachers. The mean of the urban group fell within the moderately favorable category and the mean of the suburban group fell within the category of ambivalent attitudes and behaviors. The t-test revealed a

significant p of .00015. Thus, it was found that urban teachers were more favorable to recycling and recycling education than were suburban teachers.

Table 12

Comparison of Responses of Urban and Suburban Teachers

Group	n	Mean	Standard Deviation	df	t	p
Urban	60	26.9	6.15	190	4.35	.00015
Suburban	131	31.5	7.69	---	----	------

Responses of black teachers compared with responses of white teachers are shown in Table 13. White teachers outnumbered black teachers by slightly more than 6 to 1. The mean (30.41) of black teachers was .57 point higher than the mean (29.84) of white teachers. The mean of white teachers fell within the moderately favorable category and the mean of black teachers fell within the ambivalent category. However, both means were at the dividing point between these two categories. The t-test revealed a non-significant p of .7022.

Responses of black teachers were compared with responses of teachers of races other than black or white. These results are shown in Table 14. Black teachers outnumbered teachers of races other than black or white by more than 3 to 1. The mean

(30.41) of black teachers was 3.16 points higher than the mean (27.25) of teachers of races other than black or white. The mean of teachers of races other than black or white fell within the favorable category and the mean of black teachers fell within the ambivalent category of attitudes and behaviors regarding recycling. The t-test revealed a non-significant p of .2492.

Table 13

Comparison of Responses of Black and White Teachers

Group	n	Mean	Standard Deviation	df	t	p
Black	27	30.4	7.15	196	.386	.7022
White	170	29.8	7.13	---	----	-----

Table 14

Comparison of Responses of Black Teachers with Teachers of Races Other than Black or White

Group	n	Mean	Standard Deviation	df	t	p
Black	27	30.4	7.15	34	1.17	.249
Other	8	27.3	4.74	--	----	----

Responses of white teachers were compared with responses of teachers of races other than black or white. These results are shown in Table 15. The mean (29.84) of white teachers was 2.59 points higher than the mean (27.25) of teachers of races other than black or white. The means of both groups of teachers fell within the favorable category. The *t*-test revealed a non-significant *p* of .312.

Table 15

Comparison of Responses of White Teachers with Teachers of Races Other than Black or White

Group	n	Mean	Standard Deviation	df	*t*	*p*
White	170	29.8	7.13	177	1.01	.312
Other	8	27.3	4.74	---	----	----

Chapter V

Limitations, Suggestions, and Conclusions

The results of this study on teachers's attitudes and behaviors regarding recycling and recycling education indicated that there were several significant differences in the attitudes and behaviors of teachers. Significant *t*-tests showed that science teachers were more favorable to recycling and recycling education than social studies teachers; teachers ages 35 years or less were more favorable than teachers ages 36 years or more; teachers with primarily urban life experience were more favorable than teachers with primarily suburban life experience.

Analysis of total scores on the survey according to categories of very favorable, favorable, moderately favorable, ambivalent, and unfavorable revealed that the means for science teachers, men teachers, teachers ages 35 years or less, rural teachers, urban teachers, white teachers, and teachers of races other than black or white were moderately favorable. The means for social studies teachers, women teachers, teachers ages 36 years or more, and suburban teachers were ambivalent. No group reported an unfavorable mean. The lowest, or most favorable, mean (26.9) was reported by urban teachers and the highest, or least favorable, mean (31.5) was reported by teachers with

school curriculum, it may be advantageous to survey teacher-trainers in colleges and universities as well as state legislators who have significant power regarding school issues.

The survey is limited because its place in the environmental education literature and movement is as an introductory assessment instrument which attempted to measure secondary science and social studies teachers' receptivity and readiness to promote recycling and recycling education. It does not offer curriculum guidelines although each item of the survey was developed in light of major recycling and environmental education concepts.

Suggestions for Further Research

Based upon the overall favorable response of the teachers who participated in this study, it appears that additional research which investigates related topics could help teachers to include curriculum on environmental education topics. To develop these topics, several questions would need to be answered. 1. Should the schools participate in recycling education, advocacy, and community organizing to improve recycling? Should the schools be used to improve recycling as they were in the Japanese and Somerville, Massachusetts, examples? 2. What would be the major objections to recycling and, moreover, environmental education and how could these

objections be overcome? 3. If recycling education were to begin in elementary school and continue through secondary school, what would be appropriate learning objectives and materials? 4. How could curriculum developers take the lead to encourage teachers to include some instruction in recycling and other environmental education topics through developing grade level and learner appropriate learning materials?

Conclusions

This study contributed to the evidence which encourages educators to teach our children to be more environmentally aware. The teachers who participated in this study demonstrated that their attitudes and behaviors regarding recycling and recycling education were receptive to the development and inclusion of recycling learning materials and activities for secondary science and social studies students. If curriculum developers, educational policymakers, and educational planners were as receptive to recycling learning materials and activities as these teachers have shown themselves to be, then the school could encourage our children to purchase returnable and reusable products, to contribute to a local recycling center, to develop a recycling program at school, and to consider a political candidate's record on environmental issues when they are of age to vote. Such lessons could well last a lifetime and teachers would have the satisfaction of knowing that they were teaching

students to be better stewards of our planet.

Appendix

Principal
St. Louis County High School
St. Louis County, Missouri

Dear Principal,

I am a graduate student in education at Lindenwood College in St. Charles, Missouri. In order to complete the M.A. degree program, I am doing research in the area of environmental education. My advisor at Lindenwood College is Dr. Gene Henderson (phone: 946-6912, extension 358).

I write to ask for your support and permission to administer a very brief survey-questionnaire to your science and social studies teachers. This survey is brief; completion of it will take no more than ten minutes.

Please find enclosed a sufficient number of surveys for each of your science and social studies teachers. I have divided them into two groups: science and social studies. Please forward the science package to your Science Department Chairperson and the social studies package to your Social Studies Chairperson. They can then distribute a copy of the survey to each of their department's teachers; collect them, and then return them to me in the prestamped large envelope which I have provided.

Please encourage your teachers to complete and return these surveys as soon as possible. Thank you for your assistance!

Best Regards,

RE: Administration and Return of Enclosed Surveys

Thank you for your assistance! Enclosed please find copies of a very brief survey-questionnaire. This survey gathers secondary science and social studies teachers' opinions concerning environmental education, specifically recycling.

This survey takes no more than ten minutes to complete. Thus, in order to further insure a high percentage of participation, please:

1. Distribute a copy of the survey to each teacher in your department.

2. Have your teachers return the surveys to you as soon as possible.

3. Put the completed surveys into the enclosed folded envelope which is preaddressed and prestamped.

4. Put this envelope into the mail so that it can reach me by October 5, 1984.

Perhaps you may want to do the survey as a group at your next department meeting.

Thank you very much for your assistance! Also, always feel free to call me at 889-2940 (work) or 781-1674 (home) if you have any questions.

Best Regards,

RECYCLING SURVEY

Dear Teacher,

Please circle the appropriate response to each question below. Thank you!

1=Strongly Agree, 2=Agree, 3=No Opinion, 4=Disagree, 5=Strongly Disagree

1.	Our society should be recycling-oriented.	1	2	3	4	5
2.	Recycling is the most environmentally sound method of solid waste disposal.	1	2	3	4	5
3.	The importance of recycling will grow in the near future.	1	2	3	4	5
4.	Recycling should be mandated by law.	1	2	3	4	5
5.	Recycling education should be included in the secondary science and/or social studies curriculum.	1	2	3	4	5
6.	Instruction in environmental education is as important as instruction in the basic skills.	1	2	3	4	5

1=Always, 2=Often, 3=Sometimes, 4=Seldom, 5=Never

7.	I have purchased returnable and reusable products and I have avoided products designed for one-time use.	1	2	3	4	5
8.	I have asked my administrator to provide a recycling program at school.	1	2	3	4	5
9.	I contribute to a local recycling center.	1	2	3	4	5
10.	I consider a political candidate's record on environmental issues when I vote.	1	2	3	4	5
11.	I urge my students to recycle.	1	2	3	4	5
12.	I include information on recycling in my courses.	1	2	3	4	5

Please check the appropriate blanks:

1. I teach: _____ Science, _____ Social Studies.

2. I am: _____ a Woman, _____ a Man.

3. I am: _____ 35 years of age or less, _____ 36 years of age or more.

4. I have lived more than half of my life in a setting that could be described most accurately as:
_____ Rural, _____ Urban, _____ Suburban.

5. I am: _____ Black, _____ Caucasian, _____ Other.

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