DOCUMENT RESUME

ED 360 186 SE 053 573

AUTHOR Rillero, Peter

TITLE The Revolution of Enlightenment: A Historical Case Study of Significant Educational Change through Teacher Education.

PUB DATE Apr 93

NOTE 24p.; Paper presented at the Annual Conference of the National Association of Research in Science Teaching (Atlanta, GA, April 20, 1993).

PUB TYPE Reports - Descriptive (141) -- Historical Materials (060) -- Speeches/Conference Papers (150)

EDRS PRICE MF01/PC01 Plus Postage.

DESCRIPTORS Case Studies; Demonstrations (Educational); *Educational Change; Educational Philosophy; Elementary Secondary Education; Field Trips; Higher Education; Science Activities; Science Curriculum; *Science Education History; *Teacher Education; Teacher Educator Education; Teaching Methods; Textbooks; Theory Practice Relationship

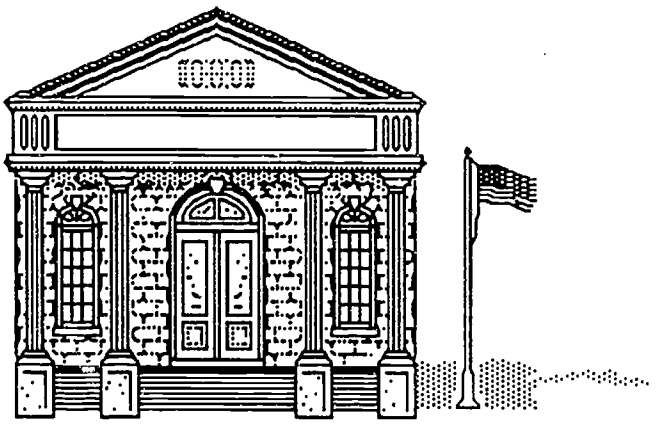
IDENTIFIERS Enlightenment Thought; Nature Study Movement; Normal Schools; *Object Teaching; Pestalozzi (Johann Heinrich); Sheldon (Edward Austin); State University of New York Coll at Oswego

ABSTRACT

The object teaching revolution challenged the 19th century American education practices of learning by rote memorization and relying on the textbook and teacher for knowledge. The American version of object teaching evolved from Pestalozzi's educational philosophy of "Arschauung," which refers to learning from direct concrete observation. Early efforts to introduce object teaching in America failed because proponents of this system did not utilize teacher education. Sheldon was responsible for successfully initiating the object teaching revolution. In 1859, he introduced the system in the school system of Oswego, New York by utilizing inservice teacher education. Two years later Sheldon started a teacher training college at Oswego that appears to be the first that combined theory and practice. Sheldon and his colleagues made it their goal to also educate teacher educators. Graduates of Oswego found employment in school districts and newly forming normal schools (teacher training schools) across America and were key reasons for the spread of object teaching. Despite the eventual decline of object teaching, it impacted art education, vocational education, and reading textbooks, and had a large impact on science education. The focus on natural objects made object teaching an early form of science education. Object teaching evolved into nature study, which later evolved into elementary school science. At all levels, science teaching methods such as field trips, demonstrations, and science laboratories where promoted by object teaching. The object teaching revolution provides evidence that meaningful educational change can occur in schools through teacher education. (Contains 55 references.) (PR)

THE REVOLUTION OF ENLIGHTENMENT

A Historical Case Study of Significant Educational Change Through Teacher Education.



Peter Rillero
The Ohio State University
1200 Chambers Road, Room 310
Columbus, OH 43212

Paper presented at the National Association of Research in Science Teaching Conference
Atlanta, Georgia.

April 20, 1993

Nature endows even the best heads and hearts with no more than a disposition to teach; it is for us to develop and vitalize this uncommon disposition needed in education, as we would in the case of any other profession. - Pestalozzi (reprint, 1951)

Introduction

As a result of dissatisfaction with American schools, the cry for change is pervasive. Reviews of research indicate educational practices to improve education, yet change is evasive. The object teaching revolution is important from a historical perspective because it was a forerunner of elementary school science and its evolutionary roots underlie many science education practices. Equally important, the object teaching revolution provides an important historical case study of significant positive change that occurred through teacher education. Four aspects of teacher education were necessary to achieve a change in nineteenth century educational practice: preservice teacher education, inservice teacher education, a practice and model school, and teacher educator education.

What is Object Teaching?

Johann H. Pestalozzi (1746-1827) tried to establish an education system that was based on first hand acquaintance with natural objects (Downing, 1925). The term Pestalozzi used to describe this system was *"Anschauung,"* which refers to direct concrete observation. This was described by Americans as sense perception and object lessons (Kilpatrick, 1951). "Pestalozzi and his followers organized schemes of object teaching for the purpose of giving children real knowledge of the real things of nature and industry, from the most common to the most remote" (Parker, 1919, p. 175).

Pestalozzi in *The Method,* describes object teaching as follows "The most essential point from which I start is this: sense impression of nature is the only true foundation of human knowledge. All that follows is the result of this sense impression and the process of abstraction from it" (from Downing, 1925, p. 316). Pestalozzi recognized the importance of using what is around the child to assist in education. He wrote, "The first tutor is nature, and her tuition begins the moment that the child's senses are opened to the impressions of the surrounding world" (from Krusi, 1875, p. 155).

A lesson plan on feathers taken from *Lessons on Objects* (Sheldon, 1869b) is presented as an example of how object teaching was used in the American classroom.

A FEATHER

> What is this? A feather. Whence does it come? It comes from off a bird. How do you think a bird would feel without its feathers? Very cold. Of what use then are feathers to birds? They keep them warm. What do we wear to keep us warm? Coats, frocks, aprons, &c. Do you know one word by which to speak of all these together? Yes; *clothing*. Yes, and feathers are the clothing of *birds*. Now look at this feather (the teacher throws it up in the air); what do you see? It flies about. If I throw this cent in the air, will it do the same? No, teacher, it will fall to the ground at once. Why does the feather float in the air, and the cent fall to the ground?... (Sheldon, 1869, p. 33)

Teachers were encouraged to use these lesson plans as model lessons to develop their own based on Pestalozzian principles. The American version of object teaching emphasized the following Pestalozzian principles:

1. Activity is a law of childhood. Accustom the child to do—educate the hand.
2. Cultivate the faculties in their natural order. First, form the mind, then furnish it.
3. Begin with the senses, and never tell a child what he can discover for himself.
4. Reduce every subject to its elements—one difficulty at a time is enough for a child.
5. Proceed step by step. Be thorough. The measure of information is not what the teacher can give, but what the child can receive.
6. Let every lesson have a point; either immediate or remote.
7. Develop the idea—then give the term—cultivate language.
8. Proceed from the known to the unknown—from the particular to the general—from the concrete to the abstract—from the simple to the more difficult.
9. First synthesis, then analysis—not the order of the subject, but the order of nature (Sheldon, 1869a, pp. 14-15).

Education before Object Teaching

To understand any revolution it is important to understand the conditions that led to the revolt. Rousseau in 1762, wrote of the meaningless word teaching that was occurring in Europe. Children simply reflected back words that they had learned "and those who hear the words understand them, but the child does not" (from Parker, 1919, p. 175).

Eighteenth century and nineteenth century American schools had bleak learning conditions. Johnson in 1904 described these conditions: "In most of the old district schools little was imparted beyond a few bare rudiments, the teachers were often ignorant, and sometimes brutal, the methods mechanical and dreary" (Johnson, reprint 1963, p. 134). "Teaching was by rote and drill. Encouragement was by the rod. Obedience (to God, parent and teacher) was the foundation rock for the mansion of learning" (Withers, 1963, p. vii). "Teachers knew little of their subjects and less of the children they taught .... They looked on their pupils as unregenerated. Human nature was bad. 'The will of the child must be broken,' was the doctrine of the day" (Rogers, 1961, p. 3).

The negative reaction to the prevailing education system, coupled with Enlightenment ideas were driving forces for the development of Pestalozzi's theory. The Enlightenment, an intellectual movement in the seventeenth and eighteenth century, stressed the powers of human reason and the spirit of learning true knowledge from experience rather than from authority. During this period there was great interest in science and promotion of religious tolerance (Hirsch, Kett, & Trefil, 1988). Pestalozzi extended the spirit of the Enlightenment into education (Elkind, 1987) by having students learn from their own experiences rather than the authority of the textbook and school teacher.

Several pockets of Pestalozzian influence were felt in America, with the earliest introduction being led by William Maclure (1763-1840) and Joseph Neef (1770-1854) in Philadelphia in 1806. After three years of work, this enterprise failed (Hollis, 1898; Grave, 1912) Neef was later put in charge of Robert Owen's New Harmony school in

Indiana that also collapsed.

> Neef and Maclure's attempt to popularize and disseminate Pestalozzianism suffered because not enough attention and energy was actually given to teacher preparation. Although both Neef and Maclure sometimes hinted at their intention of training teachers, they concentrated on disseminating the method by educating children (Gutek, 1978, p. 64).

Neef's personal influence was never greatly felt and his publications were given scant attention (Grave, 1912; Kilpatrick, 1951; Gutek, 1978).

Pestalozzian methods were described in publications by Henry Bernard and discussed by a few educators (Gutek, 1968). Hollis (1898) concluded that "while the Pestalozzian principles had long been heard of and talked of in different sections of the country, they had taken no hold upon American schools" (p. 5). The spirit and techniques of object teaching would be transmitted in American through teacher education.

The Object Teaching Revolution

Edward Austin Sheldon (1823-1897) described in his autobiography (edited by his daughter Sheldon Barnes, 1911) the style of leadership he used as secretary of the Oswego, New York schools. Sheldon relied on extensive end of year testing to make sure students and teachers were accountable. He developed a complete educational machine with a clearly delineated curriculum. Sheldon stated that by looking at his watch, he could tell exactly what every teacher in the city was doing. However, Sheldon realized that his machine was lacking life, spirit, and soul. He searched for a new approach.

Sheldon found the new approach at a London exhibit in Toronto and brought back object teaching ideas and materials for his school system. In 1859, he introduced a course based on object teaching in the primary school. Sheldon changed the

curriculum from reading, spelling, and arithmetic to include lessons on form, color, size, weight, plants, animals, the human body, place, and number (Dearborn, 1925). He met with the teachers on Saturday and discussed how they could accomplish the new methods that stressed the power of observation and spirit of inquiry instead of the acquisition of knowledge (Dearborn, 1925). According to Rogers (1961), this was the first inservice class for teachers.

Feeling the inadequacy of his instruction and because he was losing teachers he trained to other schools, Sheldon established a teacher training school (Oswego Board of Education, 1867). A number of teachers gave up half of their yearly salary to acquire the services of Margaret E. M. Jones of the Mayo's Home and Colonial Training School in London as a teacher trainer (Sheldon Barnes, 1911). Later, Herman Krusi, Jr. (1817-1903), whose father worked with Pestalozzi, was hired. On a May morning in 1861 only nine students heard the school bell resounding the opening of the new Oswego Primary Teachers Training School; however, in a relatively short time the reverberations of that bell could be felt around America. The first shots of the American object teaching revolution had been fired; the weapon was teacher education.

In *A Manual of Elementary Instruction for the use of Public and Private Schools and Normal Classes; Containing a Graduated Course of Object Lessons for Training the Senses and Developing the Faculties of Children*, Sheldon (1869a) makes the point that anyone discussing the need to train a mechanic, artist, lawyer, or physician would be ridiculed. Then he goes on to discuss why its important for there to be training of teachers "to whom we entrust the moral and intellectual destiny of the race" (p. 13). "It is clear that, without this knowledge teachers go blindly at their work, and can but fall into many and grievous errors. One thing is certain, that with the principles and methods here discussed, no one can hope to succeed who does not carefully study and intelligently practise them" (p. 14). After this rationale, Sheldon devotes the rest of the book to the philosophy and methods of object teaching.

Object teaching provided a definite system for instruction. The teacher played an active role in teaching and preparation was needed. In *Lessons on Objects*, Sheldon (1869b) wrote "There is, perhaps, no practice better adapted to insure effective oral teaching, than diligent preparation of the lessons which the teacher intends to give her students" (p. 11). Further advice to teachers included the importance of possession of an accurate knowledge of the subject to be taught in order to determine the effect of the lesson on the minds of the students, to prevent tedious repetitions and important omissions, and to produce the feeling that the teacher is in control. After carefully preparing the sketch for the day, the teacher is advised to write comments about the lesson in order to improve upon it.

Sheldon appears to be the first who combined theory and practice in a teacher training school (Sheldon Barnes, 1911). Preservice teachers were required to teach under supervision at the practice school. The integration of the lessons and practice are described by Sheldon in a placard for his new school (1862): "From two to three hours each day will be devoted to lessons on the theory of and methods, and from three to five hours in observation and practice under the most experienced and skilled teachers. Every lesson given will be fully illustrated and worked out in the school room." Sheldon wrote in his autobiography that "in addition to the regular school of practice, we had one model school, used exclusively for observation, and one school taught successively by the members of the training class" (Sheldon Barnes, 1911, p. 138).

Sheldon and his colleagues recognized the role of teacher education in reforming school practices. Yet, Sheldon indicated that the goal of the school was not simply to educate teachers, but also to educate teacher educators (Sheldon, 1888). This dual role of teacher education and teacher educator education was also supported by an act of the New York Legislature appropriating money to the school and indicating that the Oswego training school should take in one student from each senatorial district so that they could impart the knowledge of instruction to the school where they teach

and to the teachers they meet at teachers institutions (Krusi, 1888). At Oswego, potential teacher educators not only learned the methods of object teaching, they also became infused with its spirit.

Students came from across America to learn at Oswego, despite that fact that the Civil War (1861-1865) was occurring. The graduates of the Oswego school became missionaries spreading object teaching throughout America (Krusi, 1875; Hollis, 1898). Alumni records for the years 1861 to 1886 indicate that Oswego graduates taught in 44 states and the District of Columbia. Graduates of Oswego found employment in existing and newly developed normal schools, which helped spread the object teaching system. Object teaching became widely known as the Oswego Method.

According to Krusi (1875), object teaching became the basis of teaching methods in all the advanced schools and according to Smith, the Oswego Method "was given nearly universal acceptance in this country" (1963, p. 200). It was the most talked about innovation in elementary school education in the years from 1861 to 1880, and it was praised in annual reports of state superintendents (Reisner, 1930). From an original class of nine students, Oswego became "the chief center in the country for the training of teachers and the improvement of elementary education" (Dearborn, 1925, p. 94). Hollis in 1898 wrote, "The revolution has been complete. The days of the reign of the alphabet, the blue-back speller, the dreary rules, the narrow gauged curriculum, the impenetrable text-book, the sunless, tradition-bound schoolroom and the SCHOOLMASTER, are happily at an end. The new era of light and love and freedom is the heritage of every American boy and girl. All honor to Pestalozzi, to Dr. Sheldon, and to the American educators, who were so ready to see the good and adopt it" (p. 71).

The Oswego Normal School was not the first teacher training school, but it became known as the "Mother of Normal Schools" (Hollis, 1898; Rogers, 1961) and was called a "Mecca of American Elementary Education" (Dearborn, 1925). The combination of the philosophy of object teaching with the success of Normal Schools produced a combination that spread like wild fire. The enlightenment of education in

America did not result from experimental trials nor philosophizing, but it did occur due to teacher education.

The Swing of the Pendulum

Despite (or perhaps, because of) object teaching's wide acceptance, it did meet with criticism. It was said that this method lacked any essential element of order or direction. Object teaching was also criticized by people who thought it was only for amusement, and the teachers did all the talking. Much of the criticism resulted when the philosophy of object teaching became diluted. Often teachers did not understand the philosophy and had students commit the model lessons to memory (Underhill, 1941). Lessons often tended to stress verbalism and the use of a textbook contrary to the intent of the theorists (Reisner, 1930). An Oswego newspaper printed a Dicken's satire of object teaching in 1871 (Rogers, 1961). Charles Dickens' *Hard Times* has a scene that mocks the excessive formalized descriptions that became a part of some forms of object teaching. A girl (No. 20) who spent her entire life with horses, was intimidated by descriptions of horses in books, and does not describe a horse to the class. The instructor calls upon Bitzer, who answers, "Quadruped. Graminivorous. Forty teeth, namely: twenty-four grinders, four eye teeth, and twelve incisive. Sheds coat in Spring; in marshy countries sheds hoofs too. Hoofs hard, but requiring to be shod with iron. Age known by marks in mouth." Thus (and much more) Bitzer. "Now girl No. 20," said Mr. Gradgrind, "you know what a horse is." (From Wilbur, 1906, p. 488).

Object teaching as a major movement, did not last in its original form. However, the object teaching revolution produced significant changes in American education. Through Sheldon's efforts, the curriculum of common schools was expanded away from simply reading. Pestalozzi's system of instruction improved the mastery of ordinary school skills and the acquisition of new information, which "substantially improved the quality of school experience by introducing more of concreteness, more of thinking, and more of doing in school" (Reisner, 1930, p. 200). The credit for the change was given to the Oswego school. Out of all the institutions in

America, Professor O'Shea of the University of Buffalo said the Oswego school had the most beneficial effect on elementary education, President Butler of Columbia University said it had the greatest impact on teacher training, and Col. Francis Parker said that it had the biggest impact on American education (Rogers, 1961). Education became more student centered and started to focus on interests of children (Kambly & Suttle, 1963; Slavson & Speer, 1934).

Object Teaching and Science Education

While object teaching influenced many areas of education such as art (Tarr, 1989), vocational education (Culver, 1986; Rogers, 1961), and reading textbooks (Rillero & Rudolph, 1992), perhaps the biggest subject area affected by object teaching was science. Science education selections were contained in the eighteenth and nineteenth century children's literature, which was also know as didactic literature (Underhill, 1941; Rillero & Rudolph, 1992; Craig, 1957). However, many aspects of nature study and elementary science education evolved from object teaching (Rogers, 1961; Underhill, 1941; Croxton, 1937, DeBoer, 1991). Object teaching also influenced the development of science education methods.

Part of the reason object teaching impacted science education was that the materials studied — living things, rocks, land features — were things science studied. The process of object teaching was also equated with the process of making scientific discoveries. Marcius Wilson in 1863 wrote,

> All *science* has been built up upon this [object] system; all original investigators and discoverers even now adopt its methods; it is only when we come to elementary instruction of the school-room that we depart from its principles. Let us bring up a few cases of illustration. If we look at the science of *botany* we shall find it has grown from its beginnings by a close examination of the *objects* themselves. . . . Does not the geologist examine rocks themselves; the astronomer turns his telescope to the heavens, that he may see with his own eyes; the chemist go over in his laboratory the experiments of his predecessors; and the scientific farmer study the condition of vegetable growth in the analysis of soils and plants, and in experiments based on what he thus learns? . . . We

> see, therefore, that Nature teaches, and that science progresses, from the observation of the rudimentary facts, upward to the rules and principles which are generalization of them. And why should we, in our school instruction, invert the order? (Wilson, 1863, pp. 11-13)

In tracing the impact of object teaching on science education the trail is often obscure. Part of the problem lies in the immense popularity and acceptance of the object teaching method that it ceased to be referred to by its name. Hollis in 1898 wrote, "Pestalozzian methods have been so widely taught in various normal and training-schools throughout the land, and so widely adopted that they have long ceased to bear the name 'Oswego Methods,' which was commonly applied to them twenty-five years ago" (p. 21). The introduction of object teaching by Sheldon opened a floodgate for Pestalozzian influence to spread in America with some of this influence entering America independent of Oswego. Despite the difficulties in finding a complete trail, evidence does exist that links object teaching to the evolution of American science education.

Object Teaching and Elementary Science Education

Object teaching was a forerunner of elementary science in the schools. The Oswego Movement was responsible for widening the elementary curriculum beyond the "three R's" (Hollis, 1898). This widening included "the wealth of work with Nature, the study of plants, animals, soils, minerals, the air we breathe, and the water we drink" (Hollis, 1898, p. 37). A place for science as a separate subject in the elementary school curriculum was beginning to be established.

The materials used in object teaching were usually natural things. These were readily available and they interested the children. In *A Manual of Elementary Instruction* (Sheldon, 1869), 20 object lessons are presented. Six of these lessons focus on common household items (for example forks, teapots, and thimbles). Three of the lessons "Distinguishing Objects by their Qualities," "Distinction between the Essential and Accidental Qualities of an Object," "Distinction between Generic and Specific Terms," and "Idea of Transparent, Semi-transparent, and translucent focus on skill

development or vocabulary. The remaining 21 object lessons utilize the following natural materials: apples, two on shells, grapes, two lessons on water, lead, adhesive gum and adhesives, two lessons on eggs, comparing apples and oranges, comparing cork and sponges, loaf sugar, spider webs, honeycombs, and palm trees, plants of the Cruciform tribe, flavors (sense of taste), sense of feeling, and comparing wine and water. Despite the view held by some that object teaching was a method and not a subject, the use of natural materials and giving them scientific names led many to consider the Oswego method as synonymous with elementary school science (Slavson & Speer, 1934). However, as Parker states, "In some places, there was a definite transition when a change was made from object teaching to elementary or natural science. The natural science was thought of as new subject matter, with which the old *object-lesson* method might be used" (Slavson & Speer, 1934, p. 18). Lessons in object teaching were used to teach geography (Krusi, 1875), acids and alkalines (Slavson & Speer, 1934), size (Phelps, 1908), and shells (Mayo, 1834). Object teaching's evolution into a method for science instruction is illustrated by book titles of different periods: an 1860's book by Sheldon, A *Manual of Elementary Instruction, for the use of Public and Private Schools and Normal Classes; Containing a Graduated Course of Object Lessons for Training the Sense and Developing the Faculties of Children,* and a 1899 book by Murche', *Object Lessons in Elementary Science and Geography Combined* (Underhill, 1939).

Object Teaching and Nature Study

One of the most significant movements in the history of elementary school science was nature study. Object teaching was the direct precursor to this movement and was the foundation for its evolution (Weller & Caldwell, 1933; Woodburn & Obourn, 1965; Rogers, 1961; Smith, 1963). In 1897 Hollis indicated that one of the five most important innovations at Oswego was "the great importance given to nature study" (p. 25). Krusi gives a description of object teaching that stresses the nature study goal of developing a love of nature. "The examination of natural objects, such as

minerals, plants, shells, and animals, not only serves to awaken the observation, but also God's works, and awakens a love for the study of nature in all her forms" (1875, p. 163).

Henry H. Straight took the chair of Natural Sciences at the Oswego Normal School in 1876. "At Oswego he brought about a change from the study of separate lifeless objects to the study of living things in their manifold relationships" (Weller & Caldwell, 1933, p. 731). To make up for a problem of object teaching, he used nature to correlate the subjects of study. To accomplish this study of nature, Straight lead his students on field excursions through woods, swamps, and lake shores (Weller & Caldwell, 1933).

A further link for object teaching and nature study is found in an 1890 report from a committee of the American Society of Naturalists. The committee summarized the main propositions of their recommendations for primary and grammar schools as follows:

> (1) Instruction in natural science should commence in the lowest grades of the primary schools and should continue throughout the curriculum. (2) In the lower grades the instruction should be chiefly by means of object lessons; and the aim should be to awaken and guide the curiosity of the child in regard to natural phenomena, rather than to present systematized bodies of facts and doctrines (from Johnson, 1977, p. 126).

McMurray and McMurray made the point that object teaching is best utilized in studying the natural world. "In nature science, therefore, more than any other study, we are forced to find the true method of object study (1899, p.10).

Nature study became very popular in elementary schools and was frequently written about in journals. A content analysis of primary school journals revealed that in 1895-1899, "nature study perhaps occupied as much attention as any other three subjects" (Davis, 1919, p. 59). By 1900, nature study had become the accepted term for elementary school science (Craig, 1957). Nature study continued to exert an influence, long after the term fell into disuse. "Nature study is practically 'out,' though much of

the material may be included in other areas of science" (Cremin, 1956).

From Nature Study to Elementary School Science

Previously, it was mentioned that object teaching evolved into elementary school science. For a large proportion of schools, this evolution progressed through the intermediary of nature study. For a time nature study was synonymous with elementary school science. Trafton in 1918 described some of confusion this caused: "There has been some confusion regarding the term to be used to cover the work in science in the elementary school. 'Nature-study' has been the word in most common useage" (p. vii).

For some, nature study was considered a preparation for more advanced science study. For example the Committee on Natural History of the Committee of Ten wrote:

> The study of both plants and animals should begin in the lowest grades, or even in Kindergarten. One object of such work is to train the children to get knowledge first hand. Experience shows that if these studies begin later in the course, after the habit of depending on authority- teachers and books- has been formed, the results are much less satisfactory. Experience shows, also, that if from the beginning, 'nature study' is closely correlated with or made the basis of language work, drawing, and other forms of expression, the best results are obtained in all. (National Education Association, 1893, p. 139)

Gerald T. Craig in 1927 as a dissertation at Teachers College, Columbia University, started developing a science curriculum for Horace Mann Elementary school. He kept many of the elements of nature study but he made it a more organized curriculum. Natural objects became supportive of the curriculum (Johnson, 1977). This curriculum, is recognized by many as being the first modern elementary school curriculum.

"The nature study movement did contribute to science education in the U.S. but did not survive in name at least in our public school system. It was replaced in the 1930s by elementary school science." (Fowler, 1977, p 90). Gradually elementary science education was expanded from object teaching and nature studies to include a greater amount of subject matter including physical science material. "The objectives for the

science program gradually broadened to include emphasis toward understanding big ideas in science and away from the accumulation of unrelated facts" (Blough, 1977).

Object Teaching and Methodologies of Science Education

It is evident that object lessons played an important role in the evolution of the elementary science curriculum. Object lessons also influenced science education methodologies at all levels of science instruction.

> Pestalozzi has been a silent partner in the development of school practice; the yeast has been gradually leavening the whole lump. Field excursions, nature study, demonstrations, the use of objective materials, and the emphasis upon sense experiences are all implications of the objective method which he taught. The Pestalozzian principle is very much more widely applied now than it was thirty years ago; and the end is not yet. (Finney, 1921, pp. 267-68)

Object Teaching and the Field Trip.

The field trip or excursion used in all levels of schooling resulted from object teaching (Hunter, 1934; Twiss, 1938). One of Pestalozzi's students described how they learned geography:

> The first elements of geography were taught us from the land itself. We were first taken to a narrow valley not far from Yverdon, where the river Buron runs. After taking a general view of the valley, we were made to examine the details, until we had obtained an exact and complete idea of it. We were then told to take some clay which lay in beds on one side of the valley. . . . On our return to the Castle . . . we reproduced in relief the valley we had just studied. (from Walch, 1952, p. 126)

Herman Krusi, Sr. an associate of Pestalozzi at Yverdon, used field excursions in teaching natural history and local field geography (Mossman, 1938). Joseph Neef who came to America with Pestalozzian ideas, taught nature and geography through field lessons (Mossman, 1938). Straight used field trips for studying nature in Oswego in 1876. Field work became popular in America during the 1880 to 1920 period (Fowler, 1977), which is when the nature study movement peaked. This is not surprising given that an important objective of nature study was to get students outdoors to appreciate nature. In high school biology there was an emphasis on collecting, identifying, and

describing plants (Fowler, 1977).

Mary Alling-Aber, an influential member of staff at Oswego wrote in 1897 that "Field lessons should be the beginning, and throughout, the foundation of lessons in science to children in all grades up to the high school" (p. 109).

The Committee of Ten was also influenced by the trend "one afternoon in every week should be used for out-of-door instruction in geography, botany, zoology, and geology" (National Education Association, 1893, p. 50). Field observation was regarded by experts as indispensable in geography and highly important in botany, zoology, and natural science (Twiss, 1938). Rillo (1980), considers Pestalozzi's methods to have had the greatest impact on outdoor education.

Object Teaching, Demonstrations, and the Science Laboratory.

In object teaching, the teacher would bring materials into class to help develop student skills in observing and thinking. It can, therefore, be argued that object teaching was an early form of the demonstration method. It was a natural development for the materials to pass from the teacher's hands into the students' hands.

Slavson and Speer in their 1934 book Science in the New Education describe many methods that were current practices. One of these is the object-study lesson where an object is presented to the pupil and the teacher describes it. A derivative of this method is the picture method in which a picture is used instead of the actual object. Slavson and Speer describe the observation method to be similar to the object-study method but now the students make their own observations. They go on to describe the lecture-demonstration method as combination of the lecture and object-study methods.

The object teaching movement was one of the polygenic influences on the development of school science laboratories. Slavson and Speer (1934) describe four historical phases of science education. The first period used the recitation method, and in the second the discussion method came into prominence. In both of these periods

the instruction can be described as verbal in nature. The third period used object teaching. The idea of child activity assumed a dominant place in educational thought, and in the fourth period the laboratory method began to be used.

The philosophy and ideas associated with the school science laboratory "seemed to combine well with the emphasis on object teaching as popularized by the Oswego Normal School." (Blosser, 1982, p. 6). The Oswego movement promoted ideas that encouraged students to be engaged in activity in order to learn. Statements such as "Activity is a law of childhood" and "Begin with the senses, and never tell a child what he can discover for himself," are at the heart of many science educators views of the purpose of school laboratories and hands-on activities. Sheldon (1869a) described six ways of giving a lesson on a plant. The sixth way was what Sheldon considered to be the correct method: "Specimens distributed—parts found out by the children, who frame a description, which is put on the board and committed to memory" (p. 14).

In America in 1880, hardly any school offered physical science with laboratory (Tamir, 1976). In 1882, the Bureau of Education of the Department of the interior issued a bulletin that contained the following statement supporting the value of experiments by giving the following indirect reference to object lessons:

> Instruction in natural science should be a training in thinking. Pupils should be led to form general ideas and laws from the objects of study and the phenomena presented to them, to draw conclusions upon the causes of such phenomena and predict the future action of the causes they have learned to know. In this way not only a knowledge but also an understanding of nature is reached (from Johnson, 1977 p. 121).

The subcommittee on Physics, Chemistry and Astronomy of the Committee of Ten resolved "that the study of simple natural phenomena be introduced into the elementary schools and that this study, so far as practicable, be pursued by means of experiments carried on by the pupil" (National Education Association, 1893, p. 118). The impact of object teaching on their thinking can be discerned by the following statement: "The study of books is well enough and undoubtedly important, but the

study of things and of phenomena by direct contact must not be neglected" (National Education Association, 1893, p. 119).

Downing (1934) in *An Introduction to the Teaching of Science, indicated* that the only point of object teaching was to have students do something other than memorize book learning. Yet he recognized object teaching's influence on science education. According to Downing, object teaching evolved into the observation method, which stressed purposeful observation. This evolved into the experimental method where students set up situations to make observations. Teachers took this over and through demonstrations they created situations for students to observe and analyze. Eventually the activity was returned to the students with the laboratory method.

Conclusion

The impact of Pestalozzian theory as embodied in object teaching was only significantly felt in America when teacher education institutions began teaching the spirit and techniques of this method. Oswego helped spread object teaching across America by utilizing preservice teacher education, inservice teacher education, a practice and a model school, and education of teacher educators. This enlightenment of education shifted the focus to the child and stressed activity and concrete experiences, rather than dull rote memorization. Elementary science education evolved from object teaching and methods of science instruction were influenced by the object teaching movement. Educational change may never again occur as swiftly nor as dramatically; however, the message is clear: Significant, meaningful change can occur in schools through teacher education.

References

Alling-Aber, M. R. (1897). An Experiment in Education. New York: Harper and Brothers.

Blosser, P. B. (1981). A Critical Review of the Role of the Laboratory in Science Teaching. Columbus, Ohio: ERIC Clearinghouse for Science, Mathematics, and Environmental Education.

Blough, G. O. (1977). Some reflections about elementary school science, in R. L. Steiner (Ed.), Science Education: Past or Prologue. Columbus, Ohio: ERIC Information Analysis Center for Science, Mathematics, and Environmental Education.

Craig, G. S. (1957) Elementary school science in the past century. The Science Teacher, 24 (1), 11-14.

Cremin, A. L. (1956). The problem of curriculum making: An Historical Perspective, in Mackenzie, G. N. (Ed.) What Shall the High Schools Teach? Washington, D.C.: Association for Supervision and Curriculum Development.

Croxton, W. C. (1937). Science in the Elementary School: Including an Activity Program. New York: Mcgraw-hill Book Co.

Culver, S. M. (1986). Pestalozzi's influence on manual training in nineteenth century Germany. Journal of Vocational and Technical Education. 2 (2), 37 -43.

Davis, S., E. (1919). Educational Periodicals During the Nineteenth Century. U.S. Department of the Interior: Government Printing Office. Reprint 1970. Metuchen, NJ: Scarecrow Reprint Corporation.

Dearborn, N. H. (1925). The Oswego Movement in American Education. New York: Teachers College, Columbia University.

DeBoer, G. E. (1991). A History of Ideas in Science Education. New York: Teachers College Press.

Downing, E. R. (1925). Teaching Science in the Schools. Chicago: The University of Chicago Press.

Downing, E. R. (1934) An Introduction to the Teaching of Science Chicago: The University of Chicago Press.

Elkind, D. (1987). Early Childhood Education. (ERIC Document Reproduction Services No. ED 326 311).

Finney, R. L. (1921). The American Public School. New York: The Macmillan Co.

Fowler, H. S. (1977). Some comments on the history of science education in the United States, in R. L. Steiner (Ed.), Science Education: Past or Prologue. Columbus, Ohio: ERIC Information Analysis Center for Science, Mathematics, and Environmental Education.

Gutek, G. L. (1968). Pestalozzi and Education. New York: Random House.

Gutek, G. L. (1978). Joseph Neef The Americanization of Pestalozzianism. Alabama: The University of Alabama Press.

Hirsch, E. D., Jr., Kett, J. F., & Trefil, J. (1988). The Dictionary of Cultural Literacy. Boston: Houghton Mifflin Co.

Hollis, A. P. (1898). The Contribution of The Oswego Normal School to Educational Progress in the United States. Boston: D.C. Heath and Co.

Hunter, G. W. (1934). Science Teaching at Junior and Senior High School Levels. New York: American Book Company.

Johnson, C. (1963). Old-Time Schools and School Books (Reprint of 1904 edition). New York: Dover Publications.

Johnson, P. G. (1977). Some revolutionary changes in science education: 1850 to 1950, in R. L. Steiner (Ed.), Science Education: Past or Prologue. Columbus, Ohio: ERIC Information Analysis Center for Science, Mathematics, and Environmental Education.

Kambly, P. E., & Suttle, J. E. (1963). Teaching Elementary School Science: Methods and Resources. New York: Ronald Press Company.

Kilpatrick, W. H. (1951). Introduction. In H. Pestalozzi, The Education of Man: Aphorisms. New York: Greenwood Press.

Krusi, H. (1875). Pestalozzi: His Life, Work, and Influence. Cincinnati: Wilson, Hinkle & Co.

Krusi, H. (1888). History of the normal school. In Oswego Alumni Association (Eds.), Original Sketches Relating to the First Quarter Century of the State Normal and Training School at Oswego, N.Y. (pp. 41-57). Oswego: R. J. Oliphant.

Mayo, E. (1834). Lessons on Shells as given in a Pestalozzian School. New York: Peter Hill and Co.

McMurray, C. A., & McMurray, L. B. (1899). Special Methods in Science for the First Four Grades of the Common School. Third Edition. Illinois: Public School Publishing Company. Bloomington.

Mossman, L. C. (1938). The Activity Concept an Interpretation. New York: Macmillan Co.

National Education Association. (1893). Report of the Committee of Ten of the Committee on Secondary School Studies. Washington, DC: US Government

Printing Office.

Oswego Board of Education. (1867). 13th and 14th Annual Report. Oswego: Commercial Times.

Parker, S. C. (1919). General Methods of Teaching in Elementary Schools. Boston: Ginn and Co.

Pestalozzi, J. H. (1951). The Education of Man: Aphorisms (With an Introduction by William H. Kilpatrick). Greenwood Press.

Phelps, W. F. (1906) Primary instruction by Object Lessons, in H. Barnard (Ed.) Pestalozzi and His Educational System (pp. 405-428) Syracuse: C.W. Bardeen.

Reisner, E. H. (1930). The Evolution of the Common School. New York: The Macmillan Company.

Rillero, P., & Rudolph, E. (1992, October). Science in American School Readers of the Nineteenth Century. Paper presented at the annual meeting of the Mid-Western Educational Research Association, Chicago (ERIC Document Reproduction Services No. ED 053 349).

Rillo, T. J. (1980). Outdoor Education — The Past is Prologue to the Future. Paper from the Annual Conference of the New York State Outdoor Education Association.

Rogers, D. (1961). Oswego: Fountainhead of Teacher Education. New York: Appleton-Century-Crofts, Inc.

Sheldon Barnes, M. , (Ed.). (1911). Autobiography of Edward Austin Sheldon. New York: Ies-Butler Company.

Sheldon, E. A. (1862). Oswego Training School, for Primary Teachers on Pestalozzian Principles. Unpublished Advertisement.

Sheldon, E. A. (1869a). A Manual of Elementary Instruction, for the use of Public and Private Schools and Normal Classes; Containing a Graduated Course of Object Lessons for Training the Sense and Developing the Faculties of Children. New York: Charles Scribner and Co.

Sheldon, E. A. (1869b). Lessons on Objects, Graduated Series; Designed for Children between the ages of Six and Fourteen Years; Containing, also, Information on Common Objects. New York: Charles Scribner & Co.

Sheldon, E. A. (1888). Address of welcome. In Oswego Alumni Association (Eds.), Original Sketches Relating to the First Quarter Century of the State Normal and Training School at Oswego, N.Y. (pp. 27-41). Oswego: R. J. Oliphant.

Slavson, S. R., & Speer, R. K. (1934). Science in the New Education as Applied to the Elementary School. New York: Prentice-Hall.

Smith, H. A. (1963). Educational research related tc science instruction for the elementary and junior high school: A review and commentary. Journal of Research in Science Teaching, 1 (3), 199-225.

Tamir, P. (1976). The Role of the Laboratory in Science Teaching. Iowa City: Iowa Univ. (ERIC Document Reproduction Services No. ED 135 606).

Tarr, P. (1989). Pestalozzian and Froebelian influences on contemporary elementary school art. Studies in Art Education. 30 (2), 115-112.

Trafton, G. H. (1918). The Teaching of Science in the Elementary School. Boston: Houghton Mifflin Company.

Twiss, G. R. (1938). A Textbook in the Principles of Science Teaching. New York: Macmillan Co.

Underhill, O. E. (1941). The Origins and Development of Elementary-School Science. Chicago: Scott, Foresman, and Company.

Walch, M. R. (1952). Pestalozzi and the Pestalozzian Theory of Education. Washington, D.C.: The Catholic University Press.

Weller, F., & Caldwell, O. W. (1933). The nature study and elementary science movement. School Science and Mathematics, 33 (7), 730-40.

Wilson, M. (1863). A Manual of Information and Suggestions for Object Lessons, in a Course of Elementary Instruction. New York: Harper and Brothers.

Withers, C. (1963). Introduction to Dover issue. In C. Johnson, Old-Time Schools and School Books (reprint of 1904 edition). New York: Dover Publications.

Woodburn, J. H., & E. S. Obourn. (1965). Teaching the Pursuit of Science. New York: Macmillan Company.