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Kirk Swortzel: kswortzel@ais.msstate.edu

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The Heritage of Elementary School Technology Education in the U.S.

Patrick N. Foster
Greenway High School

Abstract

Many of the current problems and opportunities of elementary-school technology (ESTE) have roots in the history of elementary-school industrial arts. In the US, industrial arts emerged during the progressive-education era as a convergence of two Western European educational movements. For several reasons, elementary school industrial arts was not able to achieve its promise during this era. In the 1960s and early 1970s, elementary school industrial arts once again became popular, but lack of agreement on a major issue whether industrial arts was a subject or a teaching method stalled progress in the field until the mid-1990s. Despite new interest in ESTE, the field has yet to reconcile issues that have divided technology educators for nearly a century. This paper serves a both a survey of the history of ESTE and a consideration of repeated patterns of historical impediments to its widespread implementation.

This historical survey is intended (a) to provide a chronological overview of the trends in general and industrial education which have led to modern elementary-school technology education (ESTE); (b) to demonstrate that at several points in its history, practitioners and theorists in ESTE and its precursors have influenced general industrial education, thus establishing the significance of ESTE in the history of industrial education in the United States; and (c) to suggest that problems in ESTE, such as its lack of a research base, its insufficient implementation in elementary schools, and the lack of consensus regarding its identity as a subject in its own right, have occurred previously at critical junctures in the past century. This paper also serves to fill a more basic need: no new survey of the history of ESTE has been available to the profession in twenty years.

At the outset of such a survey, the debate as to the philosophical forebears of technology education in the US should be acknowledged. One central issue is whether technology education was a direct descendant of industrial arts, or whether the two are only vaguely related. Pretzer (1997) opined that the rationale for technology education is "not just different from but fundamentally unrelated to earlier arguments for learning manual or industrial arts or industrial technologies" (p. 14). Similarly, Flowers (1998) questioned the value of teaching industrial arts history to prospective technology educators.

Volk (1996) also treated industrial arts separately from technology education, but suggested that "greater strength may exist in seeking common ground [and] not continuing policies of exclusion and fragmentation" (p. 36) between the two programs. It seems clear that whether or not technology education and industrial arts are philosophically similar, they are closely related historically. Thus they will be treated here as such.

Context

In the final years of the 20th century, educators at all levels continue to hear and heed calls for the improvement of nearly all aspects of education in the US, including school-to-work and vocationally-related initiatives ("Interview with Sandra Feldman," 1997). The literature indicates a need to increase not only achievement, but student motivation (Maselow, 1995) and engagement (Parnell, 1996) as well. At the elementary level, popular methods of addressing these problems include object-centered learning (Field, Labbo, Wilhelm & Garrett, 1996; Rule & Sunal, 1994), as well as "making connections between school and community," or "real-life learning" (Morehouse, 1995, p. 57). In a recent study, general elementary teachers reported making real-world connections in their classrooms more often than any other group of teachers including vocational educators ("Teachers at Work," 1997). A high value is still placed on academics, but many educational writers agree that students should learn important academic concepts in practical settings (e.g., Gloeckner & Adamson, 1996) so that they can more readily apply this learning later. Calls for reform also prescribe practical and reality-based assessment (Borthwick, 1995; Custer, 1994).

Many of these recommendations made for education in general increased student motivation and engagement, hands-on learning, community and career awareness, applied academics, and the like have been claimed as outcomes of ESTE throughout the present century. These outcomes arguably position ESTE as more critical than ever to education in the U.S.

ESTE has experienced a resurgence in interest since the beginning of the 1990s. Increased attention to ESTE in technology education literature and at technology education conferences has been both substantial and steady. Technology educators are beginning to recognize the potential ESTE has in delivering on the promise of educational trends such as constructivism (see, e.g., Järvinen, 1998) and science-technology-society integration.

Meanwhile, ESTE is succeeding abroad. Technology education in some form is compulsory for elementary-aged children in such countries as the UK (Karwatka, 1994), Australia, Sweden and the Czech Republic (Dugger, 1995).

The Origins of Industrial Arts in the US

The educational program now known as *technology education* in the US had generally been referred to as *industrial arts* from the depression era until the mid-1980s. Prior to the early 20th century, several programs of manual and industrial education were popular. Prominent educational philosophers such as Dewey saw value in such programs as manual arts and manual training, but felt that these programs lacked the cultural or social base which would recommend their inclusion in general education. Because many students at the time did not progress beyond the 8th grade, many proposals to improve industrial education focused on elementary education.

As a general-education subject, industrial arts had its start at Teachers College, Columbia University (Towers, Lux & Ray, 1966; cf. Zuga, 1994). It was intended as a cultural, progressive recasting of the existing manual subjects. Teachers College is generally recognized for popularizing the term *industrial arts* as a replacement for *manual arts* (cf. Snyder, 1992). Its faculty and graduate students were responsible for the "first and only" (Brown, 1977, p. 2) definition of *industrial arts*, written by Teachers College staffers Bonser and Mossman (1923), as well as the *social-industrial theory* of industrial arts (Snedden & Warner, 1927). Even as late as the 1970s, the precepts underlying the Bonser and Mossman definition were considered to be the "basis of our present day philosophy" (ACESIA, 1971, p. 50) of elementary-school industrial arts.

Before the 20th Century

Hostetter (1974) argued that the precursors of elementary-school industrial arts in the US came from around the globe from the early Egyptians, the Babylonians, from the peoples of Asia, and from the ancient Greeks and Romans. According to Hostetter, nineteenth-century influences also came from abroad. Examples included handwork and crafts programs from England, children s technical education in post-Revolutionary France, and the Scandinavian Sloyd system. Apparently, the philosophies of the Sloyd system and the Russian manual-training emphasis were already present in the Boston and New York elementary schools by the 1880s (Swierkos & Morse, 1973).

Anderson (1926) discussed the key international figures influencing industrial arts in the US:

A still later development of this stage of the development of this conception of industrial education is represented in a work by Professors F.G. Bonser and L.C. Mossman of Teachers College entitled *Industrial Arts for Elementary Schools*. In this recent move in the field of cultural industrial education history is repeating itself. As reference to the preceding pages will show, the objective study of the industries which it proposes was advocated by Rabelais in the sixteenth, by Comenius in the seventeenth, and by Basedow in the eighteenth century. (p. 223-224)

Anderson s inclusion of Rabelais as among the first to advocate cultural industrial education is based on Rabelais educational interest in "the industrial occupations as well as in the other features of the everyday life around him" (p. 8). "Rabelais saw the advantage of approaching the abstract and remote through the concrete and the near at hand" (Bennett, 1926, p. 32). Graves (1910) recognized Rabelais (1495-1553) influence upon later theorists, including Rousseau.

Comenius (1592-1671) is regarded as one of the most important figures in European education during the seventeenth century. He advocated education that was at once practical, objective, and cultural. Comenius is also regarded as a primary influence upon the German theorist Basedow (1723-1790). Basedow s model school emphasized handicrafts for all students in a curriculum intended to "give some account of man" (Anderson, 1926, p. 29). Thus the lineage preceding Bonser and Mossman clearly extends back hundreds of years.

Confounding Issues

In many histories of industrial arts, the progression of the educational ideal of cultural industrial education, exemplified by the works of Basedow, Comenius, and others, is presented simultaneously with the concurrent history of tool instruction and its historical figures such as Della Vos and Runkle (e.g., Anderson, 1926, p. 155; Nelson, 1981). Yet these movements were quite distinct..

Hostetter (1974) identified Bacon, Comenius, Locke, Rousseau, Pestalozzi, and Froebel (p. 213-215) as leading western educational philosophers who influenced elementary-school industrial arts in the U.S. Miller (1979) added Kant, Hegel, and Herbart to this list. Kirkwood (1994) mentioned most of these names, but also emphasized Sheldon s role in implementing Herbart s ideas in the U.S.

Gerbracht and Babcock (1969) also underscored Sheldon s importance in popularizing "Pestalozzian methods" in the US, as well as his significance in the history of elementary school industrial arts in the US. Interestingly, certain writers seem to be much more likely to credit Sheldon and others regarded as *implementers* of ideas (rather than *creators* of ideas, such as Pestalozzi) with influence in the forming of elementary-school industrial arts in the US. Often it is these same writers (e.g. Kirkwood, 1968; Kirkwood & South, 1973) and Gerbracht and Babcock are good examples who view elementary school industrial arts or technology education as a *method of teaching* rather than as a distinct school subject.

At least three distinct conceptions of industrial education are often confounded and presented as the early history of the field. One such program was *manual training*. Manual training programs for children and young adults primarily consisted of tool instruction, although programs such as Woodward s had cultural dimensions (see Zuga, 1980, for a treatment of this program). Secondly, *object teaching* (Mossman, 1924), a movement formalized by Pestalozzi, emphasized the value of manipulative activities in teaching children, and was thus quite different than manual training. Finally, *manual arts* (Griffith, 1920), sought to provide social or cultural education to children via industrial experiences.

Industrial Education Context of the Industrial Arts Movement

Distinguishing among the terms *industrial arts*, *manual training*, and *manual arts*, Bennett (1937) explained that "in the term industrial arts, the industrial is emphasized; while, in manual arts, the arts is historically the distinctive word and, in the term manual training, manual is the important word" (p. 455).

To Russell, Dean of Teachers College, manual training in practice was rarely more than a series of disjointed projects serving little cultural purpose severally or as a program. The following is a frequently cited explication of his opinion.

Woolly sheep have sported with polar bears under fir trees set in a desert of sand. Book-binding and block houses, Indian war bonnets and water wheels, ink wells and Navajo blankets, bent iron jimcracks and raffia baskets, bookshelves and dolls clothes, broom holders and picture frames all these and a thousand more mixed up in indiscernible confusion! Is it any wonder that some one should raise the cry of fads and frills? The wonder is that any one should try to justify such work in school on any ground other than mere recreation. (in Russell & Bonser, 1914, p. 4)

Teachers College faculty members Bonser and Mossman (1923) were still using the term "manual training" to identify the prevailing interpretation of industrial education in the 1920s. In *Industrial Arts for Elementary Schools* they drew a sharp distinction between manual training and their program of industrial arts, which could generally be considered an attempt at reconciling cultural industrial education and object teaching.

According to industrial education historian Bennett (1937), Bonser s first contribution in applying Dewey s philosophy was a 1913 paper in which he "expanded the conception of industrial arts in the elementary school." Bonser considered industrial arts to be "both a subject and a method an end and a means" (p. 453). To Kirkwood (1994), Bonser and Mossman were "clearly prescient" of trends which would later gain popularity in general education (p. 78). These trends included the integration of school subjects, cultural literacy, and project-based learning. Although Kirkwood noted the relationship between the ideas of Dewey and the writings of Bonser and Mossman, he also emphasized the connection between these writings and the work of Herbart, who perhaps influenced Mossman more than he did Bonser.

The Influence of Bonser and Mossman

Just as current technology-education curricula are composed of content organizers such as manufacturing, communication, and the like, Lois Coffey Mossman s organization of the study of industry included several content areas. But hers were a bit different: foods, clothing, shelter, records of human experiences, containers, and tools and machines (Mossman, 1938; Bonser & Mossman, 1923).

It is clear from her earlier work that Mossman regarded industrial arts to be a distinct curricular area in the public schools (Coffey, 1909a, 1909b; Mossman, 1921). But ultimately, she did not regard any arrangement of practical subjects as a separate part of the curriculum, instead including studies of industry as a part of the social studies (Mossman, 1929b, 1938). In fact, she eventually ceased using the term "industrial arts" altogether (see Mossman, 1927, 1929a). It bears mention that in her major book concerning the elementary school curriculum, Mossman (1938) included all industrial arts content in the social studies curriculum.

She specified that much elementary-school subject matter was best learned through constructive activities. Although she believed that "genuine participation in the processes of making the products may develop respect for work and for man s inventive achievement" (1938, p. 60), she cautioned that construction should not be used when more efficient methods were available (Mossman, 1927).

Frederick Gordon Bonser (1875-1931) served as professor of education at the State Normal School in Cheney, Washington (Mossman, 1931) and professor of education and director of the training school at Western Illinois State Normal School (Luetkemeyer & McPherson, 1975). It was at Western Illinois that he met Mossman and began his work in industrial arts education. In 1910 they both moved to Teachers College.

In *Industrial Arts for Elementary Schools*, Bonser and Mossman asked, "is there not also a body of experience and knowledge relative to the industrial arts which is of common value to all, regardless of sex or occupation?" (1923, p. 20). While many have cited this passage as evidence that Bonser and Mossman regarded industrial arts as a subject matter, it also demonstrates their belief that human industriousness, be it traditionally female (cooking, sewing) or male (woodwork, drafting), should be experienced by all students, "regardless of sex." Secondly, they positioned industrial arts as *general* education for elementary students, noting that it is appropriate for all, "regardless of occupation."

"Because of its very extensive relationships," they wrote, "industrial arts, of all subjects is not a special subject in the sense of being unrelated to other subjects, but, quite the contrary, it is rather *the most general subject of all* in its far-reaching relationships" (Bonser and Mossman, 1923, p. 74; emphasis added). They viewed industrial arts as ideally being completely integrated with the rest of the school curriculum. Seventy-five years later, these are tenets of technology education at all levels.

Bonser and Mossman were also influential in developing the multiple-activities method of teaching industrial arts (Luetkemeyer & McPherson, 1975), popularized before World War II first as the *general shop* approach, and later as the *exploratorium* approach of the 1970s. This method also foreshadowed elementary activity centers popular today. Bonser, probably with Mossman, organized a room in which students experienced activities in shopwork, drawing, and home economics. It seems clear, however, that Bonser and Mossman were more interested in connections with regular school subjects than in imparting tool skills to students (see Coffey, 1909b). They believed that "the social and liberal elements in the study of the industrial arts are more significant than are the elements involved in the mere manipulation of materials" (Bonser, 1910, p. 28).

William E. Warner, a student of Bonser s, later popularized the general shop in secondary industrial arts (Gemmill, 1989). The term *general shop* is still used to describe the curricula of some middle-school and high-school industrial education programs in the U.S.

After Bonser and Mossman

Beginning about 1930 there seemed to be a revival of interests in constructional activities as a method of teaching in the elementary school. The constructional activity subject-matter specialist suggested that the use of constructional activity as a method of teaching was not enough to fulfill all the purposes these activities should serve in the elementary school. (Bicknell, 1942, p. 95)

Origins of the Subject vs. Method Debate

As the influence of Bonser and Mossman s work began to be felt, an essential argument emerged: was elementary-school industrial arts primarily a school subject, or was it a method of teaching other elementary-school subjects? In the 1970s, when this debate became heated, some writers noted that Bonser and Mossman favored *both* views. Bonser, who died in 1931, may not have had the chance to address the debate. Mossman later made it clear that she favored the method view, recommending that industrial subject matter be included in the elementary curriculum as part of social studies, which at the time was an emerging school subject.

In a 1927 *School and Society* article, Bonser stated his opinion of the place of industrial arts content in the school curriculum:

The social studies *Trivium* history, geography, and civics should expand itself into a *Quadrivium* by adding industrial arts as a representative of the basic social activities, more vital to immediate social participation than many of the questions of the other three fields or of any fusion of them into one. (Bonser, 1927b, p. 679)

Bonser, like Mossman, favored an active, progressive, project-oriented classroom. Although he specifically advised against making industrial arts the core of the elementary curriculum (Bonser, 1927a), he identified exactly the same qualities in good classroom projects as he did in ideal objectives for industrial arts.

Selvidge also saw elementary-school industrial arts as being "predominantly" a *method of teaching* intended for "the development of attitudes and interests" (Bicknell, 1942, p. 98). Selvidge s opinion is significant because of his influence on the philosophy of industrial arts at the University of Missouri Columbia, which would produce dozens of elementary-school industrial arts studies in the coming decades. Bonser's protégé Warner, now at the rival Ohio State University and a dominant national figure in industrial arts, did not disagree with this view, but tended to emphasize the role of industrial arts in the elementary school as a *subject matter*.

In a well-known Ohio State publication, Towers, Lux and Ray (1966) noted that "Bonser spelled out the major subdivisions of content, such as the activities to provide food, clothing, and shelter, but he did not develop a complete subject matter structure" (p. 106). The authors credited Warner with continuing the Bonser and Mossman tradition. Petrina and Volk (1995) provided a different view, suggesting that the profession generally, and Warner specifically, missed the opportunity to implement industrial arts as proposed by Bonser and Mossman. Warner clearly regarded the Bonser-Mossman-Russell interpretation as his prime influence (e.g

Warner, 1928), but he "disregarded much of their vision" (Petrina & Volk, 1995) including the social-industrial conception.

Several other writers have implied that a lack of a subject-matter structure hindered complete acceptance of Bonser and Mossman s work. Yet those who favored a subject-matter view of elementary-school industrial arts (e.g., Hoots, 1974) still sought to reconcile the subject-matter view with the writings of Bonser and Mossman.

Although some felt that the ideas in the Bonser-Mossman book were "somewhat difficult to follow and somewhat difficult to implement" (Hoots, 1974, p. 227), others at Teachers College explicated these ideas more clearly in books written for the practitioner. The same year that the Bonser and Mossman book was published, Jane Welling and Charlotte Calkins published *Social and Industrial Studies for the Elementary Grades* (1923), which provided practical examples of implementing Bonser and Mossman s work. Clara Stilmar (1912), Alice Krackowizer (1919), and Margaret Wells (1921), all of Teachers College, produced similarly practical elementary-school industrial arts books in the years preceding the publication of the Bonser and Mossman book.

While most of the publications related to elementary-school industrial arts in the 1920s and 1930s were practice-oriented, at least one Teachers College study employed empirical methods. Theresa Gunther s (1931) research substantiated Bonser and Mossman s claims that to be effective, industrial arts should be manipulative. Gunther s study notwithstanding, Bicknell noted in 1942 that

studies have been made of certain practices followed in the elementary school, which reveal that constructional activities have been carried on as a part of the elementary school program. However, none of these studies has dealt with constructional activities as they actually function in the complete program of the elementary school today. (p. 27)

In fact, there appears to have been very little literature published about elementary-school industrial arts from the mid-1930s until the 1960s. "Following the work of Bonser and Mossman in the first quarter of the 20th century, the absence of citations in the professional literature indicates that there were no substantial new developments in elementary school industrial arts" until the early 1960s (Miller, 1979, p. 50-51). As further evidence of an apparent lack of interest during these years, Hostetter (1974) noted that "for many years prior to 1958 there was no effort made to coordinate the existing (elementary-school industrial arts) programs" (p. 219).

Formation of ACESIA

Bruce (1964) found that in the early 1960s, more than 140 colleges and universities in the U.S. offered courses in elementary-school industrial arts. It was only a matter of time before an organization was formed to represent this area of industrial arts. The American Council for Elementary School Industrial Arts (ACESIA) was founded in 1962 as a council of the American Industrial Arts Association.

Miller (1979) specified that Mary-Margaret Scobey and Elizabeth Hunt, both known for their work outside of industrial arts, were most responsible for the formation and early success of ACESIA. He also cited the importance of Hoots (1971) publication *Industrial Arts in the Elementary School: Education for a Changing Society*, which was a report of the 1969 National Conference on Elementary School Industrial Arts. The conference, apparently the only one of its kind ever to be held in the US, was funded by the U.S. Office of Education.

Hunt (e.g., 1963), the first president of ACESIA, noted that neither tradition nor conjecture was sufficient in making a case for industrial arts in the elementary curriculum. She argued that research was needed to inform practice. Apparently, Bicknell s call for further research, issued during World War II, had gone unheeded.

Downs (1968) echoed the need for research, noting that many professional articles argued in favor of industrial arts in elementary schools, but that "research evidence is lacking to substantiate the argument for the inclusion of a constructional activities approach in the elementary curriculum" (Downs, 1968, p. 29). Thirty years later, the dilemma remains (Zuga, 1996, 1997).

Elementary-School Industrial Arts in the Late 20th Century

The relative success of elementary-school industrial arts throughout the twentieth century seems to have been closely related to the degree to which it was associated with popular programs in general education. For example, industrial arts fit well with the activity movement of the 1920s and 1930s. The activity movement was part of the larger program of progressive education. When progressive education fell out of favor before World War II, the field of industrial arts seems to have lost some of its interest in its elementary-school program.

In the 1960s and 1970s, career education, a popular general-education program, provided a vehicle for elementary-school industrial arts to realize a resurgence in popularity in the industrial arts profession. Career education did not begin as a part of industrial arts, but former U.S. Commissioner of Education Sidney Marland, who is often identified as having initiated the career-education movement of the 1970s, credited industrial-arts pioneers Russell and Dewey with many of the ideas underlying career education (O Bannon, 1975).

Indeed, during the 1970s, "the most significant shift in elementary school industrial arts resulted from an increased emphasis on career education" (Miller, 1979, p. 54). Miller (1979) predicted that the trend would continue. He also predicted that the emphasis on technologicalliteracy would spur efforts in elementary school industrial arts later in the 20th century. Probably due to the formation of ACESIA and the popularity of career education, elementary programs began to garner attention in the industrial-arts press in the late 1960s and early 1970s.

Leeper (1978) suggested that two programs initiated after the formation of ACESIA especially embodied the philosophy of "Bonser and others" (p. 18): *Technology for Children* the *Technological Exploratorium K-6*. The Technological Exploratorium (Heasley, n.d.) was an early-1970s project in the Hudson, Ohio schools. Elementary students learned about technology and its three areas: communication, manufacturing, and transportation. This project, which was coordinated with the elementary curriculum, garnered significant national attention, but does not appear to have been directly influential beyond the schools in which it was implemented.

The Technology for Children (T4C) program (e.g., Dreves, 1975) was also nationally recognized, garnering frequent citations in professional publications. Developed at Rutgers University for the State of New Jersey s Department of Education, T4C was a concerted program of technological and career-related activities. Ultimately, though, Dreves (1975) wrote, T4C was an "organized approach to provide children with individualized experiential learning and opportunities to develop interests and self awareness" (p. 1). Dreves went on to note that the T4C program implied the thorough integration of the elementary curriculum.

According to Elliot (1971), the T4C program "borrow[ed] heavily from the British Infant School, and from the problem-solving, hands-on approaches to learning" (p. 64). The T4C program was considered in part to be a vehicle for elementary-school career education. Three separate studies were conducted in the late 1970s to determine the program s success in improving career maturity, but they were generally inconclusive (Zuga, 1997).

Resurfacing of the Subject vs. Method Debate

In Bruce s 1964 study of 141 college-level elementary-school industrial arts courses, 130 were found to use Gerbracht and Babcock s 1959 book, *Industrial Arts for Grades K-6* (revised in 1969), as a text or reference. The book was specifically used as a text in 56 of these courses, making it clearly the most popular text of the time. All other books used as texts in more than 10 courses were either crafts or handwork books. Although it was then over 40 years old, Bonser and Mossman s *Industrial Arts for Elementary Schools*, was used as a text in four courses, and cited as a reference in 86 others.

Gerbracht and Babcock made it clear that they favored the method view of industrial arts, while many of the leaders of ACESIA, Scobey (e.g., 1968) perhaps chief among them, seem to have favored the subject-matter position. Gerbracht and Babcock (1969) identified eight "contributions of industrial arts to elementary education" (p. 14), none of which related to industrial-arts subject matter. Industrial arts, they said, made contributions to elementary education in the areas of intellectual development, individual differences among students, socialization, occupational awareness, satisfaction in school, motivation, cultural literacy, and basic skills in language and mathematics, as well as manual skills. Gerbracht and Babcock clearly considered Bonser and Mossman to be among their philosophical influences.

Hoots (1974) argued that proponents of the method view could not rightfully lay claim to the true heritage of Bonser and Mossman. He wrote that in the elementary-school industrial arts field, sometime after Bonser s death, "there was a transition toward an arts and crafts and/or handicrafts approach. It is probable that this approach, as well as the method of teaching approach, stemmed from an out-of-context application of the Bonser philosophy" (Hoots, 1974, p. 234). In describing the method view, Hoots (1974) made reference exclusively to Gerbracht and Babcock s 1969 book.

In the late 1960s and early 1970s, elementary-school industrial arts appeared to be growing in popularity, having been established in at least 42 US states (Pinelli & West, 1973). But in 1974, Ingram and Pace were only able to identify 80 colleges or universities offering elementary-school industrial arts courses, far fewer than the 141 Bruce had found ten years earlier. Ingram and Pace used different methodology than Bruce did, so a direct comparison of the two studies is not appropriate. Nonetheless, by the mid-1970s, fewer and fewer teacher-preparation institutions were offering elementary-school industrial arts courses. By the mid-1990s, very few universities offered industrial education courses for elementary-education majors.

The Move toward Technology Education

From the mid-1970s until the early 1990s, industrial education at the elementary level drew comparably little attention in the industrial arts literature. This may have been due to several reasons, including the demise of career education, leadership changes in ACESIA, the elimination of many elementary-school industrial arts classes at universities and colleges across the US, and the preoccupation of the industrial arts field with changing its name to *technology education*. In 1987, ACESIA became the Technology Education for Children Council.

Paul W. DeVore and Donald P. Lauda (e.g., 1976) are often regarded as having spearheaded the move to rechristen the general industrial arts profession as *technology education*. Lauda (e.g., 1969), DeVore, and others were using rationales for technology education in the 1960s and 1970s that were very similar to those of Russell, Bonser, and Mossman during the 1910s and 1920s. These rationales were essentially based on the assumption that a technological (or industrial) society demanded social technological education.

Status of ESTE in the United States

The emphasis on mathematics and science in technology education during the 1980s and 1990s may have caused the newly renamed *technology education* field to view technology teachers as the providers of highly technical information to students information, perhaps, too technical for elementary-school children. This view replaced an older (but similar) one in which industrial arts emphasized tool skills that were regarded as too difficult for elementary students. For whatever reason, technology education is virtually nonexistent in elementary schools in the U.S., although many believe that the field should "become more proactive at the elementary school" level (Salinger, 1994, p. 7).

Current Theories of Elementary-School Technology Education

At least three distinct perspectives of ESTE are evident from the literature. Although the views are not mutually exclusive, each seems to be the result of a different philosophy of technology education.

Technology education as content. Proponents of the *content* view see ESTE primarily as providing students with knowledge about technology. To them, technology is an "academic discipline" (e.g., R.T. Wright, 1996, p. 2). The National Science Foundation and the National Aeronautics and Space Administration recently awarded over $1 million for the establishment of the *Technology For All Americans* project, whose members are developing standards for K-12 technology education in the U.S. These standards are predicated on the view that technology education is a school subject with "quantifiable and universal" content (Dugger, 1997, p. 11; the elementary-education components of the project are discussed in Singletary and Altice, 1997).

The content view is clear in many historically influential ESTE texts intended for pre-service elementary classroom teachers, most notably *Industrial Arts for Elementary Schools* (Bonser & Mossman, 1923) and *Teaching Children About Technology* (Scobey, 1968). Recent advocates of the content view include Dugger(1997), Kieft (1988), and others.

Technology education as process. Another view regards ESTE as a process or skill to be taught to children, and which has attendant content related to replicating the process. In this view, ESTE is often referred to as "children s engineering" (Dunn & Larson, 1990, p. 37) or *design technology* (see Hill, 1994). Design technology "is about identifying needs, generating ideas, planning and creating, testing, and finding the best solutions" (Ackerman, Etchison, Lydic, & Spiro, 1997, p. 7). Thus it differs from the *content* view insofar as it focuses more on technological capabilities than on knowledge. Todd and Hutchinson (1991) differentiated the process view from the content view when they described design technology a "new paradigm" for education (p. 4).

Technology education as method. The *method* view of ESTE "begins with three things in mind. The first and certainly the most important is the child, the second is the elementary school curriculum, and the third is an appropriate technology activity" (Kirkwood, 1992, p. 30). Here, the content is drawn from the existing elementary curriculum, not from a curriculum of technological content. Historically, this view has been championed by Gerbracht and Babcock (1969) and other university-level textbook authors.

In a recent interview (Bottrill, 1996), Colleen Stone, a district technology education coordinator, discussed the instruction in technology teaching which she received from Delaware state education specialists. "From the very beginning, technology education was introduced to us as an integrator of the curriculum" (p. 14). When working with teachers in her district, Stone emphasizes employing technology education as a means of delivering the curriculum. The *method* view regards ESTE as a vehicle teachers may use to help children achieve educational objectives.

Elementary-School Technology Education in Practice in the U.S.

Although a series of distinct philosophies of ESTE is evident in the literature, it is unlikely that many ESTE programs reflect one view exclusively. Bottrill (1997), for example, regarded "activities as an area of technology education" (p. 3) but not the only area. In practice, decisions about how and when to implement ESTE in the classroom are "typically grounded in curriculum requirements, students academic, social, and emotional development" and other considerations (Knobloch, 1996, p. 10; see also Welty, 1997).

Remaining Challenges

The debate as to whether elementary-school technology education should be viewed as a subject or method may be academic, but it has likely limited the implementation of ESTE in the US over the past three-quarters of a century. Clearly, the debate has stymied cooperation among differing scholars. This problem dates back at least to Warner and Selvidge in the post-World-War-II period, and is exemplified in Hoots writings in the early 1970s as well as in divided participation in the Technology Education for Children Council and the International Technology Education Association throughout the 1990s. If there is any truth to prevailing stereotypes about college professors and elementary-school teachers, this debate may also be silently widening the gap between theorists (who may tend to focus on the importance of technical content and may overestimate teachers technical knowledge) and practitioners (who are likely to practice the "method" philosophy). Well-meaning curriculum writers seem to be producing materials that are of limited use to teachers. Interestingly, it is exactly this increased production of ESTE materials, which is sometimes cited to demonstrate increased implementation of ESTE.

Current trends in elementary education imply that public education in the US may finally be ready for true implementation of ESTE. In the past, trends favorable to ESTE included progressive education, the open concept, and career education. Today s constructivism and comprehensive school-to-work initiatives could well be delivered with the use of ESTE. To take advantage of present opportunities, leaders in technology education may have to compromise, conceding the content issue.

There is some hope that the content method debate may soon be transcended. (Welty 1997; cf. M. Wright, 1996) has conceptualized a modern system of views of ESTE. He has proposed that elementary educators see ESTE as some combination not only of content and method, but as context and process as well. This step beyond the black-and-white content-method debate may allow proponents of the ESTE-as-content view to reconcile their differences with method proponents by regarding the *processes* of technology (e.g., design, material manipulation, etc.) as the *content* of technology education, at least for young children. Viewing ESTE as a context or process is especially prominent in design and technology (Raizen, Sellwood, Todd, & Vickers, 1995), and may for once permit the field to move beyond the stifling content-method debate. With its professional house in order, the time may be right for ESTE to receive a full hearing from the educational community.

Final Thoughts

Using teacher preparation figures as a measure, technology education in the US has been in decline for years (Volk, 1993, 1997). At the same time, conference sessions and published literature (e.g. Gober, 1998) suggest that professionals in the field still believe strongly that all students should receive technology education from Kindergarten through twelfth grade. And they believe in the importance of the content they teach. By these measures, the field may still have the opportunity to deliver technology education to every student.

The first step may be to recognize a few lessons from history. Educational trends come and go, and implementation of ESTE during a friendly trend may not guarantee its retention when that trend falls out of favor. Secondly, internal rivalries and academic debates in the technology education field have historically not aided in generating positive interest in ESTE from the larger educational community.

Finally, history suggests that the content-method debate must be openly addressed if ESTE professionals are to effect true ESTE implementation in US public schools. Contemporary literature contains plausible alternatives to the content-method dichotomy. Perhaps the field should investigate these possibilities and then move on to realize its promise in improving the education and lives of all children.

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