Articles

Curriculum Consonance and Dissonance in Technology Education Classrooms

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Introduction

In a time of increased accountability, a tightened curriculum, and fewer curricular choices for students, technology education in the United States is in the position of defending itself by "carving a niche" (Meade, 2004, p. 24) in the school curriculum. Justifying the place of technology education is becoming increasingly difficult, as there has been little agreement in either policy or practice over the definition and function of technology education. Within the past several decades, the International Technology Education Association (ITEA) has taken on the task of defining the nature of technology education and has created a series of standards, benchmarks, and curriculum documents that are focused on that goal. As Thornton (1988) noted, however, "curriculum decisions are ineffective unless they affect what teachers do in classrooms and what students learn" (p. 308).

The problem addressed in this study is determining whether the new "official" definition and purpose for technology education has had any effect on technology education classrooms. The concern, and the focus of this study, is that technology education as defined by ITEA might not be what is currently taught by teachers and experienced by students. A gap between the field's conception of technology education and what is actually being taught in the classrooms would not be unusual, as similar disparities were found in math, biology, and physics nearly a decade after new curricula had been introduced in each of those areas (Cuban, 1993).

The purpose of this study was to determine if inconsistencies exist between the field's view of technology education and the events that take place in the technology education classrooms by examining the relationships among the

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field's teachers' and students' ideas regarding the nature and outcomes of technology education. This was designed to help bridge a gap in technology education research. Over the years, research in technology education has examined the nature of the technology education curriculum and student outcomes associated with taking technology education courses from the perspective of experts in the field of technology education. Several recent studies have examined the curriculum and outcomes of technology education from either the teachers' or students' perspectives (see Boser, Palmer, & Daugherty, 1998; Foster & Wright, 2001; Taylor, 2006; Volk, Yip, & Lo, 2003; Weber & Custer, 2005). However, very little research has been located that compared both perspectives (see McLaren, 2006).

This study will begin to fill the gap created by the lack of teacher and student voices in technology education literature regarding the nature and outcomes of technology education courses and programs, helping to create a more complete picture of how technology education curricula are utilized by teachers and experienced by students.

Methodology

This study employs the qualitative inquiry method of a collective case study (Merriam, 1992; Stake, 2003). The case study approach was used in an effort to, as Merriam (1992) suggests, "gain an in-depth understanding of the situation and meaning for those involved" (p. 19). A collective case study was designed in which multiple sites were used to "investigate the phenomenon" with the belief that it may lead to a "better understanding of a larger collection of cases" (Stake, 2003, p. 138). Three cases were used because it was believed that combining the cases would lead to a better understanding of the curriculum consonance or dissonance that is present in technology education classrooms.

Settings and Participants

Three Indiana high school technology education classrooms were selected to include "variety across the attribute" (Stake, 2003, p. 153). The schools were purposefully selected to include a range of small to large schools in rural to urban settings, within a specific region (within 50 miles of Indianapolis). The cases were also chosen to include teachers of both genders and different levels of experience. Southern Glen High School was selected first, as it was one of few schools in the region with a female technology education teacher. Southern Glen is a mid-sized school (1,000 students) in a rural setting. Ms. Marshall, the technology teacher, has 23 years of teaching experience. The other two schools were then selected using the Indiana Department of Education website to locate a small and a large school with a male teacher early in their career and one in the middle of their career. A list of teachers and schools was generated and the first teachers on the list, Mr. Theriot and Mr. O'Malley, were contacted and agreed to participate in the study. A profile of the schools and teachers can be seen in Table 1. All school, teacher, and student names in this study are pseudonyms.

Table 1
School Profiles

School	Teacher	Teacher Experience	School Enroll-ment	Depart-ment Size	Curriculum
Three Rivers High School	Mr. Theriot	3 years, as a technology teacher	550	1 technology teacher	Traditional technology education
Southern Glen High School	Ms. Marshall	23 years	1000	2 technology teachers	Traditional technology education and Project Lead the Way
North Side High School	Mr. O'Malley	9 years	1500	3 technology teachers	Project Lead the Way

Conceptual Framework and Research Questions

In order to examine the curricula that existed in technology education classrooms and to compare them to an official curriculum, it was determined that it would be beneficial to focus on specific phases, or types, of curricula. Myriad labels are used to represent a stage of either planning or teaching that occurs along a continuum that begins with a national or district-level set of objectives or standards and concludes in the mind of the students. Throughout this continuum, "transformations occur as curriculum meanings are modified or contested by teachers and students in the context of their own beliefs, experiences, and communities" (Werner, 1991, p. 114). The curriculum continuum was examined in this study through the use of Thornton's (1985) concept of curriculum consonance, which he defined as the "relationships between the intended, the actualized, and the experienced curricula" (p. 9). This notion of examining the curriculum that the teacher intends to teach, the curriculum that is actually taught, and the curriculum that is experienced by students supplied an effective framework for use in examining the nature, aims, and outcomes of the technology education curriculum at various levels within the classroom. However, the relationship between the field's conception of the curriculum and the classroom curriculum was absent from Thornton's concept of curriculum consonance. This study adds the *official curriculum* as a factor in the relationship between the curriculum that exists in the classroom and the one that exists in the teacher's mind.

The research questions were:

1. What is the official technology education curriculum?
2. What are the intended, implemented, and experienced curricula in technology education classrooms?
3. How are the official, intended, implemented, and experienced curricula related to each other? How are they consonant? How are they dissonant?

Data Collection and Curriculum Types

In order to better understand the nature, aims, and outcomes of technology education and to answer the above research questions, the official, intended, implemented, and experienced curricula were examined within both the literature of the technology education field and in technology education classrooms. The data collection methods varied based on the type of curriculum that was being examined and included document analysis, interviews, and observation. A discussion of the definitions of the types of curricula that were examined and the methods used to collect data for these curricula follows.

The *official curriculum* is comprised of the national, state, and district-level standards and frameworks for the study of technology education. In this study, the official curriculum has been determined based on the analysis of standards and technological literacy documents (i.e. Indiana Department of Education, 2004; International Technology Education Association, 2000, 2003; National Academy of Engineering & National Research Council, 2002, 2006), state course guides, textbooks, monographs (i.e. Maley, 1995), and journal articles.

The curriculum that is written into the teacher's plan book is known, in this study, as the *intended curriculum*. The intended curriculum is created by a series of choices that teachers make as they plan their courses. The intended curriculum of each teacher was ascertained primarily through teacher interviews. A semi-structured interview was conducted at the beginning of the research that focused on each teacher's teaching background, concept of technology education, perceived student benefits from their classes, use of teaching and evaluation methods, and beliefs regarding the importance of technology education concepts. The interviews for each teacher were based around a common protocol that allowed for consistency but also allowed for the researcher to ask follow-up and contextual questions. In addition to the formal interview with each teacher, this study was also informed a great deal through informal discussions and conversations with the teachers that took place between classes, before or after school, and while students were engaged in projects.

The *implemented curriculum* is "what teachers actually do in their courses once they close the door of their classrooms" (Schugurensky, 2002, p. 3) and is much more visible than the official or intended curriculum. In this study, data on the implemented curriculum were collected during approximately one month of classroom observations. The researcher spent over 50 hours in each of the three teachers' classrooms and observed at least two courses taught by each teacher. Field notes were recorded that included descriptions, teacher and student comments, the researcher's initial reactions, and questions that arose during the observations.

The *experienced curriculum* consists of "those things that a student chooses to emphasize, elaborate on, ignore, or omit as he or she recounts learnings…the learner's personal meanings" (Rogers, 1989, p. 715). The primary data source used to develop an understanding of the experienced curriculum was student interviews, which helped identify their perceptions of the class curriculum, their definition of technology education, and the expected outcomes of having taken the course. An average of 10 students were interviewed in each of the three classrooms. In some cases, the students were in more than one of a given teacher's classes and were able to speak in regards to several courses during the interview. Like the teacher interviews, the student interviews followed a common protocol that was slightly adapted for each school. Several of the questions posed to the students were based on their teacher's intentions or on specific information related to their course.

Data Analysis

The data that were collected for the official curriculum and each case were sorted into six categories (context, broad educational aims, objectives of specific curricula, curriculum materials, transactions, and outcomes), based on the components of curriculum suggested by Madaus and Kellaghan (1992). The remaining analysis of the data was conducted using a process described by Spencer, Ritchie, and O'Connor (2003) that included managing data, creating descriptive accounts, and generating explanatory accounts. This process included creating an index of main and sub themes, sorting and clustering data, and refining categories. Lastly, patterns were detected and explanations were developed.

Limitations

Several important aspects of this study limit the findings. The sites that were utilized in the study provide a limitation. While they represented different sized schools and different settings, all were high schools within a 50-mile radius in Indiana. Schools outside of Indiana and a greater range of grade levels may have provided different data. The student population was also a limitation. This study examined three varying schools, but the vast majority of students in all three schools were white males. The researcher is unable to report how consonance in technology education is addressed in schools with high levels of minority students and how the curriculum is experienced by minority students. It would also be interesting to learn more about the experiences of female students in the courses. This study did include interviews with at least one female student at each school; however the data were not analyzed in a manner in which the experiences of the female students can be reported with confidence. Lastly, the time spent in the classrooms is a limitation. Spending a larger amount of time in each classroom could have provided greater insights into all levels of curricula that existed.

Summary of Findings

The findings presented here will be focused mainly on the final research question: How are the official, intended, implemented, and experienced curricula related to each other? How are they consonant? How are they dissonant? The official, intended, implemented, and experienced curricula of the three classrooms in this study exhibited relationships that ranged from highly consonant to extremely dissonant.

Technological Literacy

A critical finding is that both consonance and dissonance were found when the concept of technological literacy was explored. It was found that the intended, implemented, and experienced curricula included a slice of technological literacy, using the *Standards for Technological Literacy* (ITEA, 2000) as a framework. Mr. Theriot was the only teacher to specifically mention technological literacy as an intended outcome of his course, stating that he tries to avoid "technological literacy from the Google standpoint," which he describes as focusing on vocabulary, but instead he intends on getting students to use technology to figure out how to solve problems. He believes that will lead to students "becoming technologically literate." While Mr. O'Malley and Ms. Marshall did not use the term technological literacy, they responded to the use of the standards in their teaching.Ms. Marshall, when asked about the influence of the standards, responded that "I figure that I am pretty close on hitting them because I am following the curriculum, [short pause] for the most part." Mr. O'Malley on the other hand, stated that "to be dead honest, I haven't even looked at" the *Standards for Technological Literacy,* but he did claim to periodically look at the state standards to make sure that there is a connection between his curriculum and the standards.

The teachers, while not always focused on technological literacy, did intend to teach content that fits within the *Standards for Technological Literacy* (ITEA, 2000). Ms. Marshall, for example, intended to teach students how to design and create video and printed materials and Mr. Theriot intended to teach students to use telecommunication tools. Mr. O'Malley intended to teach the students how to use the design process. All of these intentions can be found within the *abilities for a technical world*, *design*, and the *designed world* categories of the *Standards for Technological Literacy*.

These three categories were being implemented in all three of the technology education classrooms. Design; problem solving; and content specific to communication, construction, and information technology were the main areas of these standards that were implemented in the classrooms. Throughout the three classrooms, the researcher observed students designing products such as desk organizers and doghouses and creating artifacts such as videos, news programs, and models of homes.

The majority of students reported learning concepts related to these areas of the standards in the experienced curriculum as well. In Mr. O'Malley's class, for example, students were asked about the most important concepts that they had learned in the course and most students' responses involved the design process. Several of Mr. Theriot's students stated that concepts related to problem solving were the most important concepts that they learned in the course. Ms. Marshall's students stated that technical skills (related to video production) were the most important concepts that were learned.

While several aspects of technological literacy were found to be consonant, as described above, several were found dissonant. Of the five areas of the *Standards for Technological Literacy* (ITEA, 2000), the *nature of technology* and *technology and society* were addressed only in Mr. Theriot's curricula, although he stated that he does not use the standards to plan his curriculum. The *nature of technology* and *technology and society* aspects of the standards were implemented as the students were introduced to content such as the systems model, math and science integration, and technology assessment and evaluation. Because these areas of the curriculum were missing from Mr. O'Malley's and Ms. Marshall's curricula, these teachers did not intentionally introduce students to the characteristics, scope, and core concepts of technology; the relationships between technology and other fields; the cultural, social, and economic effects of technology, and the role of society in the development and use of technology. These was evident in student interviews regarding the experienced curriculum, as Mr. Theriot's students were better able to define and give examples of technology than either Mr. O'Malley's or Ms. Marshall's students. Mark and Michele, two of Mr. Theriot's students, defined technology as "the use of all modern inventions and instruments" and "inventions that help us make things easier," respectively. The majority of Ms. Marshall's students either identified technology only as information technology (computers, software, printers, etc…) or simply did not know how to define it. The standards in these two categories represent over one third of the *Standards for Technological Literacy*. Interestingly, however, all three of the teachers believed that they were meeting the standards (even after admitting that they do not rely on them for planning purposes) while even in the intended curriculum they were omitting the majority, if not all, of two of the five categories of the *Standards for Technological Literacy* (ITEA, 2003).

Preparation for the Future

Another consonant theme that cut across all three cases was a focus on preparing students for the future. This theme is also found in the official curriculum of technology education and has been carried over from the industrial arts era (see Zuga, 1989). More recently, it has been stated in official curriculum literature that, "technological literacy is what every person needs in order to be an informed and contributing citizen for the world of today and tomorrow" (ITEA, 2003, p. 10).

While it was not always focused on citizenship, each of the three teachers described one of the aims of his or her course as preparing students for the future in one of several ways. Mr. O'Malley intended to provide students with the background and career knowledge that they would need in the future, Mr.

Theriot intended for students to engage in experiences that they would use in the future and that may help them to select a career path, and Ms. Marshall hoped that students would explore their interests and potential career opportunities.

The researcher found that a number of students reported experiencing content that either they would use later in life or that would help to prepare them for the future. Mr. O'Malley's students, generally, believed that they would use their knowledge of the design process later in life. Mr. Theriot's construction students described that the course helped provide information about career paths. Russ explained that the course was helpful because "you kind of group [construction careers] together when you think about construction, but if you actually think of all of the different ones you get a better idea of construction." Mark stated that he learned "which careers I would like to go into if I go into the field," which included either framing or roofing. Ms. Marshall's students believed that their technology education courses not only helped identify potential careers but also helped to make them more responsible and better planners. Eric, a student of Ms. Marshall, stated that he has become better at planning "because there are so many steps you have to do before a project. You have to make a rough draft, plan it out, get it checked, make your corrections, and then finally you get to start on the main project". He believes this will help him in his future pursuit of a degree in architecture. In implementation, like in the official curriculum, the theme of preparation for the future was not overt, but it was intended and experienced.

Computer Literacy

The final finding is related to computer literacy. While describing the intended aims of their courses, the teachers' in this study did not list computer literacy. Computers were discussed in most of the interviews, but never as the focus of learning. For example, Mr. O'Malley stated that his students "would be learning the software, so that they could apply it" to the design process.

However, a substantial number of students at each of the three schools stated that they gained computer knowledge and skills. Students from all three schools often cited improved computer and software skills as the most important thing they have learned in the courses. Mark, one of Mr. Theriot's students, when asked about what he will take away from the course, stated that it was the "computer software stuff that I am learning, I won't be able to forget that." When Eric, a student of Ms. Marshall, was asked the same question, he responded "I know that I will use all the software and anytime that you want to make a memo or turn in an application, you will use Microsoft Word or for a presentation PowerPoint or Publisher." In all three schools, computer skills were also the main reason that many students took the courses. While it can be argued that computer knowledge and skills should not be the sole focus of technology education courses, the fact remains that students consider this knowledge valuable.

Conclusions

The findings demonstrate both consonance and dissonance within the technology education curricula. The examination of these findings from the three technology education classrooms has led to two main conclusions regarding the consonance and dissonance in technology education curricula: (1) technological literacy and the *Standards for Technological Literacy* are not fully intended, implemented, or experienced; and (2) technological literacy has been subsumed by computer literacy in some classrooms.

Technological Literacy and Standards

Technological literacy and the *Standards for Technological Literacy* are not fully intended, implemented, or experienced. Technological literacy was described as an intention only in Mr. Theriot's classroom, and the components of technological literacy were only partially implemented and experienced in all three classrooms. As described earlier, the areas neglected most were the *nature of technology* and the *technology and society* aspects of technological literacy. All teachers were successful at teaching the *designed world* and *abilities for a technical world* categories of the standards, which were also well covered in the intended, implemented, and experienced curricula of the three schools.

It comes as little surprise that the *designed world* and *abilities for a technical world* standards are stressed most in the classrooms, as they can be seen as the "hands-on" components of technology education. These standards emphasize learning how to use and create technology and are easily shaped into "hands-on" activities and lessons. Skills contained in these standards include processes such as developing a product or system using a design process, using computers in a number of applications, communicating a message, and understanding the requirements of a structure. These components of the standards are commonly found in technology education classes in the form of activities such as designing a CO_2-powered car, using design software, creating a graphic or video advertisement, and designing a house to meet requirements, which were all activities that were observed during this research.

All three of the teachers made statements similar to Ms. Marshall's comment that "the tech. ed. standards are broad enough that you can close your eyes and point to one and almost be guaranteed that you are going to hit it." The teachers were correct. The standards are broad and cover a wide range of content. However, the curriculum that was observed was narrower and only covered several standards. It is true that these teachers, and possibly most technology teachers, hit upon the standards as they plan and implement their lessons. Their lessons, with the exception of several of Mr. Theriot's lessons, always tended to cover the same or similar standards. In Mr. O'Malley's and Ms. Marshall's classrooms, the *nature of technology* and *technology and society* standards were largely untouched.

Mr. O'Malley, Ms. Marshall, and to a lesser degree Mr. Theriot were working under the faulty assumption that they would achieve consonance with the *Standards for Technological Literacy* by using planning resources such as textbooks, course guides, former students, community service needs, and their own experiences. These resources, however, as used by the teachers in this study, do not automatically lead to complete coverage of the Standards. Consider for instance the textbook used by Ms. Marshall in the communication systems course—only three of the over forty chapters cover content related to the seven standards that are included in the *nature of technology* and *technology and society* categories. Even the Indiana Course Guide (Indiana Department of Education, 2005) for the communication systems course lacks content related to these two categories. This study found that only *Unit One: Communication Technology* actually included substantial content from these standards. Teachers could certainly find ways to include this content in the units, as Mr. Theriot did on several occasions, but they are not provided with examples of how to do so.

We are left with several questions. First, as in the case of the communication textbook and course guide, is a minor presence of the *nature of technology* and *technology and society* content enough to conclude that the standards have been covered? This question is at the crux of the standards debate. The standards are not intended to be a curriculum, as they provide neither a scope nor sequence. However, if Ms. Marshall or Mr. Theriot followed either the textbook or the course guide in their communication systems courses, students would have been introduced to information. Such information would include the characteristics of technology, the effects of communication technology, its influences on history, and its role in society at either the beginning or end of the course with little or no discussion of these concepts at the heart of the course. This is a shallow treatment of a major portion of the Standards. But is that acceptable? Should every standard be covered in every course? Is that even possible? Is this a case where dissonance is actually desired?

There are certainly several reasons why dissonance with the inclusion of *nature of technology* and *technology and society* standards may be preferred by the teachers and the students. The first is that this content may be new to teachers and outside of their own backgrounds and experience. It was evident in the research that each teacher's experiences and background had an impact on the content that was taught. For example, Mr. Theriot's has a strong background in computer technology and mathematics that influenced the curriculum that he planned and the way that he understood and taught technological concepts. He was able to infuse mathematics into the curriculum and help students create small computer programs. Technology teachers often have a large amount of flexibility when planning their curriculum since high-stakes tests, at least at the present time, do not determine course content; it is likely that teachers would choose to teach the content with which they are the most comfortable. The second reason is that the content in these two areas is not as easily viewed in terms of "hands-on" activities, the typical instruction method in technology education. It was evident in the research that the teachers wanted students to be actively engaged in the learning. However, topics like the cultural, social, and economic effects of technology, and the role of society and its historical influence, are not easily taught in the same "hands-on" way that can be used to teach students how to use design software or create a structure, vehicle, news program, or advertisement.

This leads me to a final reason that teachers and students may prefer dissonance in this area: based on the research it was found that the students take the courses to use computers and to participate in hands-on projects. In an elective content area, teachers must keep students interested and excited about the course in order to keep enrollment high. Marketing and promotion were certainly intertwined into each technology education program. Teachers used school board meetings, graduation, and display cases to showcase the work that their students were completing to drum up interest and support for their programs. They also used the curriculum and instructional methods to promote their programs. By using hands-on activities, action-based content, and avoiding content that is more conceptual and theoretical, the teachers are in turn marketing their courses as fun, activity-oriented classes where doing and building come before learning and analyzing the entire scope of the standards.

Computer Literacy

The second and final conclusion is that computer literacy is a real and valid experience in technology education courses. This conclusion is not surprising if we were to agree with Petrina's (2003) assertion that educational technology and technology education are one-in-the-same. While that point can be argued, many in the technology education field have been adamant about recognizing the division between technology education, educational technology, and computer education or computer literacy and have also acknowledged that public misconceptions exist over these terms (Dugger & Naik, 2001; McCade, 2001; Weber, 2005). McCade (2001) stated that "technology educators have at one time or another been frustrated by the confusion created by such terms as educational technology, computer technology, or instructional technology" (p. 9). He also stated that while learning about computers has a place in technology education, "if technology educators attempt to claim all of computer literacy, we will not have the time or resources to deliver other important aspects of our content" (p. 9). Computer knowledge and skills can be found in the *Standards for Technological Literacy*, but as McCade (2001) suggested, those skills are only a portion of the content that should be delivered in technology education courses.

In the classrooms studied here, a range of content was delivered; however, the content and experiences that students recognized most were computer knowledge and skill. It is also a reality that many of the students enrolled in technology education classes for that specific purpose, to learn computer skills. Students spent a large amount of time engaged in projects that required the use of computers. Mr. Theriot's students were creating Flash animations and learning to use 3D design software. The students in Mr. O'Malley's courses were engaged in learning to design products using solid modeling software. Ms. Marshall's courses were focused on using computers to edit videos and create graphic designs. Based on the observations of the classrooms, it is realistic to expect students to have experienced computer skills because it was a major portion of the implemented curriculum, often to the exclusion of other content. For example, Mr. O'Malley taught students to use Autodesk Inventor without teaching the concepts behind the skills they were learning. The same was the case in Ms. Marshall's class; as students created banners on Microsoft Publisher, they learned the software but not elements of design. Lewis and Zuga (2005) refer to this phenomenon as teaching students using the language of technology. They provide the following example:

> Without technological language as identified in taxonomies, children are asked to make bridges and they are tested on the physics related to bridges while the technological concepts such as the structure of the bridge and the best means of assembling that structure may be ignored. It is not that the physics of bridge construction are not important, but it is that the technology of bridge construction and the relationship of the technology to the physics through making choices about the best way to construct a bridge is what is important in bridge building. (p. 81)

The case of computer knowledge is similar in that the computer knowledge and skill are important, but so are the underlying concepts for which the students are using the computer (engineering design and graphic design, in these cases). Students reported gaining computer knowledge and skill as part of the experienced curriculum because without the additional conceptual knowledge, the students had only computer knowledge and skills to take away from these activities. For example, at Southern Glen High School, Ms. Marshall created a graphic communications unit that was intended to teach students design elements such as formal and informal balance. However, the implementation of the unit stressed the use of Microsoft Publisher and students were unable to describe graphic design elements such as balance. The same was the case in Ms. Marshall's video production course, as students created digital movies with a focus on iMovie and little, if any, instruction on the elements of a quality movie. Likewise, in Mr. O'Malley's classroom, the students learned how to use the features of Autodesk Inventor without gaining a conceptual knowledge of the features they were using.

This conclusion is particularly interesting when examined alongside the financial aspects of each school. The three programs represented a wide range of funding. Mr. Theriot at Two Rivers High School was faced with providing a full line of technology education courses while mainly relying on outdated computers, mismatched video technology, a sparsely equipped laboratory area, and a budget of only one hundred dollars per course for the entire school year. It was observed that Ms. Marshall had newer computers and video equipment, although she was limited in making other purchases, as they sold food to raise money for the department. North Side High School had the newest computer technology and ample funds to purchase supplies and equipment. Full implementation of the standards and technological literacy was found to be inversely proportional to the age of the computer technology and the amount of available funds. In the schools with newer computer technology, all aspects of the curriculum were more focused on computer literacy rather than technological literacy. This finding demonstrates that in these three classrooms computer technology does not necessarily lead to greater technological literacy and greater implementation of the standards.

Implications for Further Research

Each of the conclusions leads directly to additional questions for further research and closer examination. Additional studies are needed to examine the curriculum in technology education classrooms over a longer period of time to determine whether or not the missing content might be present at other times in the semester. Further research is also needed to determine why content such as the nature of technology and connections between technology and society were the areas that were largely absent from the curriculum. It is important to determine the impacts and consequences of the focus on marketing and whether it overshadows curriculum, and to examine why students see computer literacy as a more valuable learning experience than technological literacy.

References

Boser, R. A., Palmer, J. D., & Daugherty, M. K. (1998). Students attitudes toward technology in selected technology education programs. *Journal of Technology Education, 10*(1), 4-19.

Cuban, L. (1993). The lure of curricular reform and its pitiful history. *Phi Delta Kappan, 75*(2), 182-185.

Dugger, W., & Naik, N. (2001). Clarifying misconceptions between technology education and educational technology. *The Technology Teacher, 61*(1), 31-35.

Foster, P. N., & Wright, M. D. (2001). How children think and feel about design and technology: Two case studies. *Journal of Industrial Teacher Education, 38*(2).

Indiana Department of Education. (2004). Technology education content standards. Retrieved March 13, 2007, from http://www.doe.state.in.us/standards/docs-Technology/2006-08-15-TechEd-Stds.pdf

Indiana Department of Education. (2005). *Communication systems course guide*. Indianapolis, IN: Indiana Department of Education.

International Technology Education Association. (2000). *Standards for technological literacy: Content for the study of technology*. Reston, VA: ITEA.

International Technology Education Association. (2003). *Advancing excellence in technological literacy : student assessment, professional development, and program standards*. Reston, Va.: International Technology Education Association.

Lewis, T., & Zuga, K. (2005). *A conceptual framework of ideas and issues in technology education. Washington, DC:* National Science Foundation.

Madaus, G., & Kellaghan, T. (1992). Curriculum evaluation and assessment. In P. Jackson (Ed.), *Handbook of research on curriculum* (pp. 119-154). New York: Macmillan Publishing Company.

Maley, D. (Ed.). (1995). *Quotations in support of technology education: A compendium of positive outcome that may be attributed to an effective program in the area of technology education*. Reston, VA: Council on Technology Teacher Education.

McCade, J. (2001). Technology education and computer literacy. *The Technology Teacher, 61*(2), 9-13.

McLaren, S. V. (2006). Exploring perceptions and attitudes toward teaching and learning manual technical drawing in a digital age. *International Journal of Technology and Design Education, 18*, 167-188.

Meade, S. (2004). Marketing technological literacy for the classroom. *The Technology Teacher, 64*(3), 24-25.

Merriam, S. (1992). *Qualitative research and case study applications in education*. San Francisco Jossey-Bass.

National Academy of Engineering, & National Research Council. (2002). *Technically speaking : why all Americans need to know more about technology*. Washington, D.C.: National Academy Press.

National Academy of Engineering, & National Research Council. (2006). *Tech tally: Approaches to assessing technological literacy*. Washington, D.C.: National Academy Press.

Rogers, V. (1989). Assessing the curriculum experienced by children. *Phi Delta Kappan, 70*(9), 714-717.

Schugurensky, D. (2002). The eight curricula of multicultural citizenship education. *Multicultural Education, 10*(1), 2-6.

Spencer, L., Ritchie, J., & O'Connor, W. (2003). Carrying out qualitative analysis. In J. Ritchie & J. Lewis (Eds.), *Qualitative research practice: A guide for social science students and researchers* (pp. 219-262). Thousand Oaks, CA: Sage.

Stake, R. (2003). Case Studies. In N. Denzin & Y. S. Lincoln (Eds.), *Strategies of Qualitative Inquiry* (pp. 134-164). Thousand Oaks, CA: Sage.

Taylor, J. (2006). Student perceptions of selected Technology Student Association activities. *Journal of Technology Education, 17*(2), 56-71.

Thornton, S. J. (1985). *Curriculum consonance in United States history classrooms*. Stanford University, Stanford, CA.

Thornton, S. J. (1988). Curriculum consonance in United States history classrooms. *Journal of Curriculum and Supervision, 3*(4), 308-320.

Volk, K., Yip, W., & Lo, T. (2003). Hong Kong pupils' attitudes toward technology: The impact of design and technology programs. *Journal of Technology Education, 15*(1), 48-63.

Weber, K. (2005). A proactive approach to technological literacy. *The Technology Teacher, 64*(7), 28-30.

Weber, K., & Custer, R. (2005). Gender-based preferences toward technology education content, activities, and instructional methods. *Journal of Technology Education*, *12*(2), 55-71.

Werner, W. (1991). Curriculum and uncertainty. In R. Ghosh & D. Ray (Eds.), *Social change and education in Canada* (pp. 105-115). Toronto: Harcourt Brace Jovanovich.

Zuga, K. (1989). Relating technology education goals to curriculum planning [Electronic Version]. *Journal of Technology Education*, *1*(1), 33-58, Retrieved January 15, 2007 from http://scholar.lib.vt.edu/ejournal/JTE/v1n1/pdf