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| **Should There Be a National Curriculum for Technological Literacy? Opinions From Leaders in the Field**

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    Laura Johnson Hummell is a North Carolina middle school technology education teacher and doctoral candidate at East Carolina University.
    My answer is "yes;" I do believe that the United States should have a national curriculum for technological literacy. For the last decade, people from the President of the United States to individual citizens have been calling for stronger technology-related educational programs in order to prepare today's students for the challenges they will face in the twenty-first century and beyond (U.S. Department of Education, 1996; Clinton, 1997; ITEA, 2000; Pearson & Young, 2002; LaPorte, 2002). Many of the challenges outlined in various articles, surveys, professional journals, and books have focused on the concept of technological literacy. According to the North Central Regional Educational Laboratory (2006), "Technological literacy is knowledge about what technology is, how it works, what purposes it can serve, and how it can be used efficiently and effectively to achieve specific goals."
    The reason I believe that a national curriculum for technological literacy should exist would be to avoid the inconsistencies that currently exist. From state to state in the United States of America, huge discrepancies and deficiencies exist in technology-based curricula. As a result, students in many instances are ill-prepared for living and working in a globally based economy and society. If a national curriculum for technological literacy is developed, I envision it would resemble Standards for Technological Literacy (2000/2002) created by the International Technology Education Association. However, I believe that a technological literacy curriculum should evolve as quickly as technology does. No longer will technology-related curriculum that is five years old or more be sufficient unless it is designed to be a fluid, continuously evolving entity that includes periodic training, updates, and revisions.
    The positive ramifications would be that teachers and students would have more guidance about what technological literacy is and how to gain the knowledge and skills necessary to live and compete in this ever-changing technological world. No longer would the United States lag behind its peers in global arenas, such as the manufacturing and communication technology industries. As a nation, we could rise to prominence as a global force in education, workforce development, and industry. With the appropriate training in technological literacy at all levels, the national economy would be positively influenced as other countries once more came to U.S. companies for guidance and products.
    The negative ramifications of establishing a national curriculum for technological literacy would be finding ways to implement the curriculum, integrate it in all other subject areas, and evaluate its overall effectiveness. Too often, when national curricula are established, multiple-choice-style testing becomes the primary way to evaluate student understanding and skills. With the complexity of technological literacy, the difficulty exists in how and when to best assess students' technological literacy. Do we design a series of tests, a single examination, or require portfolios? Do students need to demonstrate proficiency at various levels or just when they graduate from high school? With any of these evaluative instruments comes its own set of questions and problems.
    Trials and tribulations would also arise from how to best design, develop, and administer such an all-encompassing curriculum. Technological literacy cannot exist alone without making connections to all other areas of education and life. Thus, how to teach technological literacy becomes an issue. Technology education and educational technology professionals may have to change the way they teach their courses or take on new roles as resources for teachers in other disciplines.
    Any time change is imminent, people react accordingly. Some willingly go ahead with the changes, while others balk. Fullan (2001) refers to this phenomenon as "the implementation dip." Fullan goes on to remind leaders in a changing environment to be aware of how people may be affected by "two kinds of problems when they are in the dip--the social-psychological fear of change, and the lack of technical know-how or skills to make the change work." Technological leaders must also be prepared to deal with the difficulties that arise as a result. Fullan also admonishes leaders to remember, "We are more likely to learn something from people who disagree with us than we are from people who agree" When designing, developing, and implementing a new technological literacy curriculum, leaders must do their research, know the positive and negative effects, and properly train the educators and students who will be affected.
    Sthan B. Lipton, Ph.D., DTE is Assistant Vice President for Academic Affairs/Dean, Educational Support Services at California State University in Los Angeles.
    A national curriculum for technological literacy is not the answer.
    We must ensure that all high school graduates possess a foundation for success. Most would agree that literacy--the ability to read, write, communicate, comprehend, perform mathematical calculations and think--forms the cornerstone for this foundation. Preparation for today's world and that of the future also requires that each student is technologically literate, having the knowledge, skills, and attitudes required to understand the human-designed world and our place in it.
    While the implementation of a national curriculum may initially appear inviting, it is not the solution because it is inconsistent with past and current views in the United States that continue to place the responsibility for curricular decisions related to all subjects at the state and local levels. Even if the nation were to decide to adopt a national curriculum, as has been done in other countries, the time required to develop and complete the process would put the implementation date well into the future. Once established, there is no guarantee that the complex infrastructure and associated bureaucracy would make a difference, especially in the short term.
    If the goal is technological literacy for all students, the significantly more important issue for students, society, and our profession is: How do we ensure that all high school graduates are technologically literate? The first step was taken with the publication of Standards for Technological Literacy: Content for the Study of Technology, which includes "standards and associated grade-level 'benchmarks' indicating what technologically literate K-12 students should know and be able to do" (National Academy of Engineering). A growing number of resources continue to be developed related to structure, curriculum development, student assessment, and professional development for technological literacy. The next step must be the adoption of these or similar standards by state and local education agencies and their inclusion in a statewide program of rigorous assessment in a manner most appropriate to the needs of students in the region. Comprehensive, valid, and reliable assessment is much more important to meeting the goal of technological literacy for all than is the adoption of a national curriculum.
    Similar to the goal related to each student's achievement of literacy (language) and numeracy, the essential priority is that students master the knowledge, skills, and attitudes to achieve technological literacy. As with subjects such as English, attainment of this goal should not be left to one specific class or series of classes. Each student is required to take a series of English classes, but the rest of the curriculum is designed to include experiences that reinforce, support, and apply that learning.
    A similar strategy should be employed for the study of technology. Once the appropriate student learning outcomes for technological literacy have been identified along the educational continuum, effective creation, delivery, and support for learning experiences are essential. Technology educators must provide the leadership for a collaborative curriculum development process. They must create classes specifically designed to provide technological literacy core learning experiences and, as in the previously cited example related to English, work with their colleagues from other subject areas to integrate technological literacy into other classes to reinforce, support, and apply that learning. This strategy should further empower technology educators by placing them at the center of the study of technology among their peers from other subject areas.
    A national curriculum might prescribe what is to be taught and when, with such specificity as to provide entry into teaching its core content to teachers with a wide range of teacher preparation backgrounds. Maintaining responsibility at more local levels will require that the technology educator play an active and critical role in all phases of development, delivery, and assessment.
    The final critical component of ensuring the quality of the study of technology and assuring students are achieving identified learning outcomes rests in rigorous assessment of student learning outcomes. Formative assessment must be administered along the learning continuum to evaluate student progress and, if needed, modify the learning experiences. State high school exit exams must include significant assessment of the study of technology to ensure that graduates demonstrate technological literacy.
    Mellissa Morrow is Director of Career and Technical Education Sarasota County School Board, Sarasota, FL.
    A national curriculum for technological literacy is critical if we hope to move forward with widespread implementation of Standards for Technological Literacy. The curriculum must be comprehensive (K-12) and must include specific technology education courses as well as units of instruction that can easily be integrated into a variety of curricular areas. Additionally, the national curriculum must be infused in the teacher-education institutions that are preparing our future educators, and adaptable to meet a variety of implementation models. A national curriculum should serve as a model for teachers and stakeholders, and should provide the supports needed for building new programs and continually improving existing programs.
    For over four years now, we have worked extensively to enlighten our internal audiences about the need for and use of Standards for Technological Literacy. The result, coupled with the state requirements put forth to meet the provisions of No Child Left Behind, has left districts and schools wondering about the best way to implement technology education and provide sound evidence that we are truly boosting student achievement on standardized tests that measure knowledge in content areas other than our own.
    ITEA's CATTS curriculum has provided a select few teachers and states with tremendous resources and support both in curriculum and in professional development, but has focused on a very narrow group without the opportunity for widespread implementation. While this approach is broadening, it has not thus far allowed for schools, districts, or states to embrace the curriculum because of its dissemination strategy, its relatively slow development process, and its inability to correlate strongly to those skills and knowledge bases most tested on state tests.
    Curriculum redesign at the school level has taken a backseat to those companies and products that offer prepackaged options already aligned to the national standards and, equally as important, aligned to those items being tested to show student achievement. With school resources being focused on attainment of acceptable test scores, teachers are seeking tools that will both support their content and demonstrate to stakeholders the overall value of this [technology education] content in student mastery of reading, mathematics, and science.
    The national curriculum should be developed in close connection with our teacher education institutions, which have been in the forefront of creating resources to support implementation of Standards for Technological Literacy. As these educators move into our schools, it is essential that they have the background knowledge and means necessary to teach technological literacy skills in meaningful ways to their students. We have a responsibility to provide the support and resources to make our teachers successful in this transition.
    A national curriculum will provide not only the resources teachers need to market the relevance of and need for technology education, but will also enable the adaptation of content to more strongly support the application of reading skills, and mathematics and scientific concepts within existing courses.
    We must provide educators and administrators with options for implementing the technological literacy standards in a variety of courses and programs, including technology education, through national curricula. We must ensure that teachers and teacher education institutions have the knowledge of these standards and the tools necessary to immediately implement activities for students in the classroom that will help them develop technological literacy and enhance educational achievement. We have a responsibility to our students to connect this curriculum to their entire educational career and use it to support their achievement in a variety of areas.
    Jerry Streichler, DTE is a member of the ITEA Academy of Fellows. He is former Trustee Professor Emeritus and Dean Emeritus of Technology at Bowling Green State University as well as Executive Director Emeritus of Epsilon Pi Tau.
    This nation's continued leadership in technological innovation is a key factor in our standing among the world's economies, and it depends on our educational system's ability to deliver quality education: to produce persons with knowledge and capabilities or literacy in science and technology. By virtue of their critical thinking and problem-solving skills, they will contribute to the maintenance and advancement of the U.S. as a world leader in technology.
    In spite of the preceding statement, I greet the question with a qualified "Yes."
    I believe the goal of implementing a "national curriculum" will be frustrated by timing and political hurdles. Consequently, I offer an alternative strategy that may achieve or exceed a national curriculum's goals.
    ITEA should apply its ample leadership and political skills to seek funding to create and manage a National Clearinghouse for Technology Capabilities and Literacy (CTCL). Many will argue that "literacy" includes "capabilities," but I recommend use of the latter because many in the workforce education fields, as well as a good number of technology educators, will find the term attractive as they interpret it to denote the skills they impart and regard as important.
    Allow me to elaborate on this by addressing:
    (1) THE CLIMATE: (the socio-political climate that calls for the strategies implied in such an effort).
    (2) ITEA LEADERSHIP: (using ITEAS enviable record of success in such an effort and its respected position in certain government circles may be considerably strengthened by leading such an effort).
    (3) THE CLEARINGHOUSE'S INFLUENCE UPON CURRICULUM: (some Clearinghouse activities and responsibilities of consequence and influence on curriculum).
    (1) THE CLIMATE: To many, the term "literacy" refers to a degree of understanding that enables thoughtful, useful citizenship and knowledge in matters of life and living. With regard to technology, the term also suggests that one is enabled toward success in certain work and professional endeavors. Regrettably, there is confusion about the term.
    I urge using the title suggested for the Clearinghouse that denotes that capability and literacy are two important, but different educational elements. For example, when an engineer seeks to impart to a high school class the elementary capabilities and understandings about engineering design, he may not, at the time, be concerned that students consider the professional obligations of the engineer in that process or the societal consequences of poor engineering design.
    (2) ITEA LEADERSHIP: History will credit ITEA with remarkable accomplishments in achieving recognition for technology studies and for being recognized as a prime mover in the science, technology, engineering, and mathematics education efforts.
    In addition to its successes in funding and promulgating Standards for Technology Literacy, and for its recognition by the National Academies and NSF for its work in promoting effective technology curriculum efforts, ITEA leadership will enjoy even greater credit when it gains the ear of the recently established commission to set new directions for U.S. education (preK-16). The significance here is that the commission intends "...to set new directions for U.S. education from early childhood through undergraduate education (preK-16)." If it does what it intends, there may be extraordinary opportunities for technology educators to make the profession's case for a place in the school curriculum. This is connected to the role envisioned for the Clearinghouse.
    (3) THE CLEARINGHOUSE'S INFLUENCE UPON CURRICULUM: A National Clearinghouse for Technological Capabilities and Literacy will enable the realization of a vision that I hope readers will find attractive. To implement the clearinghouse, I would hope that leaders of ITEA will agree for ITEA to behave as the arbiter for ALL educational programs in technology...as if its name is and has been The International Association for Education in Technology (IAET). Rather than a national curriculum in technological literacy, through its CTCL it would endeavor to serve all the technology curriculum areas in general education, in STEM, in technology workforce and preparation programs for professions with effective materials to help those programs integrate and deliver technological literacy experiences.
    The CTCL would undertake comprehensive analyses of all instructional offerings to identify possibilities for integrating technology literacy experiences. The CTCL would develop, test and, upon determining effectiveness, promulgate easily adaptable instructional materials.
    We would see, in addition to materials for technology subjects, devices, aids, enhancements, teaching materials, lesson plans, activities, and projects that can be integrated into courses in science, mathematics, social studies, English and foreign languages, and other school experiences.
    We would see, not a curriculum for technology literacy, but a comprehensive compendium of expertly devised instructional materials that would be applicable to the subjects, courses, experiences in science, mathematics, English, social studies: all areas of technology that would enrich specific learning experiences with meaning, relevancy, and understanding connections with technology literacy connotations.
    Karen Zuga is Program Director, Division of Elementary, Secondary, and Informal Education at the National Science Foundation in Arlington, VA.
    I have never been an advocate of a national curriculum, and even though there appear to be some advantages to having one, I am still opposed to a "one size fits all" approach to education.
    First, here is what I mean by curriculum. I like the definitions that focus on the school and include all of what does and does not happen under the auspices of the school, including the overt, hidden, and null curriculum. While standards could be considered to be curriculum, for me they are only curriculum when enacted in the classroom.
    Second, let's look at history. In the Constitution of The United States, education was set up as a matter of local control by the framers who were enamored of the concept of pluralism and escaping totalitarian control. Of course, from the framing of the Constitution to the present day, a slow, steady erosion of local control has taken place with the involvement of state government, the distribution of federal funds for research and development in education, and the creation of a department of education.
    The erosion of local control has been promoted by a number of groups with special interests, such as technology educators, who would want to have a national K-12 technology education requirement (an idea I would champion, myself, if not for the unintended consequences); textbook publishers who would want their book to be the "national" book; special interest groups who would want their version of technology education to be the version of technology education that is taught to everyone; bureaucrats who would want some consistency in curriculum to make student moves from one school to the next easier; and the list could go on.
    Finally, it boils down to who controls the curriculum? In fact, state departments of education, educational publishers, and school administrators have all welcomed growth in the regulatory influence of state departments of education and the Department of Education, at times, irrespective of political leaning. For example, conservatives, whom you would think might be interested in preserving the Constitution, might also be interested in creating a national test in a desire to dictate the content of the curriculum so that what is tested, hence taught, is not in conflict with their beliefs. It is this aspect of a national curriculum that I worry about the most. If we had a national curriculum, whose curriculum would it be? Who would dictate the curriculum: textbook publishers, government bureaucrats, interest groups, corporations, anyone who had enough power and money to buy their way into the market? We have enough trouble now with special interest groups controlling textbook selection in several states and, by default, the country, and with educational corporate groups selling the next best educational program to politicians and state department bureaucrats only to be replaced in a few years after its "flash in the pan status" is eroded by the next best idea championed by those who have the power and money to promote it. I do not want to leave curriculum choice to those who can afford to promote their ideas.
    The ability of a good teacher to experiment and offer a unique and challenging curriculum enables all children to have moments of educational inspiration and excellence during the course of their schooling. A standardized, scripted curriculum eliminates the ability to innovate and locks teachers and students into a step-by-step progression through content. A skillful and knowledgeable teacher is able to orchestrate a class of students, directing students in their own pursuit of knowledge, knowing that standards are being met. A standardized curriculum works only when nothing better can be found and for teachers who aren't inspired and need the help, treating students as the raw material for an assembly-line curriculum.
    I'd rather take my chances with the variety provided by all kinds of teachers who are working together with colleagues to provide the best form of technology education that they can. For me, it is about democracy, having power in the hands of the people, and being directly responsible to the local citizens, rather than politicians, bureaucrats, and lobbyists. This is the kind of environment that incubates and fosters growth, change, and evolution.