Cultural Change in the Twenty-First Century Shop Class

Evan Barba

Introduction

The phrase "shop class of the twenty-first century" has recently appeared as a news headline and political talking point.[1] The phrase is meant to summarize and introduce Maker culture to mainstream audiences and to communicate its potential for much needed educational reform. The shop class of the twenty-first century has come to be associated with hands-on and problem-based learning, design and systems thinking, technological know-how, and a do-it-yourself (DIY) attitude, all of which are seen as skills inherent to creating a "culture of innovation" and have long been touted as better ways for students to learn. These skills are deeply engrained in the Making ethos and have been missing in an educational system that is struggling to keep students engaged and to prepare them for the jobs of the future. The phrase is an effective one because it calls to mind the familiar shop class of the twentieth century, the machine shop or the wood shop, providing convenient shorthand for the kind of environment and style of work intended to occur there. However, this new shop class also subtly communicates the kind of progress that we have come to associate with technological innovation in the current century. What lies behind this rhetoric is a set of oppositions that positions the shop class of the twenty-first century as a new, yet familiar, educational innovation. In actuality, it is not the shop class that has changed, but our assessment of it.

Machines in the old shop class were everyday items, common to a mechanic's garage or a garage workshop, slick with dirt and grease. Machines in the new shop class are semi-autonomous precision instruments (the 3D printer is almost always the example) that seem to create things directly from your imagination—slick in a very different sense of the word. The inhabitants of the shop class have been updated as well. No longer is it populated with the common trope, "grease monkey" delinquents who were ill-suited to academic pursuits of the mind and relegated to a life of manual labor. The shop class of the twenty-first century is the habitat of the mythical technology entrepreneur who (a common myth suggests) escapes higher education altogether to do something more productive in the real world. Learning a trade to earn a

1 Note a representative sample from a few mainstream news sources: http://www.edutopia.org/shop-classes-vocational-education-technology (accessed April 12, 2014); http://ebmak-erfaire.wordpress.com/2011/09/30/the-21st-century-shop-class/ (accessed April 12, 2014); http://remakelearning.org/blog/2013/06/03/21st-century-shop-class/ (accessed April 12, 2014); and http://www.cnn.com/2013/02/13/tech/innovation/obama-3d-printing/ (accessed April 15, 2014).

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living wage is no longer the focus of "educating the hands," as it was for centuries before, and the shop classroom has changed accordingly; shop class is now a place to incubate ideas, to prototype gadgets, and to network.

True or not, this rhetoric represents a reversal in how U.S. society conceives of shop class, its participants, and its purpose. The fundamental question of whom these new shop classes serve is critical. Their growing popularity is not a cultural shift in the kind of work our society values, but rather the introduction of a kind of *honors* shop class with a higher class of tool and a higher caliber of student. Although the debate around the value that practices of making, craft, hobby, and design can bring to educational contexts only recently grabbed the attention of the Maker community and its observers, it is a very old debate in U.S. education and involves differing notions of social justice and individual empowerment.

At the core of this debate is a split between education of the mind through reading, writing, and rhetoric, and education of the body through manual labor that has existed for most of recorded history. In *The Design Way,* Stolterman and Nelson describe this split as it is found in the Greek notion of sophia:

> Sophia was not only divided into separate parts, but the resulting components were also placed at the extremes of a hierarchy. In Plato's Republic, those who thought about things were elevated to the pinnacle of society, while those who made things were positioned at the bottom of the social hierarchy. This hierarchy can be seen continued in today's world. Polarities between people, such as white-collar and blue-collar workers, management and labor, thinkers and doers, continue to play out this division of sophia.[2]

For these two authors, design as a discipline represents a path toward reunification of the divided *sophia.* The goal of this article is to present the current debate over the twenty-first century shop class in the wider historical context of the ongoing "head vs. hands" debate that has long surrounded the split between vocational education (now called Career and Technical Education or CTE) and liberal education. Interestingly, the current incarnation seems to mark a shift and realignment of arguments. Where previous iterations have always located higher cognitive skills, such as problem solving and creativity, within the realm of liberal arts education, the Maker movement reassociates these skills with manual labor, or at least hands-on thinking. We appear to be moving toward the idea that working in the material world has more educational and social benefit than abstract knowledge. Evidence also suggests that the drudgery, lack of self-efficacy, and class

2 Erik Stolterman and Harold G Nelson, *The Design Way: Intentional Change in an Unpredictable World* (Boston: MIT Press, 2012), 15.

immobility that many feared would accompany a purely manual education are now being associated with a liberal education that focuses on the head and prepares a workforce for the "knowledge economy." The current shift in emphasis toward design thinking embodied in the Maker movement is an inflection point in this debate that should prompt reflection.

I argue here that simply circling around the center of gravity of this debate—emphasizing and re-emphasizing head or hands—has proven unproductive, and it will continue to do so without a clear vision of what we hope to achieve in the shop class of the twenty-first century. Whether one learns to problem-solve, think freely, and earn a living by means of liberal education or vocational education is ultimately irrelevant; what matters is that all human capacities are fostered, valued equally, and brought to bear on the problems of individuals and society.

In the past, even those who advocated for a segregated or "dual-stream" educational system that splits CTE from liberal education at the level of secondary school also recognized that linking theory and practice, head and hands, results in better learning. What has always been in question is not the learning itself, but the social value of the work that emerges from one stream or the other. While the Maker movement demonstrates how we have begun to question and break down the barriers between work with physical materials and work with abstractions, we have not yet begun to dismantle the class barriers between the shop class and the lecture hall. On the contrary, we seem to have carried them with us into the twenty-first century.

While some of the discussion around the shop class of the twenty-first century has begun to recognize its potential as an incubator for a larger *design culture,* I wish to make the additional, optimistic, suggestion that immersing a generation of youth in this culture has the potential to finally put the head vs. hands debate to rest. Learning through the hands is not inferior to learning through the head, nor is it separate but equal; rather, learning that links the head and the hands provides mutual reinforcement that is greater than either alone. Putting this idea of mutual gain at the center of twenty-first century education, in both shop class and lecture hall, I believe, not only can improve outcomes for individual learners, but also can bring about a cultural shift in how work and skills are valued in society at large, and perhaps help address the larger social problems of inequality in incomes and opportunities. Consequently, the larger questions that have condemned this debate to run in circles for centuries might resolve themselves in only a generation or two.

An Historic Split

The history of CTE is necessarily tied to a more general history of education. Ideas about the purpose and structure of education in the Americas can be traced back to Antiquity and the divisions in *sophia* already noted, and then to the Middle Ages where the split between the "liberal arts" and the "servile arts" embodied the same valuing of the head over the hands. Apprenticeship was likely the first form of education, and Scott and Sarkees-Wircenski claim it dates as far back as the Stone Age.[3] In North America too, apprenticeship was the dominant practice, and it persisted alongside public education for centuries. However, the inconsistencies inherent to this system prompted the earliest known education laws in what would become the United States in 1642, 1647, and 1648. Collectively, these laws are known as the Massachusetts School Laws, and they established very basic regulations for how towns were to conduct the education of their youth. The laws demonstrate a bias toward the value of educating the head over the hands. The text of the 1642 law states:

> And further that all parents and masters do breed & bring up their children & apprentices in some honest lawful calling, labor or employment, either in husbandry, or some other trade profitable for themselves, and the Commonwealth if they will not or cannot train them up in learning to fit them for higher employments.[4]

The higher employments are not specified explicitly in the laws, but attending Harvard Divinity School is often cited as the intended goal.[5] What is also encoded in this passage is the idea that education should benefit both the individual and society at large. Teaching reading and writing skills would enable students to read the laws of the colony; this was viewed as necessary for the survival of the body politic because the politic relied on informed and law-abiding citizens.[6] The 1647 law, dubbed "The Old Deluder Satan Act" because the first line of the law begins with that phrase, suggests the other intended purpose of education—namely, that reading enabled one to read the Bible and was therefore a stepping-stone on the road to personal salvation. In some form or other, citizenship and salvation remain recurring themes in the head vs. hands debate. Indeed, even the word "vocation" stems from the idea of a calling to religious practice.

When a confluence of forces brought the Industrial Revolution to North America in the early nineteenth century, the old apprenticeship system gradually disintegrated. Many reasons can be offered for this disintegration, but one clear factor was that the mechanics of industrial systems demanded a different kind of manual laborer—not a skilled craftsman or even an expert

3 John L. Scott and Michelle Sarkees-Wircenski, *Overview of Career and Technical Education,* 4th ed. (Orlando Park, IL: American Technical Publishers, 2008).

4 https://www3.nd.edu/~rbarger/www7/masslaws.html (accessed June 23, 2014).

5 H.R.D. Gordon, *The History and Growth of Vocational Education in America* (Long Grove, IL: Waveland Press, 2003).

6 Centuries later, Dewey would take a similar position on education as essential for the survival of democracy.

machinist, but rather a dependable worker skilled only in one particular technique necessary for the manufacture of large numbers of consumer goods. The degrading of the work of manual labor further degraded the value of those who performed it.

The Industrial Revolution also institutionalized the division between academic and manual education. Although the number of liberal arts universities modeled on Harvard had grown during the previous century, these universities were intended to educate students in the academic pursuits of law, medicine, teaching, or ministry. The need arose for institutions of higher education that focused on job training for agriculture and industry and, with the passing of the Morrill Act in 1862, a number of universities were established to fill this void. These institutions were referred to as "land grant" institutions because the money to support their vocational programs came from the sale of land owned by the federal government.[7] Not only did these universities increase the availability of education for a wider group of people, both geographically and socioeconomically, but they also introduced what Howard Gordon refers to as "integrated academics," where languages and mathematics were incorporated into agricultural and other vocational coursework.[8]

Not long after the establishment of these land-grant institutions, their leaders recognized that students coming out of secondary school were not well-prepared for their coursework, and they sought to remedy the situation by establishing secondary schools of their own that began vocational training much earlier, or by providing the tools to introduce necessary skills into existing high school curricula. This move was the beginning of shop class.

Washington and DuBois Debates

Although the second Morrill Act of 1890 legislated the establishment of land-grant institutions specifically to educate African-Americans, the inclusion of blacks in the paid workforce began much earlier. Interestingly, after the American Civil War the question of how best to educate freed slaves for participation in the labor market was met with two different answers. The first, supported by Booker T. Washington, was based on his belief that if blacks were to become equal to whites in the new society, they would need to become economically independent. This meant having the technical and vocational training to earn a living wage and fully participate in the economy. Washington's ideal was embodied in his Tuskegee Institute, where he trained students in all the various trades, emphasizing cognitive and problem-solving skills alongside moral attributes, such as self-discipline and service.

Washington's views could be considered prescient because they emphasize many of the attributes we currently espouse in education today; however, these views were not without detractors in his time. Most notably, W.E.B. DuBois took the fundamentally

7 https://www3.nd.edu/~rbarger/www7/morrill.html (accessed June 23, 2014).

8 Gordon, *History,* 15.

different position that black advancement would come through political influence at the highest levels of society. He advocated that the education of the "talented tenth" of African Americans would form an elite class of citizens who would inspire future generations. The talented tenth could advance civil rights more swiftly through political action, offering a top-down approach to racial equality rather than a bottom-up approach. This position also has much to recommend it, and although Washington and DuBois differed on how best to achieve equality, these approaches clearly are not mutually exclusive.

Most relevant to the present discussion, though, is DuBois's notion of the talented tenth. Although this complex issue deserves more nuanced analysis than is possible here, the "talented tenth" obviously would not consist of the best carpenters or mechanics. As DuBois used the term, it meant those schooled in academic subjects, presumably with doctorates like his own; it did not include those working in the manual trades. Whether DuBois's belief in the power and status of the talented tenth was the result of his innate belief in the superiority of academic work and those who did it, and potentially in the stratification of society that naturally follows, or whether it was a more pragmatic recognition that this approach was the best way to influence the white culture of the time, is an open question. Regardless, what it demonstrates is the innate and continued bias toward education of the head that existed in American culture at the turn of the twentieth century—a bias that would become progressively more institutionalized through legislation.

Going to Class

In the early twentieth century, career and technical education as we know it was fortified by legislation specifically intended to prepare industrial workers. Beginning with the Smith-Hughes Act of 1917, the two-tiered, or dual-stream, system of education was formally established—one for the head and one for the hands.[9] One provision of the Smith-Hughes Act was that local vocational education boards had to be established. These boards were separate from traditional boards of education and resulted in distinct curricula with different aims. Moreover, because funding for vocational education was tied to federal sources, it remained distinct from local funding of mainstream school activities and furthered the notion that training the hands was a fundamentally different enterprise than educating the mind.

Although seeds of class-consciousness can be found throughout the history of the head and hands debate, the early twentieth century saw this aspect of vocational training become manifest most explicitly. As notions of Taylorism began to percolate through society, the "social efficiency" of public education was called into question.[10] In this context, education that did not turn

9 *Smith-Hughes Act (Vocational Education Act) of 1917.* Public Law 347. 64th Cong., 2d sess., February 23, 1917. Reprinted in *The Statutes at Large of the United States of America from December, 1915, to March, 1917.* Vol. 39, Part 1. Washington, D.C.: GPO, 1917, 929–36.

10 Frederick Winslow Taylor, *The Principles of Scientific Management* (New York, NY: Harper and Brothers, 1911).

students into capable industrial workers was seen as a waste of their (and society's) potential, and advocates strongly supported separate tracks for vocational students. Proponents of this view, such as the influential David Snedden and his equally influential student, Charles Prosser (author of the congressional report that informed the Smith-Hughes Act), vociferously advocated for vocational curricula to be included in secondary schools and maintained that these "shops" should match the industrial environments of real work as closely as possible. Many students agreed with this thinking, feeling that a broad, general education left them unprepared for the real work environment and unable to earn a wage—a view that many liberal arts graduates voice today as well.

Although Prosser and Snedden argued effectively for a tracked vocational system, Prosser's somewhat contradictory beliefs are summarized by Gordon this way:

> Prosser felt that successful vocational education required combining two elements: (1) practice and thinking about the practice, and (2) doing and thinking about the doing. Prosser's view was that in vocational education, practice and theory must go hand in hand; the more intimately they are related to each other, the more the school will contribute to the learner's immediate success in the shop and equip the person for mastery of one's calling.[11]

What is most problematic about this passage is the idea—apparently held by Prosser—that students could reflect about their practice and understand theory without the more academic instruction of a liberal education. In a similar point, Buchanan notes that the inability to reflect on the "first principles" of their craft is what rendered practitioners of the servile arts second-class citizens throughout the Middle Ages.[12]

John Dewey opposed such notions most vocally. Although Dewey was a proponent of technical training, he believed that it should always be accompanied by academic work that taught theory explicitly. In his view this combination was essential to the reproduction of the learned and free citizens needed to maintain democracy. In *Democracy and Education,* Dewey makes much the same claim as Prosser: "…[A]n experience, is capable of generating and carrying any amount of theory, but a theory apart from an experience cannot be definitely grasped even as a theory."[13] Much as the positions of Washington and DuBois differed in their methods but not their goals, we can rectify the surprising similarities in the beliefs of Prosser and Dewey by noting their very different feelings about how vocational education should be implemented.

11 Gordon, *History,* 27.

12 Richard Buchanan, "Design Research and the New Learning," *Design Issues* 17, no. 4 (Autumn 2001): 3–23.

13 John Dewey, *Democracy and Education: An Introduction to the Philosophy of Education, Textbook Series in Education* (Macmillian, 1916), 169.

They agreed on how to achieve effective results through the connection of head and hands, but they disagreed on how these results should be institutionalized, as well as what their value was both to society at large and to the individual learner.

Strikingly, vocational education around this time became tied not only to issues of class in a growing industrialized society, but also to war. Gordon cites the approach of World War I, and its mechanized form of warfare, as a major contributing factor to the adoption of the Smith-Hughes Act. This connection was the first one made between vocational training and "national preparedness," which has recently been used as justification for the United States Defense Advanced Research Projects Administration (DARPA), initiating funding for the creation of Makerspaces in high schools across the United States through its Manufacturing Experimentation and Outreach (MENTOR) program. In a similar vein, the National Defense Education Act of 1958 provided for major increases in the funding and administration of vocational education and grew out of the same national anxiety over the 1957 Soviet launch of Sputnik, which sparked the creation of both the National Aeronautics and Space Administration (NASA) and DARPA. At the same time, Arthur Bestor condemned vocational education in its entirety as essentially robbing students of individual choice and empowerment in order to reproduce the social class structure.[14] The core of Bestor's argument was that CTE teaches knowledge as facts, apart from the context of their production, such that students learn to reproduce existing forms of theory and practice and not to arrive at original ones, stifling their creativity. The purpose of such education is to create a modular workforce that performs dutifully, rarely questions authority, and maximizes the effectiveness of the military-industrial complex, rather than produce free human beings. These same criticisms have been levied against the MENTOR program today.

Recent History

The name of late U.S. Congressman Carl D. Perkins has literally become synonymous with vocational education. In 1963 Perkins championed the Vocational Education Act, which was amended three times before being replaced by the Carl D. Perkins Vocational Education Act in 1984.[15] The 1984 Act represented a significant overhaul of vocational education and was conducted in response to a report titled, "The Unfinished Agenda: The Role of Vocational Education in the High School," which was highly critical of the effectiveness of vocational education. "The Unfinished Agenda" was itself a response to the famous education report, "A Nation at Risk: The Imperative for Educational Reform," which

14 Arthur Eugene Bestor, *The Restoration of Learning: A Program for Redeeming the Unfulfilled Promise of American Education* (New York: Knopf, 1956).

15 http://eric.ed.gov/?id=ED256926 (accessed July 23, 2015).

once again used education as an indicator of national preparedness and spawned decades of educational reform.[16] These reforms focused on academics and employed an increased reliance on standardized testing while also continuing the separation between vocational and academic education that characterized the dual-stream approach. These reforms brought about a new kind of social efficiency. Students with difficulties mastering academic subjects (many with actual learning or physical disabilities) were placed in vocational programs to avoid the costs associated with bringing these students up to educational standards. This move further eroded the status of vocational training and, subsequently, the jobs to which such training led. Among the criticisms noted in "The Unfinished Agenda" was the observation that:

> The most common perception of vocational education is that it prepares youth for low-status jobs. This perception is rooted in the ancient concept of mind–body dualism.
>
> "Head" occupations generally require a 4-year college or professional degree. They have high status. Thus, courses and curricula that lead toward college also have high status and are valued by parents and students.
>
> "Hand" occupations are frequently blue-collar, don't require a college or professional degree, and have low status. Thus, high school courses that lead toward these occupations are viewed as second class or peripheral within the high school curriculum.[17]

But "The Unfinished Agenda" also pointed the way forward, describing a balanced curriculum that integrates head and hands. Over the next 30 years, the Perkins Act was updated and re-enacted three more times. The 2006 re-enactment officially changed the name "vocational education" to "Career and Technical Education," and it created "programs of study" that were specifically intended to integrate academic education and technical training in an attempt to merge the dual-streams.

The Way Forward

Throughout this account, I have highlighted some of the recurring themes of the head vs. hands debate: questions of citizenship and democracy, the value of different kinds of work, and the efficacy of one form of learning over another. Some debaters have always favored a split between education of the mind and education of the body and others have favored integration, although not always for the same reasons, or with the same ends in mind. On the surface, both sides seem to have the noble goal of creating free and self-sufficient human beings (a more modern take on salvation) and producing (or reproducing) a form of social order. My purpose is to place current questions about

16 "A Nation at Risk" report, previously mentioned, once again used education as an indicator of national preparedness and spawned decades of educational reform. https://www2.ed.gov/pubs/NatAtRisk/risk.html (accessed July 23, 2015)

17 National Commission on Secondary Vocational Education and National Center for Research in Vocational Education, *The Unfinished Agenda: The Role of Vocational Education in the High School,* Information Series (Washington, DC: Ohio State University, 1984).

the value and utility of the shop class of the twenty-first century in the context of this longstanding debate. As suggested, the issues being discussed today in regard to the role of Making in formal education have been at the core of education theory and practice for centuries, although using different terminology. If we have not answered these questions yet, what reason do we have to believe that the short history of Making can add anything new to this debate, let alone resolve it?

In fact, the shortness of the history of Making as a growing cultural movement, with design at its core, is what gives me cause for optimism. The particular qualities of Making are not the important focus. They are, after all, not so new, but are intimately connected with timeless notions of craft and labor, and even hobby and leisure. However, Making has called attention to the debate once again, and in doing so, it has provided education reformers with an opportunity that is rare in education history. As previously mentioned, we seem to be at an inflection point where technology and design are being injected into curricula, and educators and observers are anxiously waiting to see if this injection will have the promised results. However, I worry we will miss the true transformative potential of a balanced and integrated curriculum if we try to measure it in terms of high-tech machinery, or "innovation," or even individual learning outcomes. The real social value of an integrated curriculum lies in its ability to shift culture toward revaluing work and equalizing the status of those who perform it.

The notion of "design culture" articulated by Stolterman and Nelson in *The Design Way* describes a mainstream culture that emphasizes and embraces design and designers. The need for an explicit design culture arose from the recognition that current intellectual traditions and practices are not ideally suited to design thinking. Something like the design culture that Stolterman and Nelson described does appear to be emerging; the current interest in the shop class of the twenty-first century is a part of this shift. However, one crucial element of their formulation is missing from the current incarnation—the idea of design as an act of *service*.

> It is important to understand that service is not servitude. Instead, service treats the other as an equal. This does not mean being similar, as in categories of social science, or equivalent, as in egalitarianism, but equal as in equitable partnerships.[18]

The core issue seen in "The Unfinished Agenda" is the unequal status of head-work vs. hand-work. As Stolterman and Nelson describe it, service is an equalizing concept. If students learn to find elements of design in their work and see that work as an act of service to both community and individuals, then they are more

18 Stolterman and Nelson, *The Design Way*, 42.

likely to recognize those elements in the work of others. Teaching design as a transferrable skillset, teaching students to connect the head and the hands in acts of analysis and synthesis—and doing so in a collaborative culture that sensitizes them to find these common elements in all forms of work—will create more opportunities to transfer those skills between previously unrelated job descriptions and result in a more equitable distribution of that work and its rewards. Thus, the concept of service speaks directly to educational pedagogy as well. *The Design Way* suggests:

> The purpose of design pedagogy is, therefore, to learn how to gain both objective and subjective understanding on behalf of another's interests rather than in one's self-interest only. It also includes the reintegration of reflective thought and practical action in a way that unifies the knowledge of "why" with the knowledge of "how."[19]

The "reintegration of reflective thought and practical action" through design pedagogy is a connection between the liberal and servile arts—between the head and the hands—and therefore has the potential to be the bridge between the dual streams of CTE and liberal arts education that many reformers believe is needed today. Furthermore, emphasizing the notion of service as an integral part of this education has the potential to bring about a more fully realized design culture, with all the benefits for democracy that Dewey foresaw many decades ago. Stolterman and Nelson explain:

> Design is, at its root, a form of democracy: not the arithmetic democracy of majority rule or the representative democracy of elected political bodies, but the democracy of self-determination through interrelationships of service. Design is the kind of democracy that can embrace the growing diversity and complexity of human interests in today's world. Design provides the possibility that each and every person's individual good can be considered, within the framework of the common good.[20]

There is much that can still go wrong. The way forward is not set, and what the history of this debate has shown us is that the belief that stratification is necessary for the functioning of society is persistent. Even with a universal appreciation for design thinking and an accepting design culture, we still will value some acts of design, some types of design, and some designers more than others. In some ways, this valuation is inevitable and just. Sloppy and thoughtless design should not be valued equally with designs that are precisely and thoughtfully executed. Some problems are more complex than others, and some human needs are more worthwhile, and so naturally some designs are more highly prized than

19 Ibid., 46.

20 Ibid., 47.

others. The point here is not to say that all design is equal; rather, design is a part of all work, and all work done equally well should be valued equally, regardless of how we price the product.

Approaching a universal appreciation for design through an education of its theory and practice across domains is an essential step in properly valuing all work and in making sure that all workers have the opportunity to reach their full potential. This maximizing of individual potential for optimal social good is the basic thinking behind social efficiency; yet, this thinking has too often been used as a way to reinforce class boundaries. Social efficiency needs to give way to social justice. That individual learning styles differ in that some learn best through hands-on experience while others learn best through words and abstractions, naturally, is true. At the extremes, some students are better served in dual streams than others, but this fact should no longer justify separation. Society as a whole can gain by exposing a generation of learners to different styles of work. The rapid and disruptive changes in job-skills brought about by emerging technologies are likely to continue, and if the workforce is going to be nimble and adaptive enough to absorb these disruptions we must do a better job of identifying common elements across different work styles and job descriptions. Because design is a bridge between the liberal and servile arts, and the arts and sciences as well, it has the best chance of being the universal educational constant we need to create a robust and adaptive workforce that can fluidly move across disciplines and boundaries to create and pursue new opportunities.

One argument for an integrated curriculum goes beyond what is simply the most effective way to learn, the best way to prepare a student for work, or even the best way to create a free mind. The core of that argument can be found in the U.S. Supreme Court decision in *Brown v. Board of Education,* which ended racial segregation in U.S. schools, saying that "[s]eparate educational facilities are inherently unequal."[21] Of course, there the separation was along racial lines, but the statement for our purposes is no less apt. Through integrated work with both the head and hands, students are taught implicitly that the work of the hands and the work of the head are equal and complementary. Their minds are then free to pursue that which interests them the most, best suits their disposition, and, one can hope, keeps them productive and engaged throughout their lifetimes. By being the place where this integrated approach is learned and fostered, the shop class of the twenty-first century can be an incubator of cultural change, not just of technology start-ups.

21 *Brown v. Board of Education of Topeka,* 347 U.S. 483 (1954).