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INTERDISCIPLINARITY IN UNITED STATES SCHOOLS:
Past, Present, and Future

by

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Abstract: This article examines the historical evolution of the concepts of interdisciplinarity and integration in American education. We first focus on United States education in the 20th century to review the rationales for integrated and interdisciplinary primary and secondary education. We place such rationales in the context of the larger purposes attributed to education given societal changes and intellectual developments that characterized the times. Then we turn our attention to today's educational landscape and new contemporary demands on education imposed by fundamental global, digital, and environmental transformations. Here, too, we place interdisciplinary education in the broader context of emerging trends in American life—recognizing that such trends are present and may take distinct forms in other countries.

Key words: United States of America, education, educational system, interdisciplinarity, integration.

Introduction

For more than a century the concepts of integration, and later interdisciplinarity,[1] have held a significant place in the United States educational

[1] Frank (1988) relates that the concept of interdisciplinarity was forged in the early 20th century, but after the emergence of the concept of integration. Its origins are nevertheless more remote, as it dates back to the progressive establishment of the system of scientific disciplines in the 18th and 19th centuries.

system at primary and secondary levels. Both concepts have been inscribed in curricular reform under different names including *coordination*, *correlation*, *unity of knowledge, project based learning*, *discovery learning, interrelated research*, *interpenetration*, *cross-relationships*, etc., and have taken multiple forms (Klein, 1990, 1998; Pinar, Reynolds, Slattery & Taubman, 1995). The meanings, rationales, and practical implications of integration and interdisciplinarity in curricular reform have responded to the larger purposes attributed to and pressing upon education at different historical moments, as well as to prevailing intellectual developments in knowledge production at given times. Likewise, contemporary views of integrative, interdisciplinary, and transdisciplinary instruction and learning are not detached from the purposes we assign to our educational institutions, nor from the global, environmental, technological, and social concerns of today.

To examine the shifting meaning of "integration" in American K-12 education, we revisit the 20th and early 21st centuries with three questions in mind:

1. What have been the *purposes* assigned to education over the 20th and early 21st centuries, and how have these purposes shifted over time?
2. How have the concepts of integration or interdisciplinarity been defined and justified under the distinct educational agendas derived from the purposes above?
3. How have the concepts of integration and interdisciplinarity been informed by the intellectual landscape of their time?

We organize our narrative around four periods in 20th and early 21st century American education proposed by historian Patricia Graham (2005) based on the shifting assignments given to schools by American society. They include: "Assimilation: 1900-1920"; "Adjustment: 1920-1954"; "Access: 1954-1983"; and "Achievement: 1983-Present." In each case, we examine emerging views and rationales for integrated or interdisciplinary education and the larger societal and intellectual contexts from which they stem. In Part 2 we turn our attention to today's educational landscape and contemporary demands on our educational systems: e.g., preparing our youth for global, digital, and environmentally-challenged times. We review the Elementary and Secondary Education Act (ESEA) and its prospect of renewal, framing once again the role of interdisciplinary education in the broader context of emerging trends in American life.

1. Integration and Interdisciplinarity in Historical Perspective

Since the beginning of the 20th century, American society has assigned changing responsibilities to schools. Beyond a relatively stable commitment to basic literacy for all and high academic achievement for a few, schools have had to adapt to changing societal demands. In response to migrations in the late 19th century, schools were asked to teach citizenship and developing habits of work appropriate to a democratic society. They were later required to prepare children in work and academic skills. The Civil Rights movement demanded schools be able to address problems of racial segregation or economic disparity. More recently, the target (and measure) of the system's success has been the reduction of gaps in learning achievement between more and less privileged student populations. Over the century, schooling has adapted to novel demands at a slow pace. Public educational institutions were often just beginning to master one given task when societal and technological changes assigned new purposes to education (Graham, 2005).

Patricia Graham's proposed periodization of American education outlined above does not depict exacting coherent educational agendas but a complex network of aspirations and visions, often captured in critiques of existing practices or in visionary depictions of what education should look like. The shifting and overlapping teleological, epistemological, psychological, and sociological influences on the structure and content of curricula add complexity to the debates on interdisciplinarity, integration, and their many interpretations. Paired with the decentralization of the American educational system, whereby the responsibility to educate the young is in the hands of each of its 50 states, coexisting societal demands and eclectic educational responses militate against a sharp distinction of "chapters" in American education. Our periodization of the interdisciplinarity debate is, therefore, more heuristic. Beginning dates and ending moments are blurred, but driving orientations and influences prove telling.

1.1 Assimilation: 1900-1920

Formal pre-collegiate schooling institutions had existed in America since the foundation of Boston Latin School in 1635. Public schools created to educate working class students only emerged in the early 1800s. The "common school" curriculum contrasted with its previous counterpart. It turned its attention away from the study of the classics and toward

preparation for business, mechanics, and engineering trades. By mid-century, the Massachusetts Compulsory Attendance Statute (1852) was the first piece of legislation making public schools mandatory. It stipulated that "Every person who shall have any child under his control between the ages of eight and fourteen years, shall send such child to some public school within the town or city in which he resides, during at least twelve weeks."

By the turn of the 20th century Horace Mann's vision of "common schools" had been realized in cities, towns, and most Northern and rural areas of the United States of America. Subsidized by taxes, these schools were expected to enroll at once the children of the "common people" and the leaders of their community. Schools were to offer a universal curriculum applicable to all. Common schooling was intended to create good citizens, unite society, and prevent crime and poverty. These schools were directly impacted by the massive migratory movement that brought more than 18 million people largely from Northern and Southern Europe to America between 1890 and 1920. The *assimilation* of a large number of immigrant children, whose parents viewed their children's education as the path to success in the new land, became a core agenda for education. Assimilation meant Americanization and the formation of citizenship values and virtues:

> In 1900, Americans understood that theirs was a nation that characterized itself as a democracy though its unity had recently been challenged by the Civil War, by Reconstruction and now by large numbers of foreigners who sought to live here. The nature of democracy meant that the populace, both citizens and citizens to be, had a voice in its destiny. School teachers and administrators understood their job was to assure that the predominant voice was virtuous; a little but not much knowledge would suffice for most. (Graham, 2005, p. 19)

The assimilation project challenged, and in a large measure replaced, the British Humanist curricular emphasis on knowledge for knowledge's sake rooted in the Enlightenment that had permeated schooling and tutoring practices until then. British Humanism, an older multidisciplinary model symbolically spearheaded by Cardinal Newman (1907, 1909), had engaged students in the study of Latin, Greek, and mathematics, with some attention to moral philosophy, metaphysics, English composition, and *belle lettres* in the high school years. This new orientation concerned with the social utility of education, championed by Whitehead (1929), represented a shift

in educational conceptions, based on progressivist movements, and opposed to traditional humanist conceptions advocating cultural, academic, and non-utilitarian education (Rudolph, 1977), stemming from the traditional cultural and humanist British conception of education.

American society had experienced two revolutions that were consequential for education: the *Industrial Revolution* and the *Darwinian.* The Industrial Revolution had transformed the social fabric and the life course of individuals in the major urban centers. It called for a utilitarian emphasis in education: "[t]he American public schools were created over 100 years ago to prepare citizens for jobs in an industrial economy" (Pinar, 1998, p. 205). By the turn of the century this included immigrant children who would benefit from a more practical and useful curriculum. The assimilation project was empowered by industrial metaphors of efficiency, standardization, management, and utility. Education at the turn of the century was characterized by emerging attention to its social utility, rooted in the writings of Parker, Quincy, Ward, Whitehead, the Herbartians, and Dewey, among others (Cicorrio, 1970; Kliebard, 1986, 1992*a*, 1992*b*; Rudolph, 1977; Tanner, 1989; Tanner & Tanner, 1990). Overall, assimilating newcomers demanded *preparing them for life in America*. Immigrant children's achievement and potential could not be measured through the mastery of the linguistically-laden 19th century curriculum. The new curriculum would have to prepare old and new citizens to adaptive and participatory democratic life.

In the intellectual realm, the *Darwinian revolution* had drastically divided the world of ideas. It shed doubt on the prevailing humanist education tied to aristocratic origins (Rudolph, 1977, p. 14). But most importantly it installed "evolution" writ large as a lens through which reality could be productively explained, yielding interest in matters such as the "evolution" of knowledge in history and the "evolution" of knowledge and the "evolution" (that is "development") of the child. Both "revolutions," industrial and Darwinian, were to inform educational efforts and the dominant conceptions of curricular integration in the decades to come.

What did "integration" mean in the *assimilation* era? Various studies identify the roots of a more utilitarian purpose of education in the writings of Herbert Spencer, William James, and Alexis Bertrand in the 19th century (Ciccorio, 1970). According to Beane (1997), Ciccorio (1970), and Knudsen (1937), the term *integration* was first used in the United States in 1855 by Herbert Spencer (1870). Spencer's response to the question "what knowledge is of most worth?" was deeply influenced by his interpretation of the theory of evolution. He, and later the Herbartians, extrapolated the evolutionary

principles of adaptation and selection to the genesis of knowledge forms, hypothesizing that the evolution of knowledge in individuals followed the same path as the evolution of knowledge in society.

Evolution proved to hold intellectual power and curricular authority as a cross-secting transdisciplinary concept. Blurring the boundaries between common sense knowledge and "aristocratic" knowledge (Kliebard, 1992*a*, 1992*b*), Spencer's *Synthetic Philosophy* of knowledge viewed all forms of science specialization as rooted in a common trunk of knowledge also tied to language and arts. In his view, a history of the development of the sciences was to inform education by providing a *natural progression* for the presentation of content that correlated with student interests. Such progression was integrative, leaving specialization for later in life. Viewing education as a means toward the larger goal of human self-preservation, Spencer proposed a curriculum that prepared individuals for categories of human activity directed in more or less immediate ways to meet such a goal. The curriculum put a premium on understanding matters such as food production, steam engine and furnace efficiency, railways and carpentry, money markets or war, employing knowledge of biology, mathematics, and physics of "science of society" as independent but correlated subjects when a more sophisticated response was required. Poetry and the arts, considered ornaments and leisure activities, were least prominent in Spencer's science-driven curriculum (Kliebard, 1992*b*).

Spencer's emphasis on preparation for democratic life in industrial America was aimed at *social integration* (Beane, 1997), at least at the elementary school level. Industrial values of efficiency led to the tracking of secondary school children into vocational and academic realms, both considered legitimate educations. A student could obtain a secondary education diploma either by studying biology, algebra, geometry, English, history and a foreign language for four years or by enrolling in four years of shop education including agriculture or home economics—all with few English requirements. Academic "knowledge" reached only a small number of students, while the expectations of "virtue,"—i.e., punctuality, regular attendance, teamwork, honesty, and hard work—were common for all. In both tracks, citizenship was construed in democratic-assimilationist terms.

Spencer's thoughts had roots in Johann Herbart's (1776-1841) philosophy. His followers at the end of the 19th century and in the first half of the 20th in the Herbartian Society advanced the notion of *final integration*—students' capacity to unify and apply fragmented knowledge toward the end of their training (Dutton & Snedden, 1912). Herbartians emphasized *concentration*,

(the organization of the curriculum into *topics)* and *correlation* between academic disciplines (Connole, 1937; Pinar et al., 1995). Correlation was defined as "the recognition of the natural relations existing among the various departments of human activity and such an arrangement of these departments for the presentation to the child, that all his knowledge shall stand clearly in mind in its true relation to the whole, and to each of its parts" (Ciccorio, 1970). For example, in a classic Herbartian curriculum, "fish" could function as a concentration or theme, and daily activities in geography, arithmetic, science, and literature would revolve around the topic aiming at some form of unification (Kliebard, 1992*b*).

The utilitarian orientation that characterized the *assimilation* project held in itself the kernel of the period that followed. Growing attention to science and evolution yielded interest in the developing child and unease about the rigidity of the vocational education of the turn of the century. Some began to raise questions about the flexibility with which graduates would be able to move across trades. Furthermore, the American South remained primarily rural and somewhat impermeable to the universalist effort in education that was present in the North, creating an opportunity gap that would only come to the fore decades later.

1.2 Adjustment: 1920-1954

The end of World War I shifted national priorities in the U.S. While democratic values were still challenged in the South (with the re-emergence of the Ku Klux Klan, Jim Crow practices, and lynchings), the decade of the 1920s was a period of growing wealth and a modicum amount of optimism in America. Democracy was seen, at least in the North, as a rather stable shared principle for political and social organization, and immigration had diminished almost to a halt. "Assimilation" ceased to be an educational priority, with pundits proclaiming that the project of assimilation had been completed (Graham, 2005).

Growing attention to the developing child, *his*—note the gender specificity—interests and talents, shifted educators' attention from schools that would serve the needs of American democracy to schools that would ensure the well-being of children. Education found a new partner in the rapidly growing discipline of psychology. The purpose of education, as stated by the Progressive movement that dominated educational thought during this period, was to nurture not merely children's intellectual development, but primarily their social, emotional, physical, and spiritual growth—to help

them *adjust* to life. The drastic change in emphasis from "democracy" to "the whole child" brought about key reorientations: Leading educational scholars had a greater role to play in articulating research-based child development theories and devising tests to measure intelligence and thus "personalize" education by tracking students. Educators increasingly responded to the demands of affluent and educated parents seeking supportive environments for their children. During the Great Depression such nurturing environments were especially sought after by the elite.

Curricular priorities also changed away from what was perceived as the rigid assimilation curriculum that prioritized English, mathematics, and science, to one that highlighted the arts and music, as well as learning through projects and outside of school. Virtues of punctuality, attendance, neatness, and legible handwriting were replaced by virtues of creativity, spontaneity and self-expression, honesty, and teamwork. In the Progressive movement the concept of integration referred primarily to the integral experience of the child, a rapidly adopted view of "the child as a whole." As Harold Rugg proclaimed in 1928, "education in the century of the child aims at nothing less than the production of individuality through the integration of experience" (Graham, 2005, p. 53). The curriculum expanded accordingly over the decades. Integration was to bridge multiple dimensions of human experience (social, emotional, physical) as well as multiple environments for learning (in and out of school).

The Depression years witnessed accelerated demographic growth in American high schools. In 1930, 29% of 17-year-olds graduated from high school. By 1940 that percentage had risen to more than 50%. Most of these students were children of the working class who were unable to find employment and therefore remained in school. Typically ineligible for an academically demanding curriculum, these students required a curriculum that emphasized virtue over knowledge to ensure their *adjustment* to life. Courses that had been central to the assimilation project—chemistry, physics, algebra, or European history—became optional. English classics like Shakespeare were replaced by "easier" material in courses entitled "communication," "speech," or "journalism," blurring disciplinary boundaries and their importance (Kliebard, 1992*b*).

Dominant views of the need for an integrative experience were informed by intellectual developments of the time. A growing body of scientific studies of child development was shedding light on children's interests and abilities. The personalization of instruction to meet the children's needs became *de rigueur.* Intellectual ability tests that had been originally designed

for military recruitment offered a new "scientific" (test-based) rationale for grouping students into academic, vocational, and general tracks for a more personalized educational offering. Scholarly voices from leading institutions such as the University of Chicago and especially Columbia's Teachers College, were key in defining the educational agenda of the adjustment era while the American public, more immediately concerned with economic survival, would leave education to these experts (Graham, 2005). Dewey was arguably the first pedagogue to advocate academic interdisciplinarity as systematically as he did and to associate it with the concept of integration. He reacted against 19th century approaches to teaching which he viewed as incongruent with the experience of the child (now in sharp focus). Dewey proposed that "[a]part from the thought of participation in social life the school has no end, nor aim" (Dewey, 1962, p. 137). In his view social life was to guide the establishment of programs' form and content: "This social criterion is necessary not only to mark off the studies from each other, but also to grasp the reasons for the study of each and the motives in connection with which it should be presented" (Dewey, p. 150). Dewey envisioned school that would be organized as a small society where fundamental principles of all harmonious social life could be exercised and nurtured.

Defining this era in American education, Dewey believed the function of learning was to facilitate the progressive *adaptation* of each child to its social milieu. Accordingly, an educational theory was to be centered on interest rather than on the discipline (the subject). With the child as a point of departure, "material was to stretch back indefinitely in time and extend outward indefinitely into space" (Dewey, p. 92). Teachers were to be "concerned, not with the subject matter as such, but with the subject-matter as a related factor in a total and growing experience" (Dewey, p. 110). Courses of study would merely constitute perspectives and guidelines for teachers. They were to inform teachers' efforts to link the cultural heritage acquired through "the matured experience of the adult" (Dewey, p. 91), and the dynamic of the development of the child, "an immature, undeveloped being" (Dewey, p. 91) seeking self-realization who apprehends experiences globally, and "is not conscious of transition or break" (Dewey, p. 92).

To arrive at this flexible meeting point between the child's experience and the cultural legacy, Dewey advanced a pragmatic approach, the "Project Method," later to be developed by his disciple W.H. Kilpatrick, whereby *learning by doing* is carried out, thus prioritizing concrete activities for the child that are required by the living environment. Illustrating the emphasis of this era, Dewey's lecture on "Social Aspects of Curriculum" applauded

the introduction of *occupations* such as cooking, sewing, and household management into the curriculum, conceptually reframing the Herbartian notion of subject *correlation*. Herbart had proposed a curricular approach to education built on *concentration*—i.e., the positioning of specific subjects like history or literature at the center of the curriculum— and *correlation,* an effort to find meaningful connections across the curriculum. Concentration and correlation interacted well in a curriculum that took historical epochs as its form of organization (Pinar et al., 1995). Taking the child as the center of his curricular efforts, Dewey argued for a particular view of *correlation.* He proposed the correlation between educational opportunities at home and in school and through agencies in the community. In his interpretation of *correlation*, epochs or occupations were not to be presented in school as a way to prepare students for a future adult life, nor as a point of forced correlation of subjects. Rather schools were to be places where students engage in activities and projects of intrinsic interest to them and general cultural value to society, places where children encountered opportunities to reflect on such occupations. Most interestingly, Dewey viewed students' engagement with everyday life outside of school as a way for them to come to understand the practical origins of subjects like arithmetic, geography, literature, or the arts.

Dewey and his contemporaries saw promise in the integration of areas of knowledge designed to offer a holistic learning experience. Some domains presented themselves as naturally integrative. For instance, Dewey wrote about the teaching of cultural history as a "sort of moral telescope" (Kliebard, 1992*b*, p. 79) on present human experience where children learned about how people lived, how they came to live as they did, and the difficulties they encountered over time. He viewed geography, in turn, as the "theatre of life" with an emphasis on human value (Kliebard, 1992*b*, p. 79). These ideas were reflected in practice as well as areas of knowledge that were integrated with a holistic approach to human experience in mind: The merging of history and government gave rise to "social studies" as a study of past and present human behavior. Ultimately English and social studies would give rise to "core subjects" or a "core curriculum" providing students with a unified examination of human experience (Klein, 1998; Vars, 1991). In an effort to also *adjust* curricular content to the interests and abilities of children, making works of art, learning by doing, creating maquettes of ancient civilizations became the pedagogy of the day, especially for the middle and upper classes.

Attempts at curricular reform undertaken at the national and state levels supported the recourse to integrated approaches in the academic curriculum.

The National Education Association (NEA) hoped that this approach could be used as a model for educating all of America's youth (Gehrke, 1991; Klein, 1998). In the context of the debates, Hopkins (1937) presented the results of an eight-year experimental and comparative study showing that students who had been exposed to this form of interdisciplinary teaching demonstrated greater intellectual curiosity and obtained better grades in college than their peers who were not exposed to this type of teaching. These results, however, had little impact on subsequent academic orientations (Kain, 1993).

"By the end of WWII," education historian Diane Ravitch concludes, "progressivism was the dominating educational ideology" (Ravitch, 2000 p. 7). However, growing unease about the lack of academic rigor in American education was beginning to be evident among journalists, elite parents, and the public at large. By mid century, American anxieties linked to the Cold War resulted in a full blown critique of the *laissez faire* approach of the adjustment era and its associated disregard for traditional academic subjects (Graham, 2005).

1.3 Access: 1954-1983

If World War II brought home America's deep commitment to democratic life, it also revealed the unfinished nature of the democracy project in the homeland. According to Patricia Graham, three problems dominated American education by mid-century: racism that had for decades fueled the segregation of schools; low academic achievement for most students; and especially poor academic opportunities for low-income students who needed them the most. The *access* era focused on making programs available to disenfranchised populations, now conceived as having the right to a better education. The Civil Rights Movement centered on desegregating schools so that African American children would have access to schools only available to white youth until then and presumed to offer a better education. Other minorities such as handicapped children, gifted children, and girls too fought for access to programs that were perceived as better and only available to non-handicapped, elite children, and boys, respectively. *Access* to programs did not mean close scrutiny of educational outcomes yielded by such programs.

While public attention was naturally captured by the civil rights conflicts about *access*, efforts to strengthen the American curriculum, especially for college-bound students, were underway. Such efforts stemmed from the

overall unease with the perceived lack of rigor of the Progressive curriculum. Such efforts had been dramatically catalyzed in 1957 when at the height of the Cold War, the then Soviet Union launched the satellite Sputnik and later in 1961 sent the first human into space and brought him safely back. America had no comparable space program or capacity. The news ignited a curricular revolution focused primarily in science and mathematics. School critics demanded rigorous intellectual work and research as the goal of a secondary education for college-bound students as a matter of national security. Leading post-secondary academic institutions in the country such as the Massachusetts Institute of Technology became models of quality in science, technology, and mathematics education. Federal agencies and philanthropic foundations converged in the generous funding for curricular reform.

The reform took a strong disciplinary turn away from prior calls for integration or interdisciplinarity. Disciplinary boundaries became less permeable at this historical point. Founders sought curricular reform leaders among disciplinary experts, not professors in education. Under the aegis of intellectual rigor, chemists, physicists, and mathematicians gathered to develop curricula and materials for schools. As Patricia Graham describes, groups such as the Physical Science Study committee led by MIT physicist Jerrold Zacharias attracted leading minds in their disciplines and committed to developing a "first class curriculum" geared primarily to the pre-collegiate elite. The curriculum would reflect experts' view of the underlying structure of each discipline and represent the best theories, concepts, or tools available at the time. For some, the mission had clear nationalist undertones. In Graham's account, "Zacharias sought to accomplish this with a group who would Americanize intellectual life showing that a physicist is not a Hungarian with a briefcase talking broken English but […] somebody who spoke English with no accent, who was one of the boys" (Graham, 2005, p. 123). As interdisciplinary education scholar Beane (1997) points out, "without much resistance, the disciplines of knowledge (and especially science and mathematics) were put back on the pedestal they had enjoyed before 1918" (p. 30). Yet one should clarify that the meaning and purpose assigned to "disciplinary education" had shifted in the preceding decades, as had conceptions of learning and the child.

A focused "first class disciplinary curriculum" was un-attentive to the cultures of school, the eclecticism of practice, the interests of students, or the preparation of teachers to teach the subject matter proposed. Teachers were soon deemed generally incapable of serious teaching, so educators

and the public looked for solutions through curricular development rather than through the professional development of teachers. As in previous eras, educational solutions at the time were informed by academic conceptions of knowing and learning. "Behavior" had rapidly replaced "experience" in the studies of human development and societies. Behaviorism had captured the imagination of social scientists with its commitment to objective (and therefore scientific) accounts. To be respectable, the social sciences were to limit their claims about human beings to observable conduct. "Experience," "thoughts," or "emotions" were generally seen as too subjective to be considered objects of scientific inquiry. Changes in behavior could be ensured through a carefully planned program of punishment and rewards. The pedagogical corollary of the behaviorist planning was the "teacher-proof curriculum." Stating exact behavioral learning objectives, disciplinary materials themselves were seen as able to organize students' learning without significant intervention by the teacher.

What role did interdisciplinarity play, if any, against the background of the access period's disciplinary turn? In academic circles, a new era of reflective discussions of interdisciplinary research was beginning. The rapid professionalization of disciplinary communities in academic circles triggered concern about the growing fragmentation of lines and modes of inquiry. As Hausman (1979) rightfully points out, "The concept of interdisciplinarity and the controversies over its meaning and functions are of relatively recent origin" (p. 1). Chubin, Porter, Rossini, and Connolly (1986) situate the beginning of these debates in the 1951 publication of an article by Caudill and Roberts (1951), "Pitfalls in the Organization of Interdisciplinary Research." On a somewhat humorous note, Frank (1988) advances that "'Interdisciplinarity' was probably born in New York City in the mid-1920s, most likely at the corner of 42nd and Madison" (p. 139), as the Social Science Research Council had established its offices at this location in 1923, and its primary objective was, according to Charles E. Merriam, its first chairman, ordinarily to "deal only with such problems as involve two or more disciplines" (Frank, p. 147). The birth date is hardly consensual. Stills (1986) observes that the word "interdisciplinarity" appeared for the first time in 1937 in the writings of sociologist Louis Wirtz. Similar constructs were in the air as when the United States National Academy of Sciences called for a "crossing of disciplines," and Yale University's American Council of Learned Societies concluded "it is probable that the Council's interest will continue to run strongly in the direction of these inter-discipline inquiries" (Stills, p. 17).

At a time of clear disciplinary emphasis in curricular development that followed Sputnik, interdisciplinary instruction found its way into education in the 1960s and early 1970s through numerous experimental efforts (Klein, 1990; Vertinsky & Vertinsky, 1990; Cerroni-Long & Long, 1995). One such effort was the groundbreaking humanities curriculum developed by one of the fathers of the cognitive revolution in psychology and education: Jerome Bruner (1965). *Man: A Course of Study* epitomized a comprehensive and disciplinarily informed exploration of human life. Widely taught in the 1970s, this curriculum drew heavily on anthropology but included insights from psychology, biology, or the arts to explore three fundamental questions: What makes humans human? How did they come to be so? How could they be made more so? An exploration of the life cycle brings together comparative analyses of animal life from Pacific salmon to herring gulls and baboons to examine the relationship between nature and nurture, i.e., biological endowments vs. learned cultural behavior. Attending at once to the structure of the disciplines involved and the learning processes of the child, this curriculum and others that followed its path embraced a spiraled design by which students were to see and revisit core concepts over time at developmentally appropriate levels. Underlying this curricular design was Bruner's premise that all knowledge could be taught in an intellectually respectable manner to children of all ages, as long as it was taught in developmentally sensitive ways.

Beane (1997) remarks that it is during the first part of this period that some major works reinterpreting the notion of integration appeared (Hopkins, 1954; Henry, 1958; Ward, Suttle, & Otto, 1960). They solidified the view that an "integrated" curriculum was to be seen as the integration of academic subjects, centered on the integration of the content of a course of studies rather than on the integration of learning experiences that had dominated the Progressive era. However, Tanner and Tanner (1990) noted that the concept was weakened by mainstream curricular reforms in the 1950s and 1960s that emphasized disciplinary structures.

In sum, the *access* era in American education was defined by two fundamental forces which imposed often conflicting demands on education. On the one hand, the Cold War, ever-present in people's minds and political rhetoric, justified the urgent development of rigorous academic programs in the disciplines. On the other hand, the Civil Rights Movement demanded the integration of all children in traditionally white, high-achieving schools. More disciplinary than integrative, the first decades of the "access era" saw an unprecedented growth of special curricula and programs (some

interdisciplinary) in public schools. Not all children benefited equally from such programs however. Schools had been desegregated by law but had re-segregated as a matter of fact due to housing choices. De facto differential access to quality disciplinary education during this era would serve as a catalyst for interdisciplinary approaches in movements for socio-political justice and new identity fields in the 1960s-1970s. Special programs were often offered in the form of *pullout*, systems by which eligible and prepared students are taken out of the class to receive additional and more personalized instruction. Overall, curricular reform during this era had consisted of a less than coherent collection of courses and programs offered to students in various educational "tracks." In the 1960s and 1970s policy studies in education began to focus on the evaluation of the programs that had so rapidly developed. Particular attention was paid to the learning achievement of children of varying socioeconomic and ethnic backgrounds. Were desegregated schools effectively narrowing the differences in learning between minority and high-income populations? The persistent tension between excellence and equity was to reshape the debate in education into the 21st century.

1.4 Achievement: 1983-Present

"A Nation at Risk" (National Commission on Excellence in Education, 1983) was a landmark report on the status of American education toward the end of the century. Unlike most federally commissioned reports of this kind, this one was to shape policy and academic research in education for the decades to come. The committee documented the dual failure of the American educational system, both in terms of excellence and equity. The report characterized American secondary education as a large cafeteria where students were able to choose up to 50% of their courses. Over the previous decade, students had lowered their expectations in large numbers, migrating from vocational and college preparatory programs to "general track" courses that addressed topics like personal finances, bachelor life, and health and were often falsely conflated with "interdisciplinary" approaches. The committee viewed this "curricular smorgasbord," where students failed to take advantage of the most demanding courses at their disposal, as a central factor in the failure of the system. "Our society and its educational institutions seem to have lost sight of the basic purposes of schooling, and of the high expectations and disciplined effort needed to attain them," claimed the report. The committee argued that, in order to prepare American youth

for a rapidly growing competition for markets and leadership with Japan, Europe, Canada, and other post-industrial societies, the educational system needed to produce much better educated people.

Test result comparisons led members of the Commission to conclude that the nation was "raising a new generation of Americans that is scientifically and technologically illiterate." It warned of "a growing chasm between a small scientific and technological elite and a citizenry ill informed, indeed uninformed, on issues with a science component" (National Commission on Excellence in Education, 1983). Commissioners viewed the path forward as marred by conflicting views of what mattered most for learning. For some, rudiments such as reading and computation should not come at the expense of essential skills such as "comprehension, analysis, solving problems, and drawing conclusions." Others expressed concern about an over-emphasis on technical and occupational skills and little time for studying "the arts and humanities that so enrich daily life, help maintain civility, and develop a sense of community." Still others recommended a fluid dialogue between the science and the humanities. They argued that the humanities need to play a role in science and technology if the latter were to remain creative and humane, just as the humanities need to be informed by science and technology if they were "to remain relevant to the human condition" (National Commission on Excellence in Education, 1983).

In academic circles, the report confirmed the deeply held belief of scholars subscribing to "the cognitive revolution" (Gardner, 1985). Understanding how people learn required more than examining their conditioned behavior Scholars working in disciplines that ranged from anthropology to linguistics, psychology and artificial intelligence had highlighted the importance of "opening the black box" of cognitive processes in learning. Educational psychologists examined the robust schemas and beliefs that children tend to construct early in life and that proved difficult to eradicate and replace with more informed understandings. Students may repeat information they had learned for a test, these scholars proposed, but remain incapable of applying this information flexibly in even slightly novel situations. Research in cognition flourished, shedding light on "domain-specific" (i.e., disciplinary) and domain-general learning. If during the access years scholars had attended to the nature of disciplines, the cognitive revolution now offered a battery of approaches to studying the human mind and delivered rich findings in scientific, mathematical, linguistic, and historical understanding. A generation of studies of domain-specific student misconceptions documented the challenges of disciplinary understanding. Learning to move beyond everyday

or common sense thinking in order to access and use the rich interpretive frameworks offered by the disciplines demanded more than the transmission of information. It required changing minds through deliberate instruction. Such instruction would engage students productively in the "unnatural act" of understanding history (Wineburg & Grossman, 2000) or the "counter-intuitive" experience of understanding the physical world (Gardner, 1991).

The report shaped the public educational conversation in the decades that followed by providing a clear economic rationale for education. Education was now seen as good for economic growth as well as for the financial well-being of learners. Business leaders sought better educated workers and the system committed to delivering them through a reform that was centered in clear and common disciplinary standards. Patricia Graham (2005) characterizes this transition eloquently:

> The rationale for education was rapidly narrowing from one that supported education for what it could do for the nation (make better citizens) to what it could do for the company and the individuals (get and do a better job). As the purpose of schooling narrowed, so did the measure of educational quality. What counted now was one's test scores in standardized [disciplinary] tests. (p. 166)

Across the nation, the early 1990s witnessed the soaring development of state standards—achievement objectives by discipline in each state. A productive "Goals 2000" federal initiative (1998) enlisted the expertise of various disciplinary communities to help educators understand what mattered most for learning in domains such as biology, physics, history, and mathematics. Their reports offered dynamic characterizations of disciplinary expertise that emphasized a few key rich conceptual problems (e.g., ecosystems, evolution), rigorous modes of thinking, knowledge applications, and reminders of the dynamic and provisional nature of knowledge in a domain. Drawing mostly on existing curricula and partly on experts' reports, standards represented state-level consensus on "what students should know and be able to do" in areas like reading, writing, mathematics, science, history, and the arts. The setting of standards was accompanied by the creation of standardized tests to measure student achievement. The psychometric requirements of tests designed to yield unprecedented information on student learning across students, grades, schools, and districts within states yielded an instrument able to capture how much information students have and can recall. More discerning measures of *understanding*

as the capacity to *think flexibly and insightfully with* disciplinary knowledge remained at the discretion of teachers and schools. In a similar vein, exemplary interdisciplinary curricula such as *Man: A Course of Study* or *Facing History and Ourselves*, a study of genocide and democracy in the 20th century, remained as ad hoc school-based initiatives. Teachers were left with the task of linking the rich representations of problems offered by these curricula and the itemized standards they were required to teach. Standards, increasingly dominating the America educational world, limited the status and presence of interdisciplinary and integrative approaches leading to what Beane describes as a new reductive multidisciplinary focus.

By the end of the 20th century the standards movement in American schools that coexisted with fundamental transformations in American life was beginning to pose new demands on education. A new wave of globalization had begun to transform the lives of children and youth in America and the world over; the creating of the Internet was rapidly giving rise to a new digital age; and growing anxieties about environmental sustainability were beginning to put a premium on environmental stewardship. Addressing these new demands would require reconsidering Spencer's question—What knowledge is of most worth?—and examining the role that disciplines and interdisciplinary curricula might play in the decades to come. Against the background of these transformations the American educational policy makers prepare for the reauthorization of the national Elementary and Secondary Education Act at the beginning of the 21st century.

2. Integration and Interdisciplinarity: Present and Future

At the dawn of the 21st century, the American public educational system finds itself in transition. The standards movement has been institutionalized at scale nationwide. As a National Research Council report says

> Every state in the United States today has its own standards for education from kindergarten through grade 12, at least in core subjects. Some are based on content standards developed by professional societies in mathematics, English language arts, science, civics, foreign languages, and other academic subjects. This abundance of standards reflects a vigorous response to the call for high standards in *A Nation at Risk.* (National Commission on Excellence in Education, 1983, p. 1)

Twenty-five years after the report that triggered the *achievement* era, Americans are assessing the role that standards are playing in curriculum and instructional practice. We can now evaluate their impact on student learning in terms of quality, equity, and implementation. Studies suggest that the standards movement has yielded greater attention to the academic performance of disadvantaged students as measured by state tests. States have reported reductions in the achievement gap; more uniform state-level education systems; and some efforts toward instruction that is tailored to the needs of individual students. At the same time, researchers have detected significant variation in how *"proficient"* performance standards definitions and actual achievement are across states. A significant proportion of students who by state-based measures demonstrate progress in achievement do not do so when their performance is measured by a common national test (National Assessment of Educational Progress). Observers have pointed out the risks of an assessment-, rather than standards-, driven educational reform, whereby teachers, administrators, publishers, and parents, organize instruction with performance tests rather than quality disciplinary or interdisciplinary standards in mind (National Research Council, 2008).

Critics of the No Child Left Behind (NCLB) law have warned that the demands of accountability have had dangerous consequences on curriculum and instruction and as a consequence on the education of our young: NCLB has yielded: (1) an emphasis on reading and mathematics to the detriment of disciplines like history, science, or the arts, and (2) a reduction of complex disciplinary knowledge and inquiry to basic facts and skills to be memorized. In her most recent book, Diane Ravitch (2010), a former supporter and champion of NCLB, describes clearly how the movement originally aimed at ensuring high quality disciplinary education for all students is now exhibiting consequential flaws:

> Because the law demanded progress only in reading and math, schools were incentivized to show gains only on those subjects. Hundreds of millions of dollars were invested in test-preparation materials. Meanwhile, there was no incentive to teach the arts, science, history, literature, geography, civics, foreign languages or physical education [...]. In short, accountability turned into a nightmare for American schools, producing graduates who were drilled regularly on the basic skills but were often ignorant about almost everything else. Colleges continued to complain about the poor preparation of entering students,

> who not only had meager knowledge of the world but still required remediation in basic skills. (Ravitch, 2010a)

Today's public debate over the reauthorization of the National Elementary and Secondary Education Act takes place against the background of profound societal, technological, and environmental transformations that are, once again, imposing new demands on our educational system and calling for a renewed debate about the very purpose of education, one in which interdisciplinary learning may prove to be key.

A rapid process of globalization (the accelerating traffic of people, capital, and cultural products around the world) presents new opportunities and risks. New global labor markets are opening for the young, but they are doing so in unequal ways. Competencies like expert thinking, group learning, and complex communication are becoming the new survival tools. Migration is again reaching large proportions and changing the demographics of classrooms and neighborhoods alike. Media and trade, too, are increasingly bringing distant people and cultures into contact. They open opportunities for new forms of intercultural learning and exchange, but also generate fear of the unknown. Increasingly interconnected societies require educational systems that prepare globally competent individuals: that is, young men and women who understand the transformations defining their lives and who are able to reflect and act on past, present, and future issues of global significance. Responding to the new demand, organizations like Facing History and Ourselves have updated their interdisciplinary curriculum offerings to include serious examinations of questions of immigration and civic responsibility addressed through the lenses of history, comparative religions, and the arts (see www.facinghistory.org).

The digital revolution has created important opportunities for learning and instruction: It is "bringing the world into the classroom"; opening access to diverse and distant sources of expertise; and enabling learners to customize learning, create new social networks, and make virtual realities a part of daily life. With opportunities come important challenges: Access to the new digital worlds is unequal; information is excessive and often of dubious quality; digital environments invite ethical and unethical behavior alike. The digital revolution is imposing novel demands on education. It requires the formation of individuals who are able to access and filter information digitally, collaborate across barriers of space, culture, and language, and capitalize on new opportunities for digital inquiry, political participation, and artistic expression.

Worrisome environmental challenges of our times are providing a new framework for curricular change. Growing recognition of the ecological, societal, and economic consequences of climate instability has yielded unprecedented efforts in environmental education. Leading federal funding agencies, like the National Science Foundation as well as academic and grassroots organizations, have committed to developing a generation of youth who understand the tender balance of the biosphere, the requirements of sustainable life on the planet, and the need for proactive individual and collective stewardship. As with globalization and the digital revolution, the environmental challenges we face today are redefining the expected graduate profile in K-12 education, inviting a review of the purposes that drive our efforts. In this case, too, the call for interdisciplinary curricula is clear among experts who understand environmental problems in depth. For instance, the National Science Foundation terms its newly released framework for climate change education an "opportunity for interdisciplinary teaching." In turn the National Research Council (2009) is proposing a "New Biology" education that places interdisciplinarity on center stage:

> The essence of the New Biology, as defined by the committee, is integration—re-integration of the many sub-disciplines of biology, and the integration into biology of physicists, chemists, computer scientists, engineers, and mathematicians to create a research community with the capacity to tackle a broad range of scientific and societal problems. Integrating knowledge from many disciplines will permit deeper understanding of biological systems, which will both lead to biology-based solutions to societal problems and also feed back to enrich the individual scientific disciplines that contribute new insights. (p. 3)

The corollary of these social and technological transformations is the emergence of a new kind of learner and desired graduate profile. These learners include "neomillennial," "globally competent," "environmentally-aware," and "career- and college-ready" individuals able to access and filter information digitally, collaborate across barriers of space, culture, and language, and capitalize on new opportunities for environmental inquiry, political participation, and artistic expression. Such 21st century learners and professionals will clearly benefit from interdisciplinary competence: the capacity to use and integrate insights from multiple areas of expertise to explain phenomena, create products, and solve problems that do not easily fit within particular disciplines or areas of expertise.

Many teachers in the United States public school system find themselves at a crossroad of historical proportion. They are requested by their state to measure student achievement through isomorphic test responses aligned with No Child Left Behind. Yet such measurements contrast sharply with the dynamic new interdisciplinary approaches to learning valued by contemporary societies. Looming large behind our current and legitimate concern with the achievement gap is a more consequential source of inequality: the "relevance gap"—that is a measure of the significance of what students learn, in light of their preparation for life (Perkins, 2010; Gardner, 2008).

The K-12 standards were conceived as a discipline-based movement. Today, aided by the NCLB accountability requirements, standards are often implemented in ways that challenge the integrity of disciplinary thought. To date the movement has sidestepped serious engagement with interdisciplinarity, leaving interdisciplinary curricula and education in the hands of independent initiatives. For example, the International Baccalaureate Middle Years Program taught in numerous American schools is designed to integrate disciplinary learning in focal inquiry areas such as understanding the environment, community service, human ingenuity, or social relations and health. Other examples are: The Facing History and Ourselves curriculum mentioned above; and The Partnership for 21st Century Skills, whose emphasis on work readiness includes a preparation in life and career skills, learning and innovation skills, and information media and technology skills applied to core subjects (e.g., math, history, English) and "21st Century (interdisciplinary) Themes." By offering a curriculum that meets the demands of our times these initiatives are increasingly drawing attention to the centrality of interdisciplinary approaches to the study of our world today. Of special interest and particular systemwide promise is the recent articulation of a voluntary framework for global competence—an initiative led by the Council of Chief State School Officers and the Asia Society in collaboration with representatives from 26 states. These new standards place disciplinary and interdisciplinary understanding of issues of contemporary global significance at their center. Among key global competencies, such as *investigate the world, weigh perspective, communicate ideas,* and *take action,* students will be required to *apply disciplinary and interdisciplinary expertise:*

> Globally competent students learn to think like historians and scientists and artists by using the tools and methods of inquiry of the disciplines. [It also] requires the ability to understand prevailing world conditions, issues, and trends through an interdisciplinary lens, in order to understand the interconnectedness of particular issues and

> broader themes with subtle nuance. A competitive advantage will go to those students in San Francisco or São Paulo who know what's going on in the world, can comprehend the interconnectedness of environmental, financial, social, and other systems, and understand how the relative balance of power between societies and cultures has significant short- and long-term consequences. Educating students for global competence requires substantive, developmentally appropriate engagement over time with the world's complexities. (Council of Chief State School Officers and the Asia Society, 2010)

In sum, peering into the future of interdisciplinarity in American education from the standpoint of a system in transition can only yield precarious predictions. Under one "business as usual" future scenario the standards and accountability movements will run their course, and current malaise about their limitations to deliver high quality disciplinary (or any interdisciplinary) education will remain on the sidelines of reform. Under a second "reform" scenario, a recognition of contemporary demands for interdisciplinary competence at work as well as growing interest in interdisciplinary and integrative learning in higher education will trigger the development of further standards in new interdisciplinary fields—e.g., science, technology, engineering, and mathematics (STEM), humanities, and new media. A third and more "transformative" scenario will build on an open debate about what knowledge matters most to survive and thrive in today's global, digital, and environmentally challenged societies, and what role interdisciplinary learning might have in reaching such capacities—not as a goal in itself, but as a means to create products, advance knowledge, solve problems, and propose new relevant questions.

Historian Patricia Graham's four "A" eras mark the purposes assigned to American public education over the 20th century. Competing frames for the years to come underlie the debate over the re-authorization of the ESEA and the concomitant role of interdisciplinarity in public schools. Will we retreat further into an era of *Accountability*? Will we seek *Advantage* in international test comparisons, as some pundits propose? Or will we perhaps re-conceptualize ours as an era that puts a premium on *Adaptive Agency,* preparing individuals to work and participate in increasingly complex social contexts and uncertain knowledge spheres? Two lessons can be drawn from comparable past educational transitions. First, the transition will not be clean. Competing agendas will co-exist and overlap. As before, beginning dates and ending moments will be blurred, but driving orientations and influences

will prove telling. A second lesson can be drawn. Regardless of whether we find ourselves being enthusiastic advocates or cautious observers of the call for interdisciplinarity in pre-collegiate education, our policy debates will be ultimately resolved *de facto* in the intimacy of a classroom—as individual teachers and their students engage in a close examination of materials and topics that constitute the heart of the matter of learning: an oil portrait of George Washington, a chart predicting weather temperature change, a novel about growing up in Kandahar, or a student's journal reflection about who we are and who we would like to become.

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