

Design's Inherent Interdisciplinarity: The Arts in Integrated Curricula

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In the November/December 1998 issue of Arts Education Policy Review, I introduced readers to the concept of design-based education and a study that I coauthored for the National Endowment for the Arts (NEA) on the ways design is being used by American teachers in a variety of subjects. The article recounted the success that teachers have in using the methods of architects, industrial designers, landscape architects, planners, and graphic designers, as well as the pedagogy of design educators, in teaching subjects other than design. Further, it linked the outcomes of design-based learning to the goals of education reform and called for greater attention to the design education of art teachers.

This second article on design-based teaching and learning concerns the ways in which design activities address national interest in integrated curricula, how the inherently interdisciplinary nature of design makes it suitable as an integration strategy. This discussion also describes a more central role for the arts in cross-disciplinary and interdisciplinary curricula and encourages defining such endeavors in terms of the cognitive skills necessary for life and work in the next century.

National Reform Initiatives Encourage Integration

For more than a decade, learning theorists and curriculum specialists have encouraged schools to pursue the benefits of integrated curricular experiences that encourage students to make connections between and across disciplines. The desire for integration also appears in national reform legislation, acknowledging the way work will be done in the future. The 1994 *Goals 2000: Education America Act* describes conditions and outcomes for education: It lists core subjects in which students must achieve mastery of disciplined-based skills and knowledge (English, mathematics, science, foreign languages, civics and government, economics, the arts, and history). Yet the language of what initially appear to be discipline-based goals in fact reveals more concern for students' thinking and problem solving skills, the implication being that schools currently pay less attention to building the repertoire of students' cognitive abilities than to the subjects of their thoughts (Davis et al. 1997, 121).

The 1992 US Department of Labor report of the *Secretary's Commission on Achieving Necessary Skills (SCANS)* is even more explicit in its call for developing competencies, skills, and qualities that are required for high skills, high-wage employment. The report cites competencies for productive work (use of resources, use of information, interpersonal skills, use of systems, and use of technology) that are not the domain of single disciplines. It further describes thinking skills for the foundation for effective mastery and use of those competencies (creative thinking, decision making, problem solving, seeing things in the mind's eye, knowing how to learn, and reasoning) that are best developed and practiced across disciplines (US Department of Labor 1992).

Developed in the early and mid 1990s, the *National Voluntary Content and Performance Standards* detail what every young American should know and be able to do in twelve subject areas but close reading evidences a more general concern for building connections among disciplines and within the interdependent systems of daily life. Throughout the standards for science, civics, and English language arts there is concern that students learn to think in a variety of ways, communicate in visual as well as verbal and computational languages, and solve disciplinary problems within broad definitions of context.

The *New Standards Project*, under the direction of the National Center on Education and the Economy (NCEE) and the University of Pittsburgh, goes a step further by defining performance standards in applied learning as "capabilities people need to be productive members of society, as individuals who apply the knowledge gained in school and elsewhere to analyze problems and propose solutions" (NCEE and University of Pittsburgh 1997, 5). Those standards address students' ability to integrate skills and knowledge from a variety of subject areas and apply them to problems that, again, do not reside in the domain of a single discipline.

Traditional Roles the Arts Have Played in Integrated Curricula

Expectations, however, often exceed practice. Heidi Hayes Jacobs summarizes the nature of interdisciplinary and integrated curricular practice today:

By 3rd grade, children view subjects as changes in behavior, teacher attitude, areas of the room, and times of the day. Rarely does anyone explain to them the nature of disciplines or how the subjects related to one another....[A] dual emphasis [singular focus on one discipline and concern for interdisciplinary curricula] is different from past attempts at curriculum integration that viewed the two approaches as opposing points of view — through this century, there has been an unfortunate tendency for schools to go to extremes of either rigid subject isolation or strained, whimsical thematic instruction. (Jacobs 1991, 22)

In the visual arts, integrated/interdisciplinary curricular strategies have been predominantly those of proximity, service, and theme.

In many schools with which I work, "visual arts" is a "special subject," along with music, physical education, and industrial arts or technology education. A recurring characteristic among subjects with "special" status is that faculty who teach them do not share common planning times with faculty in the core subjects of English, history, math, or science. In some schools, special subjects are scheduled precisely to relieve teams of faculty in core subject areas for integrated curriculum coordination. Those circumstances make integration of the visual arts with other subjects difficult and lead some schools to believe that they have accomplished the goals of integration if they can simply bring the arts closer in time and place to core subjects. Under this most limited of integration strategies, the student makes something in a visual form in a class period previously dedicated to reflective study or reports expressed in verbal form. In some schools the normal schedule of the school day may be adjusted so that students' historical study of Native Americans, for example, is back-to-back with their art class work in clay or textiles. Although the disciplines involved in proximity strategies share common issues, there is rarely curricular planning or instruction that makes those commonalities the center of students' attention. And although some students may recognize connections beyond a particular culture's use of similar materials or the replication of a typical object, they do so indirectly.

In another integration strategy, the visual arts activity serves a more dominant discipline in the curriculum, such as English, history, or science. Art enhances the study of the dominant subject area; it is the means for exploring that discipline's central concepts in an alternative form. For example, a written composition may be the source of subject matter for an art project. In history, models of medieval castles or maps of World War II Germany support investigations of other times and cultures. In science, studies of historic paintings that contain scientific objects launch comparisons of technology from the past and present. However, the content discussed remains largely the same despite the introduction of the visual arts activity — art simply provides an alternative form for its illumination and a new point of entry for students who excel in nonverbal communication.

In strategies where individual classes in various subjects address a common theme, the content of the visual arts lesson bears some relation to students' work in other disciplines. David Ackerman and David Perkins think about curriculum on two levels, curriculum and metacurriculum: "The curriculum is composed of substantive concepts and content of discipline-based fields. The metacurriculum is the thematic-based set of skills and strategies selected to help children acquire the curriculum content, and to develop the capacity to think and learn independently" (Ackerman and Perkins 1989, 80-81). Not all thematic instruction lives up to those expectations, however. I have observed art classes in which students were asked to "do something Greek" with aluminum foil or to make drawings of "my community" that focus entirely on mastering two-point perspective representations of buildings. The success of such experiences suffers from an over-generalized definition of the theme that is necessary to accommodate a variety of subject areas, and as Jacobs warns, relationships implicit in those themes are often strained. Rarely do the arts serve as the organizing discipline for the development of such themes.

What is missing in most so-called integrated curriculum strategies is a serious attempt to make evident a) how disciplines reinforce certain cognitive behaviors and b) what is revealed about subject matter and problem solving when thinking from one discipline is applied to another. For that reason, learning in many integrated experiences never transcends the instances in which connections are made; students learn the specific connections anticipated by teachers but not how to make connections in general. In most examples of integration, cognitive behaviors intrinsic to art and design are rarely considered in curricular planning and are grouped under the general categories of "intuition" and "creativity," often implying that they can be supported but not taught.

Inattention to the transfer of arts problem-solving and problem-seeking behaviors to other disciplines does not rest exclusively with educators outside the arts. In general, the education of art teachers, the articulation of national voluntary content standards that guide arts

curriculum planning, and the practices in K-12 art classrooms bring about four results: 1) the equation of process with technique (as opposed to thought), 2) the unchallenged acceptance of a culturally specific inventory of form (the "elements and principles of design"),¹ 3) the study of art history according to a very limited canon of "artists and movements",² and 4) promotion of self-expression as the highest priority in art making. In the absence of discourse about cognitive frameworks that transcend course content and build life skills, teaching collaborations across disciplines are reduced to issues of subject matter, technical skills, and vehicles for presentation.

Design Experiences Present Opportunities for a Different Type of Integration

Jacobs attributes the emphasis schools currently place on interdisciplinary curricula to expansion of information: "While the school day has stayed about the same, knowledge has grown. The traditional confines of the school day are literally bulging, and much of the newest, most valuable knowledge falls between the cracks of conventional subject areas" (Brandt 1991, 24).

The notion that valuable knowledge (and the thinking skills necessary to make appropriate use of it) resides at the intersections of conventional disciplines is borne out in the growth of interdisciplinary practices in the professional world. Design methodologist J. Christopher Jones describes a hierarchy of problems in contemporary society. At the base of the hierarchy are problems focused on components and products. At the top are problems originating in systems (interrelated products) and communities (interrelated systems). Jones tells us that the problems of post-industrial societies are primarily at the systems and community levels of the hierarchy, where the web of disciplines necessary to successful solutions is quite complex (Jones 1970). Unfortunately, schools compartmentalize problem solving through their emphasis on school subjects (emphasizing components and products of larger problems) rather than on the holistic enterprise that constitutes professional work. The study of the environmental implications of the internal combustion engine in a science class, for example, rarely spawns related study of the social consequences of our commitment to individualized transportation. Therefore, business and industry must retrain employees for interdisciplinary thinking and practice that address the scale of contemporary problems; they are less concerned that employees master current facts than that they respond strategically in a systems-oriented problem environment.

The crisis of rigid disciplinarity is seen also in the evolution of fields of study in colleges and universities. Considerable attention is now focused on reinvigorating engineering programs as the centers of invention they once were. Ironically, those programs have turned to what many would describe as the antithesis of science education for pedagogical models. Increasingly, college engineering programs experiment with arts strategies: small studio classes; open-ended, project-based instruction; active learning; and portfolio evaluation. Equally surprising is the separation of fine arts and design in college curricula. I recently conducted a ten-year review of a well-established university Bachelor of Fine Arts program accredited by the National Association of Schools of Art and Design in which education majors were permitted to choose electives from an array of fine arts studios but could not receive credit for comparable courses in graphic or interior design. That issue needs further research and policy analysis at both institutional and organizational levels.

Design's Inherent Interdisciplinarity

If proximity, service, and thematic integration strategies often result in contorted or artificial relationships among disciplines, particularly for the arts, then what strategies for integrating curricular authentically model adult problem solving? And how can these practices place cognitive skills, not facts, at the center of students' learning experiences?

Dennie Palmer Wolf, a Harvard education professor and researcher, argues that the most successful integration strategies are those that rely on inherently interdisciplinary endeavors, such as design or opera. As a consultant for the National Assessment of Educational Progress in the arts, Wolf was a vocal advocate for using design activities to assess arts standards that address building connections across disciplines and between disciplines and everyday life. Her stance was in opposition to the invention of problems that artificially join, and consequently distort, disciplinary behaviors in an effort to manufacture relationships that are unlikely to occur in real work.

What makes design problems appropriate for integrating studies in schools? And how does the design process support authentic disciplinary engagement within an integrated context?

First, design problems are situated; they have a context from which students can derive information that relates to a variety of disciplines and that is critical to successful solutions. For example, if a student is asked to design a container for transporting goldfish from the pet store to home while riding a bicycle with both hands, the student must analyze what he or she knows about: a) the conditions necessary for the fish's survival, b) the physical forces in play when riding a bicycle, and c) the available materials that perform in ways consistent with a) and b). Further, such "situatedness" allows students to see problem solving at work in the real world. There is no

"translation" necessary to make learning operational. Proposed solutions can be tested firsthand in ways that do not differ from those practiced by adult professionals.

Second, design problems require both analysis and synthesis. Students must engage in the articulation of a meaningful problem within a context, gather and make sense of relevant information, synthesize material from many sources in generating multiple solutions, and critically evaluate outcomes against rubrics that are negotiated among students and public in the classroom. Architect Christopher Alexander defines design as the goodness of fit between form and context, with *form* being that which we can shape and *context* being the ensemble of factors for which we shape it. The cognitive behaviors required to define and analyze context and to synthesize form span the disciplines and become the focus of discussions in planning and evaluating design outcomes. Students learn processes that transcend the immediate problem. In the example above, students understand that the purpose of their investigation is not to learn how to make "fish taxis" but to explore "ways of knowing."

Third, design problems are systems-oriented. Solutions must be viewed as nested in a web of interactions among physical, social, cultural, technological, and economic factors. They must be designed against a ranked set of competing priorities (with many disciplinary biases), requiring negotiation among parties whose values may be in conflict. Without teaching a particular point of view, schools that employ design-based integration strategies engage students in the process of choice and make apparent the range of users and issues that a solution must accommodate.

Finally, design problems frequently require the work of interdisciplinary teams of experts. They demonstrate to children the value of collective creativity in which each participant contributes a point of view and set of skills that may differ from those of others. Through design activities, students learn about planning, collaborating, and building a common vision of success.

Design as a Catalyst for Learning, which I coauthored as a NEA study of design in K-12 education, clearly supports Wolf's position that design is inherently interdisciplinary and serves an integrative purpose in curriculum, especially for the arts. Across grades and subject areas, teachers in the study found design problems to be effective means for addressing the integrated application of disciplinary skills and content.

An example from Salt Lake City fourth through sixth grade teacher Sherri Sohm is especially compelling. Sohm challenged her Hawthorne Elementary School students to develop their critical thinking skills by investigating a real problem in their community. The children discovered the remnant of a creek beneath construction debris on an empty twelve-acre lot ringed by buildings. Research revealed that the creek was one of the terminal segments of the old Mormon Trail and that the site had been one of the first settlements in the valley. At the county records office, the students learned that the strip of land was a city park until 1957 and that future plans called for a shopping mall that would bury the creek under a parking lot. Envisioning a new park design, Sohm's students renamed the site "Hidden Hollow" and organized KOPE (Kids protecting Our Environment), which invited other Salt Lake City elementary schools to contribute creative ideas.

The students amassed information about resources and contacted geologists, soil scientists, botanists, wildlife specialists, and an urban forester to explore the site with them. With the help of landscape architects they sketched design options for restoring the natural environment and making it accessible. In the spring, developers met with KOPE kids and dismissed their dreams as too little, too late. Undaunted, the students rallied public support for down-zoning the land so it could not be used for commercial development. Armed with research on city policies and a landscape architect's drawings of their design, the students appeared before the city council and an audience of several hundred adults and elementary school children. The council approved KOPE's plan.

Over the years, Sohm's classes have continued to use Hidden Hollow as the focus of their integrated problem solving. One group hosted a design workshop that brought together design professionals, neighborhood residents, and local business people. Using maps and a model of the site, they described their design vision and invited public comment. Under their teacher's guidance, the students won approval for the phased development of their plan. They learned how to write proposals for grants and in-kind donations. Their first proposal secured a Community Development Block Grant to pay for the removal of 17,000 tons of construction debris and the installation of a security fence to prevent further dumping. With the help of the National Guard, the students and their parents graded the land, planted trees, and laid out hiking and biking paths.

Once Hidden Hollow was officially designated as open space in the city's Master Plan, KOPE turned its attention to surrounding buildings. Working with the Chamber of Commerce, the students surveyed 269 businesses about design options, garnering an 80 percent response rate. Students also wrote and designed the *KOPE Kronical*, a newspaper that documents progress on Hidden Hollow as well as an array of

other projects in elementary and junior high schools in the area. The *Kronical* now has a distribution of 24,000 K-8 readers each school year (Davis et al. 1997, 57-59).

The lesson from Hawthorne Elementary is that even young children can be successful in integrated problem solving that models adult work in the real world. KOPE's design investigation brought the study of various disciplines together in ways that honored their respective contributions to solving a complex problem. Students engaged in activities that did not compromise the integrity of discipline-based content or contort cognitive behaviors.

In high schools, where curriculum strategy often retreats to rigid disciplinary compartmentalization, the examples of integration are fewer but equally powerful. At Lakeview High School in Columbus, Nebraska, Ed Kinzer's science class carries out independent projects that engage students with the interdisciplinary nature of invention. Student Mark Moeller designed, built, and tested an infrared walking stick for people with visual impairments. The user presses a switch in the stick, sending out beams of light that reflect back from objects and set off one of three buzzers, depending on the distance of the object. Moeller's design won national awards for science research (Davis et al. 1997, 76). Such projects extend the content of the typical science class to include an analysis of social conditions, creative problem solving, and the construction of objects that demonstrate scientific principles at work in the real world.

Our findings for the NEA study demonstrate that teachers of English, science, math, social studies, and technology education have no difficulty in using design activities in their subject areas. In particular, science and social studies teachers demonstrate considerable aptitude in developing challenging problems that demand creative responses from students. Those teachers are equally adept at building cross-disciplinary and interdisciplinary curricular that employ design experiences as tools for integration. Surprisingly, however, art teachers in the study seemed most confused about what is meant by design and how it relates to their own and other disciplines.

The Getty Institute for the Art has had a profound influence on what art teachers see as the domain of art education. While the Getty's stance on discipline-based art education (DBAE) carried the field through difficult political waters by carving out "cognitive turf" and demonstrating its value in the education of children, its implementation by teachers in schools often falls short in addressing the breadth of arts practices. Penn State art education professor Brent Wilson, in *The Quiet Evolution*, describes the outcomes of the first seven years of DBAE. He documents guidelines for the Getty summer institutes that call for acquainting teachers with design as one of many arts practices.³ However, Wilson comments that if teachers were to make their own courses "truly discipline based, they would need to acquire basic knowledge of the history and critical conditions of ceramics, textiles, photography, drawing, painting, sculpture, jewelry, design, etc." (Wilson 1997, 168).

Wilson cites the absence of mature histories in design as an obstacle to acquiring such expertise but says little about access to design courses in college-level art education curricula. Comprehensive histories of graphic and product design have existed since the early 1980s, before DBAE, and the history of architecture has been well documented and critiqued for most of this century. Access to this literature is not as limited as one might think. Philip Meggs's *History of Graphic Design* (now in its third edition) was considered interesting enough to the general population to be developed as a feature article in USAir's in-flight magazine. *Time Magazine*, *Business Week*, *Newsweek*, and the *Wall Street Journal* carry regular features and commentary on design. Art and design museums – including the Walker Art Center, MOMA, and the Cooper Hewitt National Design Museum (part of the Smithsonian) – exhibit and collect design artifacts and publish critical writing on the subject. Each of the professional design associations (American Institute of Graphic Arts, International Interior Design Association, American Institute of Architects, and Industrial Designers Society of America) has programs in and for K-12 schools, some of which have been active for as long as thirty years. In countries abroad, national design councils produce a steady stream of literature connecting design to larger issues of social, economic, and technological development. And in the United States, state design councils and design programs within government arts agencies fund competitive design project proposals and hold design conferences for teachers.

I argue that the pre-service design education of art teachers suffers, not from lack of access to information, but from lack of access to instruction. Until such instruction is seen as critical to the education of an art teacher, we will see little competency in defining design problems and using them to connect the arts to other subjects in the curriculum.

It is also notable that Wilson's inventory of "highly specialized areas" identifies jewelry and ceramics as noteworthy art practices but lumps architecture, planning, interior design, landscape architecture, product design, graphic design, computer design, and fashion design under the single entry "design." The same problem exists in the *National Voluntary Content and Performance Standards*. The developers of the standards worked closely with the team designing the National Assessment of Educational Progress in the arts and resisted all suggestions to even mention design in the standards themselves or to include language that addresses the unique aspects of design

problem solving. (The generic term *design* appears in the grade-level preambles along with more specialized nomenclature for fine art and craft practices). If semioticians are correct that language drives perception, design educators have an uphill climb to convince art educators that the powerful qualities of design problem solving have a place in arts education and a significant role to play in curricular integration.

It is evident from our study that a consensus is developing around the adoption of design experiences as strategies for curricular integration. Identified as a third type of knowledge in general education by British researchers in a study of curriculum, design has enormous potential for bridging art and science in integrated curricula (Royal College of Art 1976). What remains to be seen is who will champion the pre-service teacher education necessary to nurture and support design-based practice in schools.

Notes:

- 1 The K-12 methods for teaching the elements and principles of design are derived primarily from the Bauhaus and therefore promote an early twentieth-century European model for teaching "good" visual form. Likewise, this is the critical framework most often applied to the analysis of work, even when that work may have been produced within the context of an alternate set of values.
- 2 College art history professors generally show reluctance to challenge the perspectives from which works of art are critiqued. The predominant canon of famous artists linked to movements defined by style is only one way to critique works of art. An alternate history of art would result from investigations that privilege social/political/economic theory, technological innovation, or the vernacular. Such perspectives not only make possible the building of connections across school subjects but encourage pattern-seeking behavior and judgments characteristic of higher-order thinking skills.
- 3 I have taught the Getty summer institute and found that few participants had a clear definition of design before registration. Getty is accurate in assessing limited teacher understanding of design. The same can be said for workshops sponsored by state agencies and arts organizations. In all cases, participants express concern that their access to mentorship in design-based strategies ends with their limited workshop experience.

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