This bibliography covers a range of topics, from research on teaching and learning through design experiences in K-12 classrooms to the application of learning theory to design problem solving in a broad range of contexts. In references that support pedagogical research in the application of design thinking and concepts to K-12 classrooms, the goal is to enhance learning and teaching in all subjects, not to provide pre-professional or vocational training in design. Emphasis is placed on the consistency between what is called for in national education reform initiatives and the learning outcomes of a design education. In the selection of references on learning theory and cognition, there is an assumption that “preferences for ways to learn” are congruent with “preferences for ways to access information.” Therefore, the concepts explored in these books have direct implications for the design of information in any context or for any audience.
EDUCATIONAL REFORM

The descriptive and analytical research in these books strengthens the position of reform initiatives in K-12 schools and teacher education intended to guide the US in meeting the economic, technological, political, cultural, and social challenges of the next century. Common to most studies in this area is the call for teachers to be flexible thinkers, creative problem solvers, competent communicators, and active participants in their communities. Some studies go as far as to cite design experiences or thinking as integral to the future, standing of their relative subjects. Also included in this section are national standards that have been developed through a consensus-building process in response to reform research. Practical strategies for achieving these standards form an important area of research. Designers hoping to have an impact on how schools teach and what children learn should become familiar with this material as it defines the political and social climate in which educators work.


This study describes the rate of science and technology in addressing the radical challenges expected with the next human age. It also points out what the standards indicate of an educational design to meet those challenges will be. More forward-thinking and demanding of creativity than the National Standards for Art Education, this publication serves as an innovative and normative model for those wishing to build a case for the use of design in mainstream instruction. The sections on technology are especially relevant to product design. The publication also provides ample justification for future research into appropriate pedagogies for delivering such an education.


These standards call for increased involvement of students in the social and political processes of their communities. A good argument for the adoption of curricula that include design experiences in which children analyze real problems and propose solutions. The standards hold particular significance for architects and environmental designers with an interest in pedagogical strategies for K-12 classrooms.


Disagreement, these standards describing what every child should know and be able to do in dance, music, theatre, and the visual arts intentionally avoid descriptions that relate to design. The authors viewed design as simply another sub-specialty of the visual arts, not as a process with specific thinking skills or content that differ from the fine arts. The subsequent framework for the National Assessment of Educational Progress in the Arts, attempted to address these differences by including specific performance standards for design.

Holmes Group, Tomorrow’s Schools of Education. Estes Lengel, Michael Holmes, and Shelley Holmes, 1995. The Holmes Group, a consortium of universities doing educational research and educator preparation, published this self-critical report on higher education that calls for educators to “adopt the reforms that link their educational contributions closely with improved schooling...or surrender their franchise.” The reform cited as necessary in teacher preparation argues in favor of exposing college education majors to experiences much like those of design students. This publication is an excellent background reading for those who wish to build strong alliances between schools of education and schools of design.


This is the first U.S. performance-based assessment of the visual arts in which students actually make and solve design problems in twenty years and the first to include design as a discrete area of performance. The framework outlines the content and achievement standards against which the national assessment was developed. While the final test suffers from the inevitable reduction in rewarding a national sample for more than 40,000 students, this framework is a useful articulation of what students should know and be able to do in design.


This landmark publication launched the US on its quest for educational reform. Highly critical of what American children know and are able to do, this report serves as a benchmark for the reform movement.


Although some of the more obvious connections to design were lost between early and final drafts, these standards clearly advocate children learning to "read" visual information (charts, graphs) as well as the written word. Further, the authors seem to see a connection between imaginative writing and thinking visually.


These national standards for social studies indicate frequency of exposure to chronological learning experience in creating graphic communications and learning to devise and analyze information from maps, charts, tables, and other graphic information.


As in other subject areas, these standards were defined, for grades K-12 through a national consensus-building process. They represent significant change toward the perception of science education as creative problem solving and application. The section on technology education encourages designing as well as using technology. The word “design” appears throughout these standards.


Led by Lawrence Resnick at the Learning Research and Development Center of the University of Pittsburgh, this National Standards Project attempts to build an assessment system to measure student progress in meeting national content and performance standards in various subject areas. Of special interest to designers is a new discipline, a category of standards titled “Applied Learning” that cites skills and knowledge common to design and that assesses student performance through design tasks.


This report cites the key worker competencies, skills, and qualities necessary in the workforce of the next century. These competencies and thinking skills bear striking resemblance to the learning outcomes of a design education (critical thinking, creative thinking, seeing things in the minds’ eye, understanding systems, interpreting and communicating information, etc.) and argue effectively for the inclusion of design-based instruction in all schools.


The Reggio Emilia schools in Italy use design and creative activities as the core of early childhood education. These programs have been the source of much study and the basis of traveling exhibits in the US.


A university professor of education, Eggen has written a guidebook to curriculum development and instruction in design and technology. To American designers, the definitions of “design” and “technology” are more narrow and context-based than in the US and share much with what we once called “industrial arts.” This thick book presents valuable insights in articulating the fit between such haphazardly designed and other aspects of curriculum.
CURRICULUM DEVELOPMENT, PEDAGOGY, AND ASSESSMENT

These books address curricular and pedagogical strategies that support a design approach to learning as well as the goals of educational reform. In some cases, the books describe the nature of thinking and learning that develop under a design-based pedagogy. The books on assessment focus on improving students' and teachers' skills, not on broad-based reporting to government and the public.

Deep Boutsikos, Learning to Teach: An Introduction to the Principles of Education 1996

The authors of these books describe the nature of teaching and learning that develop under a design-based pedagogy. The books on assessment focus on improving students' and teachers' skills, not on broad-based reporting to government and the public.


This book uses case studies to illustrate the use of metaphor in problem solving and in teaching complex ideas and relationships. Exemplars are applicable to corporate as well as educational settings and especially useful in demonstrating ways of presenting unfamiliar concepts to anyone.


The book describes the thinking about innovative, integrated curriculum experiences through which children construct knowledge and meaning. This is an opposition to the commonly used strategies of telling students what information means through lectures and textbooks. For designers, this theory holds some relevance for developing communication strategies through which individuals must acquire new knowledge and learn new skills.


Delmont discusses the difference between verbal thinking (high-probability, straight-ahead literary thinking) and the value of searching for more than one solution to problems. Delmont's thinking strategies have value in education as well as in design practice and this is one of his many books that address these issues.

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Donald Norman. *Things that Make Us Smart*  
In his conversational style, Norman describes  
types of cognition and the importance of  
representation. In particular, this book challenges  
representational strategies used in the design of  
new media.

Andrew Ortony, ed., *Metaphor and Thought*  
(second edition)  
New York: Cambridge University Press, 1995  
Editor Ortony, faculty fellow in the Institute for  
Learning Sciences at Northwestern University, has  
put together a collection of essays on the rela-  
tionship between metaphor and meaning,  
representation, understanding, science, and  
education. As designers and educators frequently  
communicate through visual and linguistic  
alogies, this book offers valuable insights into  
how metaphors shape human thought and can  
guide our selection and understanding of  
representational form.

David Perkins, *Knowledge as Design*  
Hillsdale, New Jersey: Lawrence Erlbaum  
Associates, 1986  
Co-director of Project Zero at Harvard University,  
Perkins writes on the development of thinking  
skills. In this volume, he emphasizes the  
difference between “knowledge as information”  
and “knowledge as design,” a structure adapted to  
a purpose. The book ranges across subjects such  
as problem finding, the value of models to  
thinking, and argument. For designers, Perkins’  
language provides comforting descriptions of  
experiences we have all had.

David Perkins, *The Mind’s Best Work*  
Cambridge, Massachusetts: Harvard University  
Press.  
A combination of theory, examples, and thought  
problems, this book examines the nature of  
invention and creative and critical thought.  
Perkins uses the creative lives of accomplished  
people from the arts and sciences to illustrate his  
points and then goes on to recommend teaching  
strategies that support creative thinking.

on Motivation in Education: The Classroom  
Milieu*, Volume 2 (Carole Ames and Russell  
Ames, eds.)  
A discussion of self-determination and self-  
regulation in education. The authors’ findings  
support the notion that motivation in a learning  
situation will be higher when the individual  
maintains some control about what is learned and  
how it is learned. For designers, this raises  
questions about linear, author/designer-controlled  
presentations of information.

Richard E. Snow and Marshall J. Farr, eds.,  
*Aptitude, Learning, and Instruction – Volume  
3: Conative and Affective Process Analyses*  
Hillsdale, Nj: Lawrence Erlbaum Associates, Inc.,  
1987  
Subjects range from intelligence and cognitive  
style to thinking about feelings and motivation. Of  
special interest is a discussion of the heuristics  
for designing intrinsically motivating learning  
environments.”

Robert J. Sternberg, ed. *Handbook of Human  
Intelligence*  
New York: Cambridge University Press, 1982  
This tome of essays covers the theories on the  
nature of intelligence, learning, memory, reasoning  
and problem solving, and culture and intelligence.  
A good place to start if you are trying to  
determine the range of issues on the subject of  
intelligence.

Robert J. Sternberg and Richard K. Wagner, eds.,  
*Mind in Context*  
New York: Cambridge University Press, 1994  
The preface to this collection of essays states that,  
the editors tried to bridge the gap between  
constructivists, who believe all cognition depends  
on interaction with the outside world, and the  
traditional point of view that all cognition resides  
in the mind. Sternberg’s own essay offers a model  
of person-context interaction and situated  
learning (and work) that is especially relevant to  
designers. Other essays address the concept of  
distributed intelligence.