Meredith Davis . Learning by Design

Keynote Address

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Meredith Davis – Learning by Design

It's great to be in Chicago. I've had times in my career that demanded lots of involvement in Chicago, but it's been a little sparse the last few years, so it's great to be back. And it's great to see a lot of people that I haven't seen for a long time who are making great contributions to this work.

I have a couple of apologies to start with. First, there are those of you in the audience from whose websites I've stolen shamelessly for this presentation, so my apologies to those people for plagiarism. Secondly, I have not covered the great contributions of architecture foundations in this presentation, because I felt that this is going to be, certainly, a major topic that is covered as we go along. So it's not a case of ignoring that work; it's just that I think we'll get coverage in other ways. And then I'm sure there are people out there in the audience whom I won't mention, and my apologies for slighting, but I have a limited amount of time to address a long history.

SLIDE
design in education

- Beginnings
- Flavors
- Contexts
- Challenges

What I'd like to do is give you a feel for the landscape of this particular movement in a very broad sense; to talk a little bit about its beginnings and some of the people who were major contributors at the start of thinking about design in K-12 education; to address the various flavors or variations of design in K-12 education that we see around the country; to give you some idea of the context in which this work has to compete nationally with other educational initiatives; and then discuss some summary efforts to address the challenges of the larger movement.

SLIDE
beginnings in design education

• Architecture and Children	Anne Taylor
• Center for Understanding the Built Environment	Ginny Graves
• City Building Education	Doreen Nelson
• DK-12 at University of the Arts	Charles Burnette
• Group for Environmental Education	Richard Wurman / Alan Levy
• Problem Solving in the Man-made Environment	Cranbrook Academy of Art
• Salvadori Center	Mario Salvadori
• Design and Technology in the UK	Adams, Baynes, Kimbell

There are some great pioneers in this work, and I've arranged these alphabetically just to make sure that I don't reflect any rankings in the value of the work. In the late 60's the 1970's and the 1980's, we saw a lot of invention and project development by people who were really ahead of their time in thinking about how design disciplines could influence the K-12 landscape.

SLIDE
Architecture and Children
Anne Taylor
Introduced work with children as a major area of scholarship for college architecture programs. Through the School Zone Institute, provides teachers and parents with a guide for the assessment and improvement of learning facilities.

First, we have Anne Taylor's Architecture and Children work at the University of New Mexico. What Anne really did for us was make this kind of work a reasonable and deep area of scholarship in university architecture programs. And if any of you are faculty out there, you know how tough it is to talk to people about tenure track careers in design and what it means to work with children as your area of research. I think Anne has done a great job at establishing the credibility of that kind of work in higher education. She's also concentrated on the design of learning environments, as an area for which we often see too little attention, especially in the economic climate promoting cookie cutter school buildings.

SLIDE
Center for Understanding the Built Environment
Ginny Graves
Pioneered successful Box City and Walk Around the Block activities. Focuses on responsible action in city planning and preservation.

Ginny Graves has done great work with the Center for Understanding the Built Environment, and her Box City and Walk Around the Block projects are legendary. You see lots of energy around this; enormous enthusiasm from groups of kids, very large groups of kids, working in highly visible ways in a community.

SLIDE
City Building Education
Doreen Nelson
Began as a classroom teacher. Developed the first teacher education degree program in design-based education.

Doreen Nelson developed City Building Education, established the first master's program in education focused on design and creativity, and now works in the design-based learning lab at Art Center College. Doreen has been tireless. She was discovered by Charles Eames as a classroom teacher and propelled into taking the methods that she was using to the national level. And if you know Doreen, she has not wavered one minute from this mission for teachers; she's still going very strong.

SLIDE
DK-12 at the University of the Arts
Charles Burnette, Janis Norman
Linked college industrial design and art education. Focused on process and entrepreneurship.

Charles Burnette at the University of the Arts DK-12, focusing very much on process, comes from an industrial design background and works with Janis Norman in art education. Here we see some of the earliest collaborations between the design and education communities in a university. And as I'll discuss later, that collaboration is one of the big challenges. It's very difficult for an education major just to gain access to design courses because of the popularity of design. One of the things we found in the National Endowment study is that classroom teachers find out about design through the back door. They don't find out about it through formal study. So how can we move this work along by looking for ways to build these collaborations? I think Charles was very much in the forefront of that question.

SLIDE
Group for Environmental Education
Richard Wurman and Alan Levy
Were practicing architects. Developed a publishing effort to encourage understanding of architecture in schools.

The Group for Environmental Education, under Richard Saul Wurman and Alan Levy's architectural partnership in the 70's, produced the *Process of Choice* and *Book 7*, which was a

curriculum in architecture for the seventh grade. Here we see a concentration on publications, not classroom work under the architects but an effort to see how publications can spread the word in ways that are much stronger than any individual service or enrichment program. These are a great legacy. You can still find copies of them on people's shelves. I'm always interested in that lifespan. Mine are yellowing, so it's been a while. But these were great contributions to the field that still inspire.

SLIDE
Problem Solving in the Man-made Environment
Cranbrook Academy of Art
Defined a multi-disciplinary approach to design education for children. Introduced design study through the social studies curriculum in 500 Michigan middle schools. Launched Design Michigan, a statewide design education initiative for business and government that still exists today.

A project in which I was involved at Cranbrook Academy of Art. A group of graduate students under the Michigan Council for the Arts developed *Problem Solving in the Man-made Environment*. This project includes 65 projects in a teacher's manual and a series of very large, 3' x 4' wall posters that function as books on the wall. The program went into 500 Michigan middle schools through the social studies curriculum, and is one of the first interdisciplinary approaches to design in K-12 education. This project spawned something that you may know called Design Michigan, which still exists today. Jack Williamson, the director of that program, has run a series of teacher institutes as a follow-up to this initial work.

SLIDE
Salvadori Center
Mario Salvadori
Linked architecture and engineering, capturing the design interests of students in science as well as art.

The Salvadori Center in New York combines the world of architecture and the world of science. It attracts a group of students who might not normally see themselves in design, and the original mission was a challenge from the Academy of Science to improve science instruction. This children's engineering curriculum led to the books *Why Buildings Stand Up*, *Why Buildings Fall Down* and a whole range of structural experiments that happen in New York City. Great work, and his center is still active today after his death.

SLIDE
Design and Technology in the UK
Eileen Adams, Ken Baynes, and Richard Kimbell
Established design as a discrete subject in the core curriculum of all schools. Resulted in credible methods for assessing student performance in design.

And then we can't forget the legacy from the UK and the great efforts there to bring design and technology into the national curriculum. It's a slightly different context from ours; we have site-based management rather than a national curriculum, but the UK has been really good at not only in developing curricular strategies, but also in credible assessment that reports outcomes and encourages people to really talk about it in meaningful ways. The assessment was under Richard Kimbell who was at the Technology and Education Research Unit of Goldsmith's College. Ken Baynes and Eileen Adams have absolutely been tireless in this work and also in other extensions here in the United States – helped us a lot, I think, through the dialogue in the early stages of the work here in the US.

Brit Nigel Cross, who studies how designers think and designerly ways of knowing, has just published a small book. It's a very, very articulate description of design thinking if you are looking for something compact to explain the outcomes of a design-based education.

SLIDE
flavors of design education

- Pre-professional education of future designers
- Design as reflective content in the curriculum
- Design as a problem solving process
- Design as a means for teaching something else
- Teacher education and institutes

I'd like to talk a little bit about the flavors of design education because we're all sitting here as though we're doing the same thing, but we're not. We represent some very different strains of how this approach to education plays out, and one of the things that I think we need to acknowledge in the maturing of this field is that the particular flavor of design that we practice has something to do with the methods we use and the outcomes we expect. The most successful programs have been those that have been very clear about mission and that have not tried to complicate issues by trying to do too much. So I'd like to run through some variations and talk a little bit about what we've seen over the last thirty or forty years.

SLIDE
pre-professional education
Introduces students to the architecture and design professions and replicates professional design study in colleges and universities.

One flavor is the pre-professional education of students. These are students that are likely to pursue careers in architecture or design and are looking at their experiences in K-12 work to yield some qualifications, some evidence that they can show college admissions programs what they know about design and are able to do.

SLIDE
pre-professional education

- Pre-college design camps
- Enrichment programs by non-academic institutions
- Architecture and design high schools

[Picture] - From a *Design Michigan* poster series

And these kinds of programs take the form of pre-college design camps, enrichment programs by non-academic institutions – by non-academic I mean not degree-granting – and architecture and design high schools. The posters that you see here on the left were done by *Design Michigan* to talk about careers in design and went out to Michigan public schools.

SLIDE
pre-college design camps
Students experience the setting of a college design program and the rigor of professional education with the goal of confirming career choices and preparing for the admissions process.

[Pictures] - Design Institute, University of Minnesota; Summer Design Camp, NC State University

In the pre-college design camps we place students in a college setting. They're exposed to a pedagogy that is somewhat matched to the way in which college programs teach architecture and design, and there's a kind of career emphasis to their curriculum. They begin to understand what people in these fields do, and they are self-selecting. They come to these camps through some recognition that design might be on the menu for them. In many interdisciplinary camps, they're trying to decide: "Is it right for me to be in architecture, industrial design, landscape architecture?" The camp helps them to confirm their choices before the college application process.

These are images from the Design Institute, and we have a representative here from the University of Minnesota. Jan Abram's work there, as well as Wendy's work, certainly presents an interesting model in which design practitioners work with students for very intense periods of time on focused themes. I think the interesting thing about the Design Institute is that the themes are actually quite broad in their definition. They aren't defined by specific design practices, but by ideas, and that's a really nice way to think about how to introduce students to the concepts of design without bringing lots of preconceptions about what an architect does versus what an industrial designer does.

The 25-year-old Design Camp at North Carolina State has various formats. We do day camps. We do resident camps in which kids come from all over the world and reside at the university for a period of time, working on longer projects. And we've also gone out into the extension network of the university. NC State is a land grant college. We have access to a hundred county extension centers and have worked with middle school students through the 4H. For those of you looking for an audience, the 4H is the largest youth organization in this country, and it's also an organization that has a high minority population. So if you're interested in diversifying the design practices, this is a great organization through which to reach kids. They also are great at handling all of the procedural issues, such as parent permission slips and registration; they have a system and a network set up for it. You can work with those students very efficiently and focus on the ideas and the pedagogy and not worry about all those nuts and bolts issues. The 4H doesn't do just "pigs and cows" anymore. They're very interested in the larger issues of contemporary life.

SLIDE
enrichment programs
Students supplement their high school experiences through special programs that introduce them to the design disciplines, frequently under the instruction of design professionals.

[Pictures] - DesignWise Program at the National Building Museum; Cooper-Hewitt National Design Museum

The enrichment programs. Kids are working with museums. On the screen you see the DesignWise program, which Anna Slafer and I had the privilege to teach in at the National Building Museum. The Cooper-Hewitt has done great work through its continuing programs, and I think you'll get a chance this weekend to find out about those. These organizations have taken leadership roles in modeling how some of these enrichment opportunities might work, and are also very good at documenting them. So it's nice to be able to go to these groups for advice as you're building programs.

SLIDE
architecture and design high schools
Focused programs orient students' general education around architecture and design.

[Pictures] - Charter High School in Architecture and Design, Philadelphia; Design and Architecture Senior High School, Miami

Then we have the architecture and design high schools, and these are beginning to increase in number. The charter school movement has created opportunities for focus, as has the magnet school movement. Here we have CHAD, which is the Charter High School for Architecture and Design in Philadelphia, and DASH, which is the Design and Architecture Senior High School in Miami Dade County. These schools provide opportunities for students to see the world of education through architecture and design as a kind of organizing principle for a series of ideas about how the world works.

SLIDE
design as reflective content in the curriculum
Uses existing or historical design responses to gain insight into the concepts, attributes, or values of a culture or discipline under study.

[Pictures] - Virginia State Capitol, based on the Maison Carrée from the Roman Republic

The next flavor of design in K-12 education is actually three kinds of practices that the 1997 NEA study found. One looked at design as reflective content in the curriculum; students study design as an extension of some other subject area but in a way that is mostly about thinking. They might do architectural tours. In this example we have the second century Maison Carrée and the Virginia State Capitol by Thomas Jefferson in Richmond, Virginia. The connections between these two buildings allow us to talk about Jefferson's idea of Roman Republic as the model for democracy, which is extended through the built environment, building as communication. You can go to the University of Virginia and see Jefferson's encyclopedia of architectural style around the quad, but there are no British examples. Why is that? So these concepts become ways of talking about important ideas in K-12 education, and architecture and design become the means through which those conversations take place.

SLIDE
The history of racial attitudes in thirty years of Listerine magazine advertising.

[Pictures] - The history of racial attitudes in thirty years of Listerine magazine advertising.

Here's a case study in advertising design. I sent a group of students to the Duke University J. Walter Thompson Advertising Collection, and asked them to find a product that had been advertised for at least thirty years. They came back with examples of advertising for Listerine Mouthwash and put them in chronological order. You can see here the history of public attitude toward race. On the left you have the whisk-broom blues attitude of the 1940's; in the middle, separate but equal; and on the right the 1970's after the Civil Rights Movement. So we can look at these objects as a way of understanding the larger culture and talk about reflecting on visual evidence, as we might with any other kind of resource available to students in schools.

SLIDE
design as a problem solving process
Teaches a process for solving an environmental, communication, or product problem through active engagement with materials and tools.

[Pictures of four cups] - Stable and retains heat; Stackable and conforms to hand; Elegant and refers to family heritage; Disposable and inexpensive

Design a fifth cup that is:
- Stackable and retains heat, or...
- Disposable and elegant

From the National Assessment of Educational Progress in the Arts

Then we have design as a problem solving process, in which students actively make things and engage in the kinds of activities that design professionals use. This was a problem that we developed for the design component of the National Assessment of Educational Progress in the Arts.

The problem illustrates four cups. A driving mug that is stable, retains heat, and has small exposure to air at the top so that we don't have heat loss. It is also made of a material – ceramic – that retains that heat. The next one over is a Heller mug by Massimo Vignelli, stackable and the handle conforms to the hand; it's convex where the hand is concave and vice versa. My

grandmother's teacup – the gesture of which is this when I use it; it has a heritage, it is elegant, and it embodies all the artifice of the social culture. And then we have a Dixie cup, which is disposable, a little tipsy when not filled.

The problem: design a fifth cup that is both stackable and retains heat or disposable and elegant. What this asks for is a reconciliation of competing values. How do you resolve competing priorities in a design object? These are behaviors that students can take into their own environment at any time. They don't have to know that it's design. They just have to understand that it's part of being human to be able to solve those kinds of problems and that there are modes of thinking that support this kind of activity.

SLIDE
design as a means for teaching something else
Applies the methods and perspectives of design and the pedagogy of professional design education to the teaching and learning of other subject matter.

[Pictures] - Building typology as environmental "language"

Then we have an area that's my own personal area of interest, which is design as a means for teaching something else. This is about the pedagogy of design education and the method of design practice moving into schools as a delivery system for teaching other content. The reason I'm interested in this particular area is because it makes design integral to the primary mission of the school. It is not an enrichment activity; it is not something that you do when you have the money to do it. It becomes the means for actually delivering content, and I'm going to explain later when we talk about the context, why this is really helpful in the current climate.

Here is an activity that Paul Tesar, an architect, did in one of the school systems in North Carolina. It's a variation of something by Juan Pablo Bonta, who developed the original system of blocks. These are identical sets of white blocks that are simply geometric shapes – cylinders, cubes, triangles, pyramids, whatever. Students are given a note card with a building type on it – church, factory, city hall; and they are to build it with the blocks on a piece of cardboard that represents the land. The task is to build the building type so that their classmates will recognize and be able to name it from the model. So it's a typology problem. Even when classmates can't identify the building, students discuss what it is about their model that actually deflects from the correct meaning.

Now we did this in two classrooms: a sixth grade English language arts class of gifted students, as a way of talking about language systems and how they are culturally situated, and a seventh grade social studies class with high-risk students who were likely to drop out of school by the time they were in high school. The gifted and talented kids would not leave the room until they got it "right." What we found with the high-risk kids was that we had provided a way for those students to succeed that wasn't held captive by written language and that had great tolerance for failure. They had failed all the time; it was no big deal. Let's take a risk. Very, very different results, and we're seeing this over and over again – maybe "at risk" means that the teaching and learning styles are not well matched.

SLIDE
science
Testing and designing shoe tread for maximum traction.

Here's a project that goes into science classes. All the kids take off one shoe, look at the sole, guess how much traction it represents, and line all of the shoes in a continuum from most to least traction. Then we take a 5' board, draw a line across the middle, put the toe of the shoe at the line and raise the back of the board. The minute the toe breaks the line, we record the height of the board, giving us a traction number for each shoe, and then compare that to our predictions. Well, of course, students predict that $150 running shoes will be the ones with the most traction.

They're not, and it's a great discussion about salesmanship versus performance. But then we ask them to redesign the tread of the shoe for different kinds of activities – for example, tennis has a different movement pattern than running, a different movement pattern than basketball. And they start to think about what that tread means in terms of work, energy, traction, friction – which are the concepts being taught in the science class.

SLIDE
social studies
[Pictures] - Determining the best of three locations for a city park.

- West End Neighborhood Association represents 60% of population
- East End Neighborhood Association represents 60% of the tax base
- School Board represents advocates for an outdoor environmental education program

Here's a problem that asks students to advocate for one of three particular locations for a city park and to present to the city council why their location should be the one chosen by the city council. It's a role-playing scenario activity in which we stack the deck: one location has 60% of the population, one group has 60% of the tax base, and the other represents the school board, which is supposed to stand for the whole community. They put together visual and verbal arguments, anticipate the arguments of the competing groups, and talk about design features that would overcome the limitations of the site.

What we found in this and other activities like it is that scenarios are compelling. A design scenario has student buy-in in a very different way than other kinds of design activities. In our PhD program at NC State, we're now looking at a project that will go into schools and determine: what are the characteristics that make a good scenario? How much fantasy do we need? How much integration of course content across disciplines do we need? What are the perceptions of the consequences of failure? Through this we hope to get an idea of how scenarios work and how we can actually give teachers some advice in the construction of scenarios for their own subject matter.

SLIDE
language arts
[Pictures] - Building newspaper models of the decision making structures of world governments; Modeling and diagramming in middle school science

Work in diagramming and modeling. On the left you see a newspaper diagram built by students to express the relationships of power in various world governments. We found that using a really crummy material like newspaper strips everybody down to the same level of technical competency. There are no better or worse paper crumplers in the world, you know, we crumple equally. The material focuses kids on the abstract concepts because they can't build something that looks like something else. How many times have we seen students build a model of the Globe Theatre; someone sits there creating every little piece of thatching on the roof and misses the whole point about what the architectural space does to organize performer and audience – misses that – because it's all about this kind of detailed replication? So crude materials prevent them from building models that replicate physical features and really get at the relationships. This has been a very successful exercise.

We've also developed, under funding from the Kenan Institutes, a little publication that talks about diagramming and modeling in science. Kids have used models and diagrams in science for years, but they are *readers* of models and diagrams. They are not *makers* of models and diagrams, which uses a different part of the brain. So how do we get kids to be really critical about what they make? In preparation for that project, I went into schools and asked kids about things that they typically see in science models. Do you know that they think that all nine planets rotate in a line around the sun because the models they have seen line them up in a row to illustrate comparative size? So their idea is a perfect little line of objects that keeps running around the sun. How do you get them to really be critical about form and to understand the implications of

one form versus another, especially when Microsoft will put anything in a pie chart? We've got to think about how to be really critical about that kind of information.

SLIDE
teacher education and institutes
Focus on the pre-service and in-service training of K-12 teachers in the use of design as a teaching and learning strategy.

Pre-service education of teachers:
- California Polytechnic / Pomona
- Pratt Institute
- Rhode Island School of Design
- University of the Arts

- Art Center College of Pasadena Design-based Learning Lab
- Cooper Hewitt National Design Museum Summer Institutes for teachers
- Design Michigan Summer Teacher Institutes
- Milwaukee Institute of Art and Design
- Creative Educators Institutes

I think the last flavor of design in K-12 education is teacher education and institutes, and we're seeing some growth in this area, but probably not enough. Over there on the left are just a few of the schools that are now focusing not just on art education, but art and *design* education. Paul Sproll at RISD, Doreen Nelson at Cal Poly, Amy Snider at Pratt, Janice Norman at University of the Arts. These are programs that give equal weight to design as to fine art. An then we see a whole range of institutes coming out of places like Art Center College of Pasadena in the Design-based Learning Lab and the Cooper-Hewitt's Summer Design Institutes for teachers. Design Michigan has done Summer Institutes for teachers. Milwaukee Institute of Art and Design does them also, working with Title II programs that also follow the teachers through the school year. So there's a lot happening in this area of practice. One of the findings of the NEA study was that we're not doing enough in pre-service education of teachers, and that it is much harder to undo bad teacher education through in-service education than to do it right in the first place. So this is an area that really needs a lot of concentration.

SLIDE
contexts for design education
- Achieving necessary skills
- National voluntary content standards
- National performance standards

Okay. I want to talk a little bit about the context in which all of this is happening. This is a big focus for me because I think you need to be able to describe to policymakers in education why this is important and how it fits with the current agenda, and teachers need to be able to do that or they cannot sustain this work. They are working under duress, and they need the language to argue for practices that will relieve that stress. So I want to talk about achieving necessary skills, the national voluntary content standards, and the national performance standards, which have to do all with the testing environment in which teachers are working.

SLIDE
commission for achieving necessary skills
Foundation for mastery and use of competencies

Competencies for productive work	*Thinking skills*	*Personal qualities*
Use of resources	Creative thinking	Responsibility
Use of information	Decision-making	Self-esteem
Interpersonal skills	Problem-solving skills	Sociability
Using technology	Seeing in the mind's eye	Self-management
	Knowing how to learn	Integrity
	Reasoning	

SCANS Report, 1992
US Department of Labor

The Secretary's Commission on Achieving Necessary Skills SCANS Report is a 1992 report from the Department of Labor. What it did was describe the characteristics of productive adults in the 21st century. The thinking competencies and skills map directly to the outcomes of a design education. There is recognition here that the world is different than it has been. So look at some of the things that they've identified: creative thinking, as distinct from decision-making and problem solving; seeing things in the mind's eye. This is coming out of the Department of Labor! That is powerful, to have Department of Labor endorsement on that kind of concept.

Use of resources, use of information, using systems, using technology – these are all things that a college education produces in designers. Are you familiar with Bruce Lawson's study in the UK, the study of architects versus engineers? Lawson studied senior college students in engineering and senior college students in architecture. He gave them the same problem: to determine a set of unknown rules for the combination of differently colored cubes. What he found was that the engineers generated all the possible combinations, while the architects proposed the rules, and then saw if combinations would fit those rules. He went back and studied freshmen, and there was no difference in the problem solving processes of the two groups. So the differences at the senior level were the result of the educational practices under which the students studied. It means we can teach people to be solution-oriented rather than problem-oriented. And if we focus on that, if we start thinking about that as a way of really transforming the graduates of generations of K-12 kids, this could be quite powerful – more powerful than just creating more architects. So it's an opportunity.

SLIDE
hierarchy of problems
- communities [interrelated systems]
- systems [interrelated products]
- products [interrelated components]
- components

J Christopher Jones
Design Methods

J Christopher Jones wrote a book called *Design Methods* in the 1970's, and talks about the change in the scale of problems. You have components; if I were designing a wagon, a wheel or an axle would be a component. You have a product; the product would be the wagon. You have systems; the wagon is part of a transportation system that includes busses and bicycles and cars, etcetera. And you have communities. You look at the way that the transportation system interfaces with the housing system, interfaces with the social system, and so forth. Jones tells us that the problems of contemporary society are at the community and systems levels, not at the levels of products and components.

Education at the moment is at the product and component level. It's as much at that level in college education design programs as it is in K-12 classrooms. We compartmentalize. We don't integrate. And so teaching kids to understand things in larger systems is to understand that when you want lots and lots of personal transportation on demand, you get interstate off-ramps separating people who live in the same community and holes in the ozone. Those ways of thinking, I think, are what design can bring to a discussion in which there's a hardening of categories, where there's a separation among subject areas. I'm in math now. I'll go to science next. I'll go to language arts next. Design has that integrating power, and it has the power to talk about things at the scale at which contemporary problems exist.

SLIDE

- national voluntary content standards
- national performance standards

The national voluntary content standards are a longstanding effort to describe what every child in America should know and be able to do in 12 subject areas, and it is tested through the National Assessment of Educational Progress. You may hear about it in the newspapers as the nation's report card or the NAEP test. The national performance standards are an effort of the University of Pittsburgh under Lauren Resnick, and ask: how good is good enough, relative to the content standards?

SLIDE

national science standards

- Studying how the designed world works
- Gaining direct experience with materials and forces through design activity
- Analyzing products and environments / identifying the problems they solve
- Developing design solutions to complex problems
- Probing constraints

Here are the national science standards. They come out of a project called Benchmarks for Science Literacy and a group of scientists who got together and said: "What makes good science education?" Look at the terminology in this. I realize that the type may not be very readable from the back, so I'm going to run through it. I've extracted from that list of their standards the things that I think are design specific. Studying how the designed world works. Gaining direct experience with materials and forces through design activity. Analyzing products and environments; identifying the problems they solve. Developing design solutions to complex problems. Probing constraints. These are scientists, and they're using the word design. What an opportunity to go through the door of an entire subject area that will never be cut from the budget. Never. And my experience with the NEA study was the scientists were the most receptive out of all the people out there as teaching collaborators. Absolutely terrific.

SLIDE

social studies, geography, and civics standards

- Considering how economy, culture, and technology shape design responses
- Using and interpreting graphic communication techniques
- Understanding the spatial organization of people, places, and environments
- Understanding how human actions modify the physical environment
- Discerning the interdependence of the built and natural world in spatial dimensions
- Analyzing the structure of cities and predicting the impact of change

This is a compilation. The social sciences get called social science, geography and civics depending on the grade level you're talking about, so these are collapsed. But here, considering how economy, culture, and technology shape design responses; using and interpreting graphic communication techniques; understanding the spatial organization of people, places, and environments; understanding how human actions modify the physical environment; discerning the interdependence of the built and natural world in spatial dimensions; analyzing the structure of

cities and predicting the impact of change. Urban design. Social studies have to teach this. This is what teachers are accountable for accomplishing. Another point of entry into the core curriculum for design.

SLIDE
English language arts standards
Presenting clear and convincing arguments
Gathering, evaluating, and synthesizing information in non-print text
Exploring the complexity and creative potential of problem solving
Presenting stories and information in non-print media
Extracting information from maps, charts, photos, and other graphics
Using forms of visual representation in persuasive arguments

English language arts: presenting clear and convincing arguments; gathering, evaluating, and synthesizing information in non-print text – that means visual in their terms. Non-print, isn't that nice? It's kind of like a null hypothesis. Exploring the complexity and creative potential of problem solving; presenting stories and information in non-print media; extracting information from maps, charts, photos, and other graphics; and using forms of visual representation in persuasive arguments. Another point of entry that will never be cut from the curriculum. So here's really powerful subject matter that is not in the margins of the K-12 initiative to educate future generations, and great points of entry for us in terms of design and architecture.

SLIDE
visual arts standards
Using knowledge of structures and functions
Understanding and applying media, techniques, and processes
Choosing and evaluating a range of subject matter, symbols, and ideas
Understanding the visual arts in relation to history and cultures
Reflecting upon and assessing the characteristics and merits of their work and the work of others

The national standards for the visual arts mention the word "design" in the preamble to the standards, among other "media" such as clay and stained glass.

A number of states have adopted more explicit standards for design as part of their mandated visual arts curricula.

In its 10-year assessment, the Getty Center for Education in the Arts attributed teachers' failure to address design to the lack of histories on the subject.

Visual arts standards. Design appears in the visual arts standards in the preamble with a list of media including clay and stained glass. And it appears nowhere in the standards themselves, although I was told when discussing the standards with the developers, that design is captured by this first one: using knowledge of structures and functions. Understanding and applying media, techniques, and processes; choosing and evaluating a range of subject matter, symbols, and ideas; understanding the visual arts in relation to history and cultures – they said it was there too – and reflecting upon and assessing the characteristics and merits of their work and the work of others.

So what we have here is a kind of political challenge for how we get design into the recognition and understanding of standards by art teachers. This will come up later in terms of the access to courses. How do teacher education students get access to design-based courses to build this understanding?

Also, a report by the Getty Foundation. Many of you are familiar with its discipline based art education, DBAE. A 10-year report of the progress of that particular approach to teaching the arts said that design had made no progress because there were no mature histories of design and no

access to literature. I guess we need some architectural history books. What it points out is, not that that literature is missing, but that architecture and design literature is not understood by the people who need to get it. So we have a task in acquainting people with the world references.

SLIDE
national performance standards

- University of Pittsburgh, under the direction of Lauren Resnick
- Middle school assessments of "Applied Learning" standards use design projects.

The national performance standards provide a number of disciplinary tests to determine how well we're doing in achieving content standards. There's one non-disciplinary category called *applied learning*, which is about how well students can integrate across disciplines. The applied learning standards are tested through design activities; students are asked to design a system, design a product, design communication. Here we see design being used as the testing strategy. The work I did with Denny Wolf at PACE, (Performance Assessment Collaboratives of Education at Harvard, a research unit) had to do with using design as an assessment strategy – that we can look at the outcomes of students' work in design and understand how much they understand about something else.

SLIDE
challenges for design education

- Good and bad news in the 1997 NEA study
- Task force for the Association of Independent Colleges of Art and Design

I want to close with two studies or reports and the identification of the challenges that are facing us in taking this movement to the next level. I have to tell you that I have been talking about that for thirty years, so if we can make some progress that would be great. First of all, some good and bad news in the 1997 NEA study and then a task force from the Association of Independent Colleges of Art and Design.

SLIDE
Design as a Catalyst for Learning / Good news

K-12 teachers find that the use of design in their classrooms:

- enhances students' flexible thinking skills
- promotes self-directed learning and assessment
- develops students' interpersonal and communication skills
- cultivates responsible citizens
- reaches all learner types and makes learning active
- transforms the teacher from authority to facilitator
- builds connections among teachers, subject areas, and community

The report is called *Design as a Catalyst for Learning*, and you've seen the book earlier in this session. By the way, it just went out of print, so it's tough to find. The NEA found that, across the board, K-12 teachers see that design in their classroom enhances students' flexible learning skills and thinking skills; promotes self-directed learning and assessment; develops their interpersonal and communication skills; cultivates responsible citizens; reaches all learner types and makes learning active; transforms the teacher from authority to facilitator; and builds connections across teachers, subject areas and communities. So the news was very good. These were not teachers who had design backgrounds. We opened a nomination hotline for three months and chose 169 case studies for the book. Coincidentally, only two of them were art teachers in that group, so that tells you something again about the kind of recognition of this movement within the arts community.

SLIDE
Design as a Catalyst for Learning / Bad news

Teachers also report that:

- design-based approaches to teaching are tough to maintain without administrative understanding and participating colleagues
- pre-service teacher education lags behind in-service workshops
- schools are reluctant to reallocate time and space
- in a test-obsessed environment, there is reluctance to depart from traditional approaches

But there were some downsides to it as well. Teachers reported that these approaches to teaching are tough to maintain if they don't have an understanding administrator – this means somebody who really gets it, not somebody who just says, "Good work, keep going" and pats you on the back. And if teachers don't have colleagues with whom to collaborate, they often give up. Frequently we go into schools and see team teaching going on in which the innovative, creative teacher has been paired with the losers, you know, to bring them along. Well this wasn't much fun for that great teacher who had figured out how to do this; or the losers, yeah, they weren't happy either. The goal here is to try to build a culture for teaching in which there's support at all levels, and teachers really understand that.

Pre-service teacher education lags behind in-service. And we see reluctance on the part of schools to reallocate resources and the time – I would say that time is a bigger deal than money. You know, if you've only got 45 minutes with a group of students, and it takes you 15 minutes to get them focused and 15 minutes to clean up, you're not going to get much done. So we found a lot of teachers striking deals with their colleagues, trading off time on certain days of the week. If you let me have them for two periods today, you can have them for two periods later in the week. So that's going to be a hurdle to get through. And in a test-obsessed environment, there's reluctance to depart from traditional approaches. I think teachers are really under siege about standardized tests and performance.

SLIDE
Changes from Grade 5 to Grade 6 scores on standardized tests under design-based instruction by Leslie Stolz, graduate of Doreen Nelson's MA program at California Polytechnic State University / Pomona.

[3 graphs – Reading 5/6, Math 5/6, Language 5/6]

And, in that light, here's some information that comes from one of Doreen Nelson's graduates. Her name is Leslie Stolz. She teaches in the sixth grade and entirely through design-based learning. She's in the West Chaparral school system outside of Los Angeles. Leslie compared standardized tests scores of her students in the fifth grade with the results of standardized tests of the same students in the sixth grade – the only difference being that they had been through Leslie's design-based learning experiences. There was not too much difference in the performances in reading, math and language by students in the upper two quartiles. These are kids who will learn in any way, so the differences in that group were negligible. But look at the differences in the lower two quartiles. The white is the design-based experience, and the dark is the previous experience – in some cases students doubled their scores. So what Leslie did was not worry about standardized tests – she was just a good teacher and the result was better performance on the standardized tests.

This is the kind of compelling evidence that we need to collect. We need to understand that these teachers work in a high stress environment and that they're going to have to argue to do something out of the norm. We need to provide them with the accountability and evidence that say this is going to be okay, not only to build their confidence but make the argument for their administration.

SLIDE
association of independent colleges of art and design

- Change the culture in which teachers are educated
- Recast teachers as thinkers and designers of learning experiences
- Need for credible assessment
- Need for partnerships between colleges of education and design
- Best practices database and national network
- Collaboration and persuasion of opinion leaders and policy makers

Lastly we have a report by a group convened by the Association of Independent Colleges of Art and Design (AICAD) several years ago. Marty Rayala is here; he was in that group. These were people who were working on college preparation in design-based learning, and they said that what we need to do is change the culture in which teachers are educated. We need to recast teachers as thinkers and designers of learning experiences – make this a creative profession. It's not about delivering the book. It's about figuring out: how do you design a learning experience and its environment? We need credible assessment. We need partnerships between colleges of education and colleges of design. My school is so maxed out in terms of design students, that it is almost impossible for an education student to get into a course. We have to design courses for those students, and we have to provide access or we can't wag our fingers at them and say they don't understand. Best practices databases and a national network. Thank you, A+DEN. And collaboration and persuasion of opinion leaders and policy makers. Now this was a large report that appeared in *Art Education Policy Review*, and it had a series of very specific action plans. I happen to have a draft copy of it and would be happy to leave it with Lynn if it's at all useful to you.

So, that's my agenda for this morning, and I'd be happy to talk with you about any questions.

Q+A

Question
You're very active with the American Institute of Graphic Arts, and a lot of us here are with built environment kinds of things. Is there a need for us to join forces for design education in general, with the product design folks, and the industrial designers as well, and the graphic artists?

Answer
Yes, I think that would be a really terrific thing. If you are in a pre-professional education mode, where students are really exploring career opportunities, it's great for people to be focused and to talk about specific disciplines because they are different cultures – in terms of college education and practice.

But the larger goal of creating really sensitive consumers of design, of getting people who understand how to problem solve in their lives, to get people to understand how to refer to the visual world, I don't think is a disciplinary issue. There's a lot to be learned from moving across the scales at which design operates, and I think that can be very helpful.

It also helps teachers. Sometimes they're more comfortable with some design practices than others. They may be very comfortable with making a film but not very comfortable with building things. So the more diverse the opportunities and the ways in which you connect them back to the core values and ideas, I think the better.

Question
I've had conversations with colleagues about the term *design education*, and I was just wondering what your perspective is – whether it is an umbrella term for architecture education and built environment education or if those three things are totally separate?

Answer
Well I think *design education* as a term is very general – that's what I call teaching my graphic design students. My preferred term is *design-based learning and teaching*. I personally don't think we can agree on a definition of design. I think that's probably not going to happen, but I think it may be helpful to talk about the terminology we use in the outside world.

Question
Hi, sort of following along Marty's question. You mentioned science educators as being very receptive to design-based teaching and learning, and given that architecture is such an integrative practice itself, what do you think about reaching out and having this discussion with environmental friends?

Answer
Yes, I think that's a great opportunity, and our PhD program right now is organized not around disciplines, but around places where we want design to have an impact. Our school has architecture, landscape architecture, industrial design, graphic design; and we've defined the PhD program in terms of spheres of influence. So we talk about design for learning, design for sustainability, design for health and well-being; design for the urban context; and that allows us, in many ways, to start collaborating with people who understand some aspect of those things. I think the same strategy would be useful for K-12 work. You've got people who are really in the sustainability and engineering worlds who get it. So where you can find collaborators and where you can find powerful collaborators, I think is really an important place for addressing the mission.

Question
Hi, I was wondering if you could talk a little bit about how those of us who provide enrichment type of programs – because we are with nonprofits or you know, we're individual entities – could actually really make the connection with teachers, people who are pedagogical figures in our community?

Answer
Maybe I can tell the story of the first year of DesignWise – where's Anna Slafer? We brought in teachers for the first week, and then those teachers brought their students for the second week. So it was a case of focusing on kids and what they know, but also focusing on the teachers, on extending what is possible in the classroom. I think those are great efforts.

You know, I talk about working with teachers as "going to the faucet." You train a teacher, and you've got the career lifetime of students of those teachers. You go into a student classroom, you have a one-shot experience with a student or maybe a continuing experience in short intervals. But educating those teachers is really powerful. If you want to make this a movement, teachers have to be included. Let me also say this, and this is editorializing. I have never, ever, had resistance or a problem with a classroom teacher understanding this work; the tougher problem is dealing with teacher organizations and the administration of teacher organizations. So I think there's a policymaker discussion that needs to happen in colleges and universities and professional organizations, but boy, classroom teachers are enthusiastic participants.

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