Design in the Curriculum

The use of design in education sets the stage for active and reflective learning. Where design itself is the subject, students focus on the “goodness of fit” among the products of designers’ work. These design experiences may be active because something is made and a solution to a design problem is the outcome. The reflective component may be a precursor to active learning but it is a learning style unto itself since it demands the use of language to discuss, think, and comment on design objects and their environment for which they are intended.

Cross (1983, pp. 221-222) says that design has its own distinct “things to know, ways of knowing them, and ways of finding out about them.” While basic sciences rely primarily on the scientific method and the arts on intuition, design is somewhere in between. Most classroom procedures support teacher-driven assignments, criteria for excellence, and assessments. In design experiences, students are encouraged to think critically and weigh options by participating in problem solving. It is important to capture the active nature of design. With this in mind, by implementing designerly modes of inquiry, students learn how to apply design problem solving strategies to learning about something other than design. Design problem solving strategies include both the natural and built environment when considering: economics, geographic, social, cultural, scientific, and technological.

The design process actively engages students because it prompts them to consider how they would address human needs, their time or another. Building models of cities, or planning mass production of products, and designing posters to carry political messages challenge students to articulate their own vision of how to preserve the best of what generations have left as a cultural legacy while creating a new, sustainable future. It takes into consideration how the economy, culture, and technology of the time shape the design response.

In response to the social studies standards, students analyze the ways in which people, past or present, encode meaning in their communications, make products, design buildings, build bridges, and transform the landscape with cities and towns.

The visual thinking in reading and writing in English language arts standards pay special attention to posing problems and speculating on solutions when students gather, evaluate, and synthesize information from print and non-print text, artifacts, and people. Design activities ask students to become participants in their own communities when they use interviews and persuasive language in support of their own ideas for change.
Most commonly reported by primary teachers is that the use of design activities to teach measuring and calculation also gave way to learning scale and proportion. The mathematics standards are evident in a design lesson that provided students the opportunity to design a research station where they had to calculate the costs to build it. By calculating costs of building and maintaining the structure, the students arrived at a real-world argument in order to defend their design decision.

Science literacy means to have students make sense of how the natural and designed worlds work. To achieve such literacy, teaching students principles and process, rather than in the abstract, encourages them to identify problems, frame questions, actively investigate, generate and test alternative solutions and describe outcomes using a full range of visual and mathematical models.

Technology is about taking action and knowing how to take action upon our physical surroundings. Technology and design education share similar problem solving concerns: performance expectations for proposed solution, invention of alternative physical form; testing of prototypes; and assessment of outcomes in human as well as mechanical terms. The quote below suggests how the design process helps students to understand a bigger picture and how this process offers the teacher more of an integrative approach to teaching by seeing and working with math, science, and technology as interdependent.

“Most of my design projects have to do with synthesizing specific subject matter and application of learned concepts. . .Life is not compartmentalized into English, science, math, and social studies, so I strive to integrate all these into my course”.

L. Sweetay, 11-12th Grade Teacher of Ecology  
Taravella High School, Coral Gables, Florida

When we consider strategies for second language learning and learners, the inclusion of design-based education offers skill development rich in reading, writing, speaking, and listening. By uniquely combining experiential learning with a design-based activity that includes calculating, testing, writing, discussing, making hypotheses, and investigation, second language learners ‘see’ what they are being taught. Design-based education is an excellent model of inclusion for many kinds of special learners. The design process is a unique combination of whole language and traditional learning because built into is review and practice, and activities presented as a whole, both adequate for sheltered instruction. Design in education offers students the opportunity to engage in activities that help make sense of language because of the physical involvement with the content. We go beyond talking about a town to designing a model of one, imaginary or real.
It is acknowledged that performance-based assessment and testing is not easy. When results are not immediate, we turn to more traditional ways of testing. In order to promote design in education, we need documentation of student performance on standardized tests. When measuring and reporting individual student learning, it seems appropriate to consider performance-based and portfolio assessment. Included are dimensions critical to the design process:

1) Evaluation of holistic problem solving in which thinking and doing are as important as the products of thought and action.

2) Assessment across time, rather than as single measurement at one moment in time; and

3) Accommodation of differences in students' learning preferences and ways of demonstrating mastery.

These dimensions seem appropriate to apply to assessment in second language learning because it considers development of language, cognition, and learning styles.

**Summary**

By having a true understanding of the design process, teachers may adequately coach students to create their own design solutions to a problem; imaginary or real. To broaden students understanding, teachers may need to consider how to develop ongoing facilitation techniques of the subject matter. Knowing how to have students produce 2- or 3-dimensional products does not adequately reflect an understanding of design. It has been suggested that hiring designers as part of a teaching staff support the development of well-informed teaching professionals who wish to use design-based methods in their schools.

In conclusion, these presenters believe that design-based education is a 'good fit' when considering a language-rich curriculum and applied learning in the development of activities in second language learning. When considering reaching learners from different cultures taught in a traditional rote fashion, the use of design-based education introduces best practices of a lively and practical learning environment.

The use of design in education sets the stage for active and reflective learning. Building models of cities, or planning mass production of products, and designing posters to carry political messages challenge students to articulate their own vision of how to preserve the best of what generations have left as a cultural legacy while creating a new, sustainable future. It takes into consideration how the economy, culture, and technology of the time shape the design response. The design process actively engages students because it prompts them to consider how they would address human needs, their time or another.

"Researchers have found that even very young children engage in complex thinking and problem-solving. For this reason, educators talk less today about whether the child is ready for school and more about whether the school is ready for the child."


Compiled by M. Strano and C. Robinson, T&L 815, May 2004
Presenters Intent:

The following design-based units were inspired by C.U.B.E. (The Center for Understanding the Built Environment). The use of activities suitable to application for second language learning was reviewed and planned for the purpose of engaging students in an active process of learning language by implementing a design-based educational course of study. While other design in education curricula was reviewed, C.U.B.E. was more precise in describing intent and outcome and for that reason we integrated our ideas into their general format.

Throughout the units, we imagined that second language learners would maintain documentation of new words and their meaning; a strategy used by successful students. In order to individualize it, each student would document words unknown only to that student. The word journal would serve as an ongoing list for the teacher to include in vocabulary practice, use, and testing and for students to practice and use dictionary skills. It is considered that words might be categorized: verbs, pronouns, etc. These words would serve as a springboard when writing is considered for design activities.

The classroom environment would include visual aids of the design tools needed to support design activities, such as: ruler, blueprints, cutting tools, etc. Each student would maintain a bi-weekly or daily problem solving worksheet that documents the process of problem solving while at the same time prompts accurately completion of sentences that relate to ongoing activities (see next page). These sheets were accessed through Kansas State Department of Education and look similar to cloze procedure activities. In order to maintain the ideals of inclusion, students less proficient in writing, and more proficient in speaking, may choose recording on tape their problem solving process.

Built into our design-based activities is the belief that not all resources need to be provided by the teachers. Students will research and access resources to include, games, songs, and myths as part of our belief to help them become autonomous learners. There are numerous videos available to inspire and stimulate thinking in design. These would add visual support and prompt small group discussions. At the end of this packet is a list of books on design for young readers, books about design and designing, and books about teaching and learning through design gathered from, Design as a Catalyst for Learning.
Lesson One: My Flag for the Future
Overview:
This lesson is designed for students to re-claim the symbol of their hometown by creating a new crest or logo. Students will first study their hometown’s logo or crest and comment on what it means to them. Following that, the students will work in teams of two to three to create a new logo or crest for the youth of their hometown.

National Standards:
Civics-Government: promoting common good
History: understanding significant individuals, groups, and symbols

ESL Standards:
Academic and Socio-Cultural

Learning Objective:
Students will work as teams in articulating their symbols of pride in the creation of a new city logo or crest
My Flag for the Future

Lesson:
1. Read and review literature on United States and native flags, symbols, and logos
2. Find examples & meaning of hometown logo, flag, or crest
3. When it was designed and what might have been its predecessor
4. Locate examples of other crests and logos from other towns and cities
5. Read Long May She Wave by Kit Hinrichs, pictorial history of American flags
6. Students, in small groups, discuss by brainstorming what youth-centric symbols or ideas they have for a new logo or crest
7. Once agreed, team designs by drawing an original logo or crest

Previously Learned:
Discussion of flags and their creators. Review new vocabulary

Multiple Intelligence:
Visual-Spatial, Verbal Linguistic, Inter-Personal

Subject Matter:
Social Studies, Visual Arts

LEP Instructional Strategy:
Props, Oral, Physical Gestures, Visual Aids
On board, teacher writes one word at a time in English and in Spanish
bandera = banner
Teacher prompts oral response of each word. Teacher points to flag

Learner Strategy:
Repetition, oral and written responses
Student repeats & writes words in English

Remediation: teacher-student tutorial and flag illustrations

Materials: 11”X17” paper, crayons, pencils, markers, scissors

Song: O Say Can You see and Himno Nacional Mexicana
Lesson Two:

Creating a Landmark Calendar
Creating a Landmark Calendar

Overview:
Students will team up with graphic design specialists in order to structure a school-based enterprise with the goal of publishing a student-generated 12-month calendar featuring local architectural sites and landmarks.

**National Standards**: Fine Arts

**ESL Standards**: Social, Academic, SocioCultural

**Learning Objectives**: Students will increase their knowledge of art, job-related skills, and career opportunities. Students will practice and apply skills in: elements and principles of art and design; drawing and illustration; photography and digital imaging.
Creating a Landmark Calendar

**Lesson:**
1. Walking tour of selected area.
2. Record images to be used in 12 month calendar, hand sketch or digital
3. Students apply research techniques (electronic and library) to gather historical and factual information regarding each selected site
4. Apply economics in determining the necessary cost charged for each calendar in order to make a profit

**Previously Learned:**
Identification of local historical buildings, monument, or significant structures
Review new vocabulary

**Multiple Intelligences:**
Inter-Personal, Verbal Linguistic, Visual-Spatial, Bodily-Kinesthetic, Logical-Mathematical

**Subject Matter:**
Fine Arts, Communication Arts, Photography, Technology

**LEP Instructional Strategy:**
Visual Scaffolding, Oral & Written Instructions of Digital Technology
Immediate Feedback

**Learner Strategy:**
Problem Solving: understand, plan, solve, look back; review

**Remediation:**
Visual Aids, Students demonstrates safety use of tools

**Materials:**
Digital camera, drawing pencils, computer use, student clipboards, notebook paper, eraser, disposable camera.
Lesson Three:

City
People
City
Stories
Overview: Understanding the architecture and cities must begin with an understanding of the people of that city. This set of activities enables children to think about the city from that perspective; the children create scale citizens; then, following their natural inclination to invent stories about the people and buildings they create, they develop, write, and share those stories.

National Standards: English Language Arts

ESL Standards:
Academic, Social, SocioCultural

Learning Objectives:
Students will hear and observe examples of how authors and illustrators describe architecture places by creating scale citizens, develop stories about the citizens, share stories, recognize common elements in the process of design planners and architects use to design the built environment, and the process writers use to design stories.
Lesson:
2. Create scale figures (1/4" = 1’) to represent the people in an original 3-D model
3. Invent name, age, occupation, gender for their created people
   embellish with yarn for hair, backpacks, pets, etc. to illustrate personality
4. Write a story about the person you created in the city where they live
5. Create news writing for the city and its people

Previously Learned:
Reviewed literature about city buildings and those who came to our cities from other countries
Review and discuss types of articles in news writing
Review new vocabulary

Multiple Intelligences:
Logical-Mathematics, Verbal-Linguistic, Kinesthetic

Subject Matter:
Language and Visual Arts, Mathematics, Social Studies

LEP Instructional Strategy:
Visual Aids, Small Group Discussion, Semantic Map, Demonstration of Use of Cutting Tools, Oral Reading of News Writings
Complete City Game

Learner Strategy:
Practice cutting, Highlighting New Vocabulary from News Writings,
Categorizing Attributes of City Folks

Remediation:
teacher-student tutorial, complete Spanish-English City Game

Materials: pipe cleaners, scrap fabric, yarn, index card or oak tag board, scissors, stapler, pencils, ruler, xacto knife, computer use

Song: It’s a Small World After All
Lesson Four:

Physics Park

Internet-based lesson plan adapted for second language learners
Physics Park

**Overview:**
Student ownership of community projects is the primary focus of this activity. Students will be engaged in the construction of a web site playground and the examination of the physics behind the playground’s equipment. Due to the nature of this activity, it can be used as an introduction or a review of a unit on physics. As an extension to this activity, students will become involved in the persuasive promotion of their ideas to local school districts.

**National Standards:**
Math and Technology

**ESL Standards:**
Social, Academic, SocioCultural

**Learning Objective:**
Students will discuss constructing a playground for the website school. The playground will be designed by the students to accommodate all physical abilities.

www.cubekc.org/architivities/lesson/physicspark.html
Lesson:

1. The teacher will show visuals from Physics Park web and read the script for the introductory activity while showing the class the intro lesson images.

2. It begins. . .You can be a part of building the new American City. Youth represents the future of the city and is just one segment of the many people who use the city. . .

Previously Learned:
Review website of Grid Pattern for Playground
Review Word Wall of new words acquired from website

Multiple Intelligences:
Logical-Mathematics, Spatial, Verbal-Linguistics

Subject Matter:
Social Studies, Math, Computer Technology, Language Arts

LEP Instructional Strategy:
Research on Web, Immediate feedback, Technology visuals
Listening and comprehension for visuals used by teacher for script to lesson images link

Learner Strategy:
Listening, comprehension, oral and written responses. Correct oral responses to visual images on web. Memory strategies

Remediation:
Teacher-student review of computer use
Instructional language
Cooperative peer teaching

Game:
Students create playground game with instructions or create a computer program using framework from physics park to include new vocabulary words
Lesson Five:

Grid It Map It
Overview:

Students use bodies and string to grid a small town then map sections of the town. Since so many cities are based on straight lines and square corners, many New England town layouts are based on the area’s varied topography. Given hills, and a river running next to the base of the hills, early settlers most often began their towns along the river; subsequent roads either skirted the edges of the hills or wound their way up and over those hills. The benefit of overlaying a New England topography with a regular mapping grid becomes clear in this hands-on mapping exercise.

National Standards:
History, Social Sciences, Science & Technology, Mathematics

ESL Standards:
Academic

Learning Objective:
The students will physically experience and discover the utility of grading an area for mapping purposes. They will engage in the design process to define and solve design problems. Students will work cooperatively to assemble grid drawings into a whole map. Students will learn scale measurements and draw features of the built environment.
Lesson:

1. Work with students to lay out an 8’X8’ square on a floor
2. Place construction paper greenspace, roads, and waterways on this space
3. Set several boxes, blocks or objects of different shapes on space to represent features of the built environment
4. Label each building and feature
5. Clearly mark each side N, S, E, W
6. Discuss and demonstrate how to draw an accurate plan-view sketch of the space and all of its features, in scale, on the graph paper.
7. Drawing in PLAN means drawing a two dimensional, top, or bird-eye view.
8. Drawing in SCALE: 1” = 1’ means that every 1” of the graph paper represents 1’ of model space.
9. Demonstrate you are building exactly what you see within the 8’X8’ square
10. Students use pencil, eraser, clipboard and graph paper
11. Orient paper to the direction of drawing
12. Sketch locations of every land feature, then built feature
13. Color and label features and buildings

Previously Learned:
Reviewed scale & meaning and the use of graph paper. Review new vocabulary

Multiples Intelligences:
Kinesthetic, Visual-Spatial, Logical, Inter- IntraPersonal

Subject Matter:
History, Science & Technology, Mathematics

LEP Instructional Strategy:
Physical responses, listening and comprehension, hands-on activity. Physical experience making a map according to spoken direction. Use of a grid or map to sketch. Imagery. Visual clues on board and on overhead
Learner Strategy:
Direct strategies practicing, guessing, and using imagery and indirect strategies paying attention

Remediation:
Demonstrate by physical response in cooperative setting. Students play game to familiarize grid concept.

Game: Find the Missing Building
Lesson Six:

Comparing Edible Communities
Comparing Edible Communities

Overview:
Students will explore the components of a community by creating analogies between aspects of a community and ingredients within a recipe. Students will demonstrate the cohesion among community areas as they attempt to create cookies from various recipes that have missing ingredients. Students will realize that the removal of one ingredient directly influences the entire product. This action is analogous to the removal of any vital aspect of a community. As one community area disappears, others are directly influenced.

National Standards:
Math, Language Arts, Food/Consumer Science

ESL Standards:
Academic

Learning Objective:
The student will create analogies between two different objects. Generate a product from a recipe. Students will analyze components of a recipe and apply information gained from experimental means into a higher-order assessment.
Comparing Edible Communities

Lesson:
1. Students sample cookies made from Chocolate Drop recipe. Students record in journal how the cookies tasted.
2. Teacher reviews previously discussed information about what is community.
3. Throughout the entire activity, teacher use words, pictures, and actual activities to make meaning clear.
4. Students create analogies between pictures of ingredients from cookie recipe and pictures of elements of community.
5. Images to show students might include: grocery store, city hall, homes, trash cans, post office.
6. Teacher gives verbal examples of analogies.
7. Example, color of orange juice is the same color that construction workers use while they work.
8. Collect student created analogies and place students into groups of four.
9. Discuss what makes a successful community.
10. Students will be given a recipe for cookies less original ingredients.
11. Students taste cookies and record how they taste.
12. The analogy of these altered recipes to the community images creates the discussion about a missing ingredient and the vitality of community.
13. Students complete a written assignment using analogies between community and recipe.

Previously Learned:
Ingredients to recipe. Ingredients to community

Multiple Intelligence:
Bodily, Mathematical, Linguistic

Subject Matter:
Food Consumer Science, Mathematics

LEP Instructional Strategy:
Verbal directions to physical outcome. Immediate feedback. Demonstrating measuring.

Learner Strategy:
Written responses. Demonstrate, record, and listening.
Comparing Edible Communities

Remediation: Teacher-student tutorial. Review and repeat steps in cooking with written prompts on board

Materials: Cookie recipe ingredients, paper towels, measuring utensils
Lesson Seven:
The Built Environment
The
Built
Environment

Overview:
The local built environment can serve as a visual textbook and a resource to all areas of instruction. Integrating the built environment into curriculum can involve designing a site-based walking tour of the school neighborhood, a historic area, or a city square. The area should be selected based on the objectives, skills, and outcomes students needs to know and perform.

National Standards:
Communication Arts, Mathematics, Science, Social Studies, Fine Arts

ESL Standards:
Academic, SocioCultural

Learning Objective:
Students will develop a knowledge base of the local built environment by practicing and applying skills across the core curriculum as they work to document, record, and present their discoveries and findings. Students will apply community-based information to various classroom activities to include: photo journals, written reports, drawings, scaled models, time lines, graphs, charts, maps, form and informal discussions, and multimedia presentations.
The Built Environment

Lesson:
1. Create a walking tour.
2. Math and Measurement Team: appropriate measuring instruments, students will measure and estimate height and width of all sites on tour.
3. Navigation Team: apply methods and skills in social science inquiry by outlining and navigating walking tour, plot directions, map coordinates, and locate significant landmarks.
4. Journal Team: apply skills in recording descriptions of sites and details as well as conducting historical interviews with local merchants and patrons. This information can then be used in written and oral reports when compiled with historical information, photos, and artwork to create form and informal presentations and discussions.
5. Historical Team: apply skills ingathering facts and information regarding each site. At school, students research the sites (library and electronic) to compile information in creating timelines and written journals.
6. Return to school and determine mass, volume, depth of each site.
7. Art Team: create illustrations, sketches, contour line drawings or texture rubbings of building materials. This becomes a souvenir as well as record of various sites.
8. Photography Team: record architectural sites and details, structural principles, angles, points of view, change and deterioration, light and shade. Compile this information with illustrations and written information to create photo records, brochures, and to be used in multimedia presentations.

Previously Learned:
Planning of walking tour and discussion of safety, signals, and how to reach destination. Practice use of different instruments and media equipment.

Multiple Intelligence:
Bodily-Kinesthetic, Visual, Mathematical, Linguistic, Inter- IntraPersonal

Subject Matter:
Language Arts, Mathematics, Science, Social Studies, Fine Arts

LEP Instructional Strategy:
Verbal directions. Visual aids support.

Learner Strategy:
Written record of new information. Discuss and read new information.
The Built Environment

Redmediation:
Walk Around the Block Game (next page)

Materials:
Student clipboards, notebook paper, drawing paper, graph paper, pencil, eraser, drawing materials

Game:
Walk Around the Block (next page)