# Designing for Behavioral Change
**A Call to Educate and Motivate**

Debra Satterfield, Iowa State University, © 2005

## Abstract
This paper examines how students in a graduate-level human interaction design course were taught to produce designs for the purpose of teaching and motivating a target audience. It discusses how students, in completing their project, in this case a method to teach sign language to non-verbal children with brain injuries, first had to go through the process of teaching themselves about the subject and their target audience before they could design for that subject and audience. Specifically, this paper examines how students conducted research on unfamiliar subjects and audiences and came to a greater understanding of both.

## Introduction
We live in a complicated world: a world with beauty, a world with diversity, and a world with problems. As designers, we are uniquely qualified to make messages that can reach people through words, images, products, and concepts. But changing the world takes guts. It also takes a passion for change that can only be fueled by re-examining the way we view the role of design in our society and the way we prepare our designers. Changing the font on a poster will never bring about the type of change that makes a large-scale difference. Designers need to learn how to reach an audience that doesn't want to be reached. They need to know how to teach a child that others thought couldn't be taught. They need to learn how to motivate the addict who has lost all hope. These are the issues that are challenging our world, and these are the skills we need to address to empower designers.

In a graduate course in human interaction design, a curriculum was designed to include lectures on the body's sensory systems, the dualistic roles of rational thought and emotion in the human decision making process, behaviorism, motivation, the theory of multiple learning styles, and education techniques. Students were expected to read books and articles by Howard Gardner, Temple Grandin, Brenda Laurel, Edward Tufte, and Donald Norman. They were also encouraged to seek out their target audiences and research their subjects experientially. And finally, they were encouraged to design for education and for change.

## Methodology
This course, as a case study, examines how a variety of interdisciplinary concepts could be incorporated into a human interaction design course to produce more effective design solutions. Information from the fields of psychology, education, and information design were identified as particularly relevant to the subject of human interaction. Ample class time was devoted to group discussion and individual interaction with each student. Students were expected to conduct field research and produce an extensive literature review for each project.

The format of the course was a combination of lectures, guest speakers, group discussions, and critiques. Because students did not have much background in the readings from outside of the design discipline, introductory lectures were given on the topics of behaviorism, perceptual psychology, Howard Gardner's theory of multiple intelligences, education theories, and the body's sensory systems. Students were asked to read books or articles on these subjects and then class discussions were conducted where students could discuss questions or personal responses to the materials. Guest lectures were used to bring in people familiar with the subject matter of the project. In this case guests were several individuals who had experience with sign language or with children with developmental disabilities. The guests had the opportunity to share their first-hand experience with students. They were brought in at various points during the project development cycle thus giving students the opportunity to not only hear what the guests had to say about the subject but also allowing the guests the opportunity to view student work at various stages. This was an advantage to the students in that they were able to hear similar stories in a different light depending on what part of the design problem solving process they were engaged in at that time. This had the added advantage of allowing guests to see what work they were guiding and giving them an added sense of contribution.

**Behaviorism as a Design Principle**
Understanding human behavior is fundamental to design that is intended for behavioral change. It is important to know not only how someone will respond to a specific situation but also why they respond in a particular way. Behaviorism, as a discipline, is a method of shaping behaviors or responses based on a system of rewards, prompts, and models. As a tool in communication or interaction design, the designer must anticipate what responses are possible from a target audience and then be prepared to equip that target audience with a model of an appropriate response, a prompt that can guide them to an appropriate response, or a reward for giving an appropriate response.

Behavioral teaching, says O. Ivar Lovaas in <u>The Me Book</u>, is breaking down large or general problems into more manageable and separate behavioral units. These units, he says, can be related to more manipulable environmental variables.[1] In design, behaviorism is about communicating information in ways that can be easily interpreted by the target audience. It should anticipate what information the audience needs and build in questions or arguments that may be plaguing them. The designer must try to identify what, if anything, the audience knows about the subject being addressed. If old ideas or misinformation are not dealt with, the behavioral change will likely fail.

When dealing with behavioral change, it is likely that the target audience may also need to unlearn or replace a maladaptive behavior. Often this should become part of the persuasion of the design. Only by understanding why the maladaptive behavior exists can an appropriate new behavior be constructed to effectively replace it. The designer's job is to understand the problem behaviors, supply the target audience with sufficient information to make a better behavioral decision, and equip them with the necessary information to make the behavioral change.

**Reinforcement as a Change Agent**
All actions have outcomes or consequences. Outcomes can sometimes be thought of as rewards or punishments. If we do a good job, we expect to be rewarded for our efforts; and if we do less than what was expected, we may lose something as a result. However, sometimes outcomes or consequences may be reinforcing or seem desirable even if the action is essentially problematic. For instance, a drug addict finds reinforcement in the addictive drugs. While the addict may want to change this behavior, it will be very difficult for a variety of reasons, one of which is the pleasurable reinforcement caused by the drugs. Even though there are many undesirable consequences, the physical reinforcement of pleasure is closely connected with the event and the unpleasant consequences are farther removed from the action making them harder to associate directly with the behavior. Some behaviors will have physical as well as psychological underpinnings to their addictions. In this case, each aspect of the addiction must be addressed in some way and then replaced with another type of reinforcement that will promote an appropriate behavior.

Whether the behaviors are good or bad, reinforcement is very powerful in forming and solidifying them. According to Gina Green in <u>Behavioral Intervention for Young Children with Autism</u>, appropriate responses closely followed by consequences that are effective as reinforcers have been found to be likely to occur again.[2] When these reinforcers are differential, or incrementally more desirable as the target audience comes closer to the desired appropriate response, the new behavior can be learned more quickly and effectively.

Reinforcement can be internal (self-provided) or external (from another source). Internal reinforcement is usually more effective but may be very dependent on circumstances. For example, a young woman who quits smoking while pregnant is internally motivated by the desire for a healthy baby. Therefore, the circumstance of pregnancy provided the reinforcement. However once the baby is born, the reinforcement may dwindle allowing the smoking habit to return. External motivators can work but tend to be less compelling to many people. This explains why the vast majority of healthy people fail at dieting since they may not have extremely strong internal motivation and external motivation is more difficult to obtain. However, some of these people when faced with life-threatening circumstances can be very motivated to maintain a dietary change because the internal motivation has increased due to a change in circumstances.

Designers need to understand what potential internal and external motivators are involved in a behavioral change situation. Often there are several motivators that are involved to varying degrees. Considering how reinforcement will impact the success of the design is critical. If the prize is in constant view, the behavioral change is more likely to occur. It is also important to note that reinforcement can change over the course of time. By being aware of a multitude of possible reinforcers and emphasizing more than one, the likelihood of properly identifying at least one of the reinforcers is greater. For example, a person who initially quits smoking while pregnant to avoid a low birth weight baby may find later reinforcement from the apparent reduction in SIDS rate among babies who are raised in a smoke-free environment.

**Sensory Input**
Our sensory systems are another critical link to education. Many brain researchers, psychologists, and educators have identified the connections between the body's sensory and motor systems and our ability to take in and process information. Because of how we process information, emotion is thought to be more important than logic in our decision making process.[3] Sensory information is become increasingly important in design as the field of design expands to include experiences and as technology allows for more realistic sensory information to be incorporated into design work. Sound, motion, and tactile sensations are often part of designed experiences. Robert Sylwester, in A Celebration of Neurons : An Educator's Guide to the Human Brain, explains the sensory system of the body as two pathways. One pathway, he says, is considered a fast pathway and provides us with information about where an object is located in space. A second, slow pathway provides us with information about the nature of the object. In addition, each of the senses provides us with distinctly different information about an object. Our eyes for example provide about 70% of our information and are the beginning of the cognitive process. Hearing, on the other hand, is taking in information even during sleep, making it a very important sense for monitoring our environement.[4]

Using multiple senses is often an excellent strategy for creating effective learning material. By incorporating visual and verbal material, multiple learning styles can be accommodated by the same design. If the design is a time-based media, then additional strategies such as motion and sound can be used to reinforce the message. Because we can take in information through non-competing sensory systems, this strategy can be used to make the information more reinforcing. In some cases, one sensory channel can be used for one type of information and another channel for another type of information. One example might be using sound to give a sense of environment, using color to give a sense of navigation in space, and using text to deliver a specific message. When these various channels are all communicating similar information in slightly different ways, the audience has many opportunities to glean the appropriate message from the design. If the target audience has any deficiencies in language, communication, or cognition, this technique is particularly useful.

Donald Norman, in The Design of Everyday Things, gives another good argument for using multi-sensory design solutions. He recommends using sound to make invisible processes visible. He says that sound can tell us when things are working properly.[5] For instance, the sound of water percolating tells us that the coffee maker is working. Sound as a form of user feedback is very informative. However, it quickly can become annoying if the user has no control over the sound. A visual equivalent of this concept is the spinning icon or progress bar that fills as the computer is loading information. User feedback is an essential part of making the target audience more comfortable with long waits or invisible processes.

**Designing to Educate**
Educating people is essential to behavioral change. We cannot change someone's mind for them, but it is possible to give enough additional information that they are able to

make a new decision. Learning and education are seemingly related processes. But often we do not tailor the education process in such a way as to meet the needs of various types of learners. Howard Gardner, in his book  Frames of Mind: The Theory of Multiple Intelligences, describes what he calls a shift in how psychology views human behavior. Gardner notes that what makes human cognition distinctive is the use of symbol systems. These symbol-based cognitive systems are found in areas such as music, language, mathematics, and the visual arts. This shift, says Gardner, does not replace the classical Piagetian theory of learning but rather provides a more pluralistic approach to education and learning.[6] The multiple intelligences approach to education opens the door to more possibilities in terms of strategies for delivering educational content. By considering the background of a target audience in terms of what might be their strongest "intelligence area or areas" it is possible to frame the design problem in a way that might be more accessible to that audience.

The book, How People Learn: Brain, Mind, Experience, and School, produced by the National Research Council, emphasizes the importance of active learning. Active learning is a process by which a person takes charge of his or her own learning. As an inquiry-based approach, students are taught to identify when they need more information and seek it out. This method has proven to be more effective in overall understanding than other approaches that are more instructor-directed. It has also proven to be more effective than the constructivist approach. Under a constructivist model, learners added new knowledge to what they already knew about a subject. This approach only works well if the previous knowledge is complete and accurate.[7]

It is important to try to make educational information active. For those needing to change a behavior or learn new information, previous information on a subject may be inaccurate or incomplete. This gap in information may have been at least partially responsible for the inappropriate behaviors, thus an inquiry-based approach may be more effective. In addition, an active learning process gives the target audience a greater sense of ownership or control over the decision making process. More control may also give a larger sense of accomplishment to the target audience and therefore be more reinforcing to them.

**Course Goals and Objectives**
In this course, students were expected to use an active learning style to glean the knowledge necessary to solve their studio problems. They were given the opportunity to learn from classroom lectures but were then given the latitude to find their own information from a variety of sources. The following six learning objectives were identified for this course:

1. **Identify Sensory Languages**
   The sensory systems of the body were researched and analyzed. Students were given the opportunity to conduct research from other fields such as perceptual psychology, occupational therapy and neurology in order to understand and identify those concepts that affect human interaction, graphic design, and sensory communication.

2. **Effectively Communicate Via Multiple Sensory Channels**
   A method of evaluating and analyzing sensory experiences was developed and utilized for creating user experiences. Students synthesized information from various fields and formulated a process of utilizing this information in practical applications.
3. **Identify Micro and Macro Sensory Experiences**
   Communication experiences were evaluated in terms of their use of fine and gross motor involvement for the user. Research in body movement, spatial orientation and tactile response were used as a basis for developing a method of analyzing and evaluating the effectiveness of these experiences.
4. **Effectively Utilize Multiple Learning Styles**
   Students researched various learning models in order to understand how people gain information.
5. **Identify the Role of Emotion in Human Interaction Design**
   Students researched ways of identifying and utilizing emotion in the design of user experiences.
6. **Identify Primary Motivating Factors in Human Behavior**
   Students learned how behavioral principles work and why they need to be incorporated into many types of human computer interaction situations.

Students were given three studio projects to complete over the course of the semester. Each project had a slightly different goal with regard to education, learning, or behavioral change. The first studio project was to develop a method or tool to teach signed English to non-verbal children with autism or brain injuries or their adult caregivers. This subject was selected due to the complexity of the problem, which required students to learn part of a new language; its ability to be multi-modal in terms of communicating through visual, auditory, or time-based media; and the fact that most students have some knowledge, albeit incomplete and probably inaccurate, about sign language. This project required research into both the content area, sign language, and the target audience, which involved children, adults or persons with cognitive disabilities. Students were able to do first hand research on some members of the target audience by visiting an on-campus lab school. Emeritus faculty members and people from the community also served as resources for the class to draw upon. The primary goal of this project was to explore ways to motivate a person to learn and use reinforcement as a way to facilitate the learning process.

The second studio project focused on presenting statistical or factual data in ways that would appeal to audiences from a variety of different learning styles. Students were assigned topics about public health or safety issues. It was required that they have no special knowledge in their subject area prior to beginning this project. The primary goal of this project was to allow students the opportunity to conduct independent research and from this identify an area of need. This active learning process let the students self-direct their third project by how they conducted the inquiry process in this phase.

Project three was focused on the area of behavioral change. It emerged from the research conducted in project two and was therefore unique to the vision and learning process

experienced by each student. Students identified areas that were often divergent from the original research area but yet a natural extension from it. The process allowed students to discover areas where they thought change could occur, and it allowed them to develop strategies to facilitate that change. Students found this aspect compelling and were better able to discuss their subjects in class and in faculty critiques.

**Results and Implications**

The outcome of the studio projects from this course as compared to previous courses is that students were more aware of learning strategies and techniques for reinforcement. They were better able to discuss their subjects in large and small group formats due to a better familiarity with the content areas and target audiences. Active learning strategies seem to foster more interest in the studio projects and encourage students to take more ownership of the final outcomes. Because in some instances, a student might also serve as area expert for other students, they could take on dual roles in the class between educator and learner. Students who directly observed or interviewed members of the target audience seemed to be more motivated to develop quality solutions. They were also more keenly aware of the human interaction component the studio project. By actually engaging with members of the target audience, students were able to relate to them better as people rather than as "the audience."

As designers, we are both learners and educators. They go hand in hand as we solve studio problems. The closer we can connect with the target audience and their unique situations, the better we can solve problems and improve lives. By focusing students on more than the formal design aspects of a project, we may be able to go farther in meeting human needs. The reality of the situation is that while we as designers are very aware of the formal aspects of design, most target audiences are not. This is not meant to imply that a solid foundation in formal problem solving is not important. It does imply that formal solutions, however beautiful, do not necessarily mean design excellence if they do not meet the educational, psychological, emotional, and physical needs of human interaction.

**References**

1. Lovaas, O. Ivar, <u>The Me Book: Teaching Developmentally Disabled Children</u>. PRO-ED, Austin, 1981, p. xi.
2. Maurice, Catherine, editor and Gina Green and Stephen C. Luce, co-editors, <u>Behavioral Intervention for Young Children with Autism: A Manual for Parents and Professionals</u>. PRO-ED, Austin, 1996, p. 30.
3. Sylwester, Robert, <u>A Celebration of Neurons: An Educator's Guide to the Human Brain</u>. Association for Supervision and Curriculum Development, Alexandria, 1995, p. 73.
4. Sylwester, p. 58-63.
5. Norman, Donald A., <u>The Design of Everyday Things</u>. Basic Books, New York, 1988, p. 102.
6. Gardner, Howard, <u>Frames of Mind: The Theory of Multiple Intelligences</u>. Basic Books, New York, 1983, pp. 24-26.
7. National Research Council, <u>How People Learn: Brain, Mind, Experience, and School</u>. National Academic Press, Washington, 2000, pp. 10-13.