Partnering with Social Service Organizations to Develop Socially-Relevant Projects in CSE

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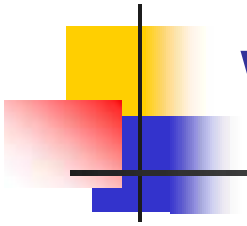
COMPUTER SCIENCE
& ENGINEERING



Why we do what we do...

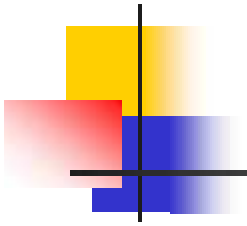
Wanted team projects that:

- Engage students
- Harness their creativity
- Give them a reason to “stay tuned” throughout the semester or longer
- Help teams understand that what they do matters
- Enable students to leave their imprint on the community – provide a lasting service

W we do what we do...

We are problem solvers:

1. David is 43 yrs. old, suffered a stroke at 27, has not spoken since.
2. Jackie is 19 and has never communicated.
3. Dean is 5 yrs. old, autistic, can select radio stations, cannot make selections on anything else including a communicator.

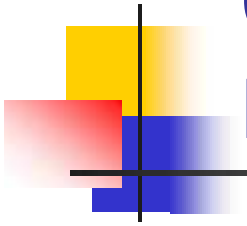


Learning and Problem Solving:

- Problem solving cannot be learned by reading.
- Problem solving cannot be learned by solving well defined problems.
- Learning to problem solve requires practical experience, support, reinforcement and motivation!

Through service learning we created an environment of:

- Very high student motivation and engagement;
- Very challenging material;
- Very high levels of instructor expectation; and
- Rich design possibilities;



Creating an Experience that Works!
Dealing with Student Expectations!

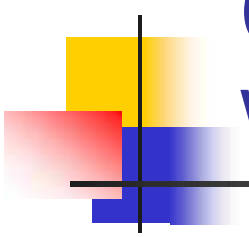
Students expect capstone courses to be "cool and neat."

Students being to problem solve by "thinking in code."

Students don't like:

- Problems they don't quickly understand (can't get their brains around easily)
- Unfamiliar customer environments

Some students expect there to be a "right" solutions to all problems.



Creating an Experience that Works!
What we give Students!

Socially relevant projects give students something MORE than they expect.

The prospect of making a difference engages their attention and sustains and motivates them throughout the course.

“It turned on a switch inside!”

Service learning combined working with real, off-campus clients to build systems that are needed and need to work!

Creating an Experience that Works!
Managing Client Expectations

- In engaging a target population in need, we built expectations of delivery.
- Our biggest challenge was not to disappoint David, or the children at the center, with a failed project.
- This added motivation beyond a grade in the course for the Computer Science and Engineering students.

Some Issues?!

- Some students expressed discomfort in working with the disabled.
  - Fear of the unknown
- Our students didn't want to disappoint their clients. Figuring out what the Professor "wanted" was no longer the "game" being played by students.
  - We had raised the "stakes"

Our Clients & Customers

Our First Client: ElderWood Senior Care at Oakwood, Williamsville, NY

The Client

- David, a 43-year old stroke patient who has been speech impaired for 20 years.
- Previously communicated using a letter board
- Current technology solutions were not adequate for David

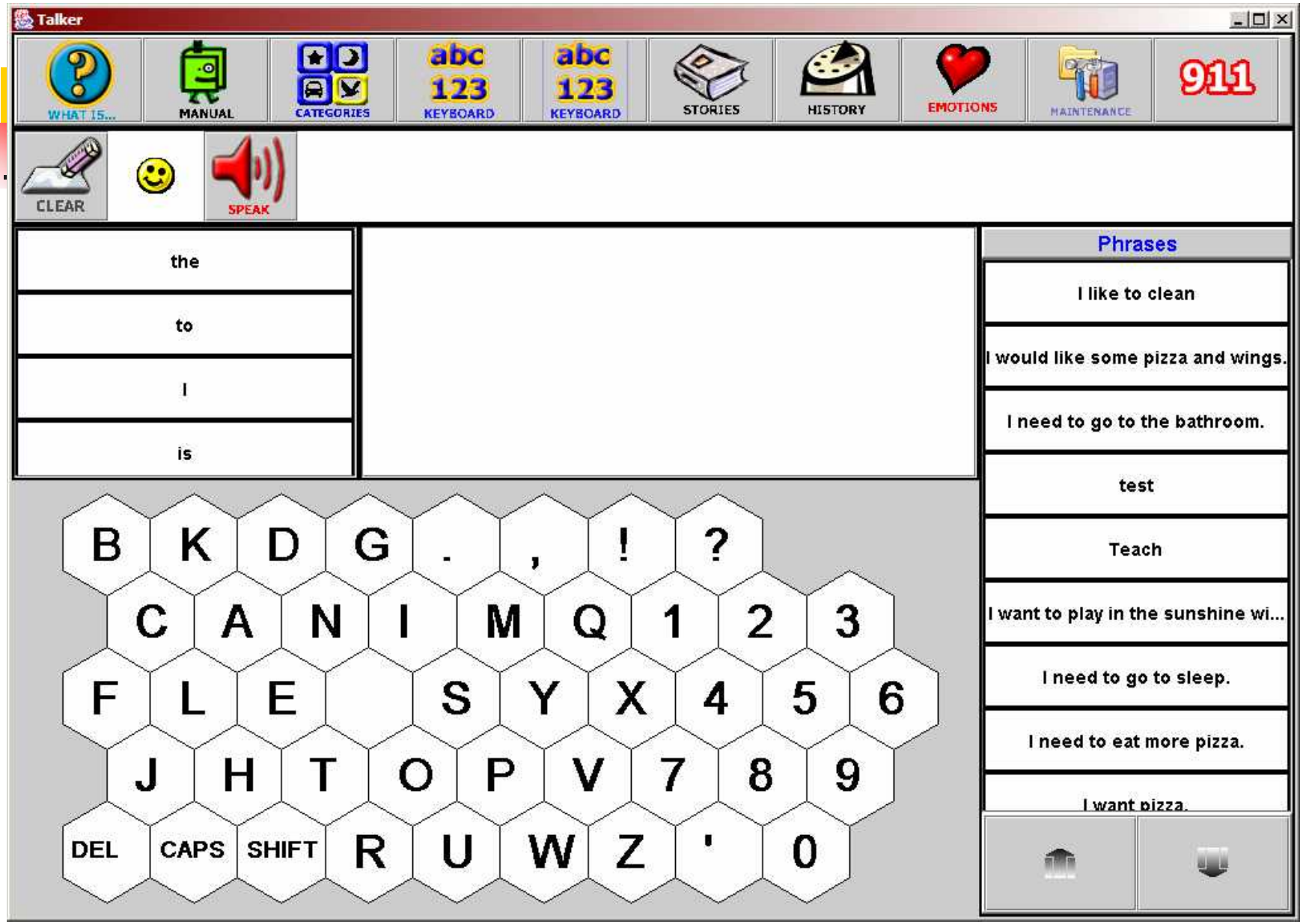
Result

- The UB Talker was developed for David by students
- VESID (Vocational and Educational Services for Individuals with Disabilities) has purchased a tablet PC for David.
- David is working with our research group as a consultant.

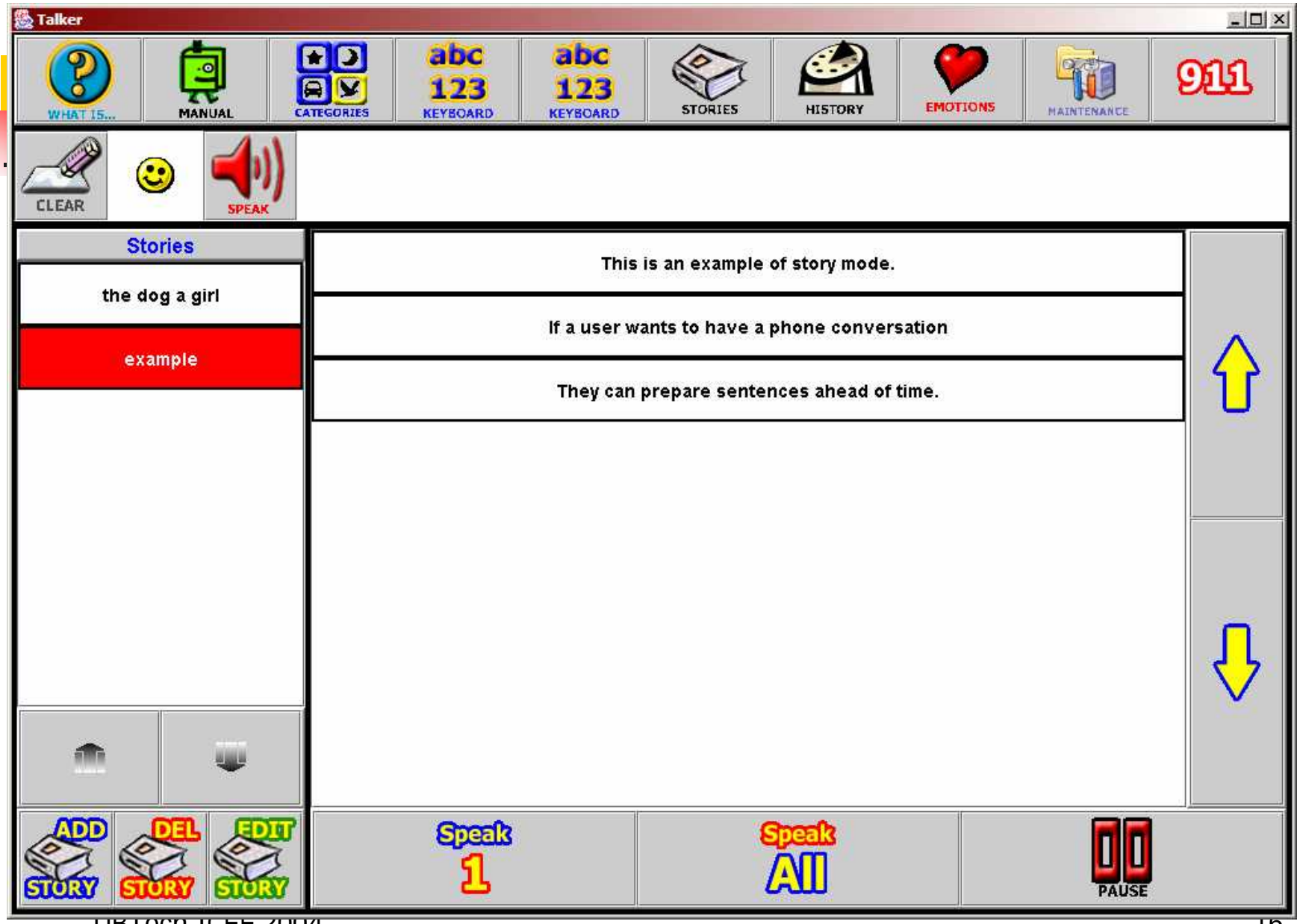
UB Talker

- Goal - Give people without the ability to speak, a voice.
- Targeted Population - Handicapped/disabled who have limited motor skills and have difficulty with voice communication
  - Phase I - Adult Talker
  - Phase II - Child Talker
  - Phase III - for the visually impaired, and for the severely handicapped (no motor skills)

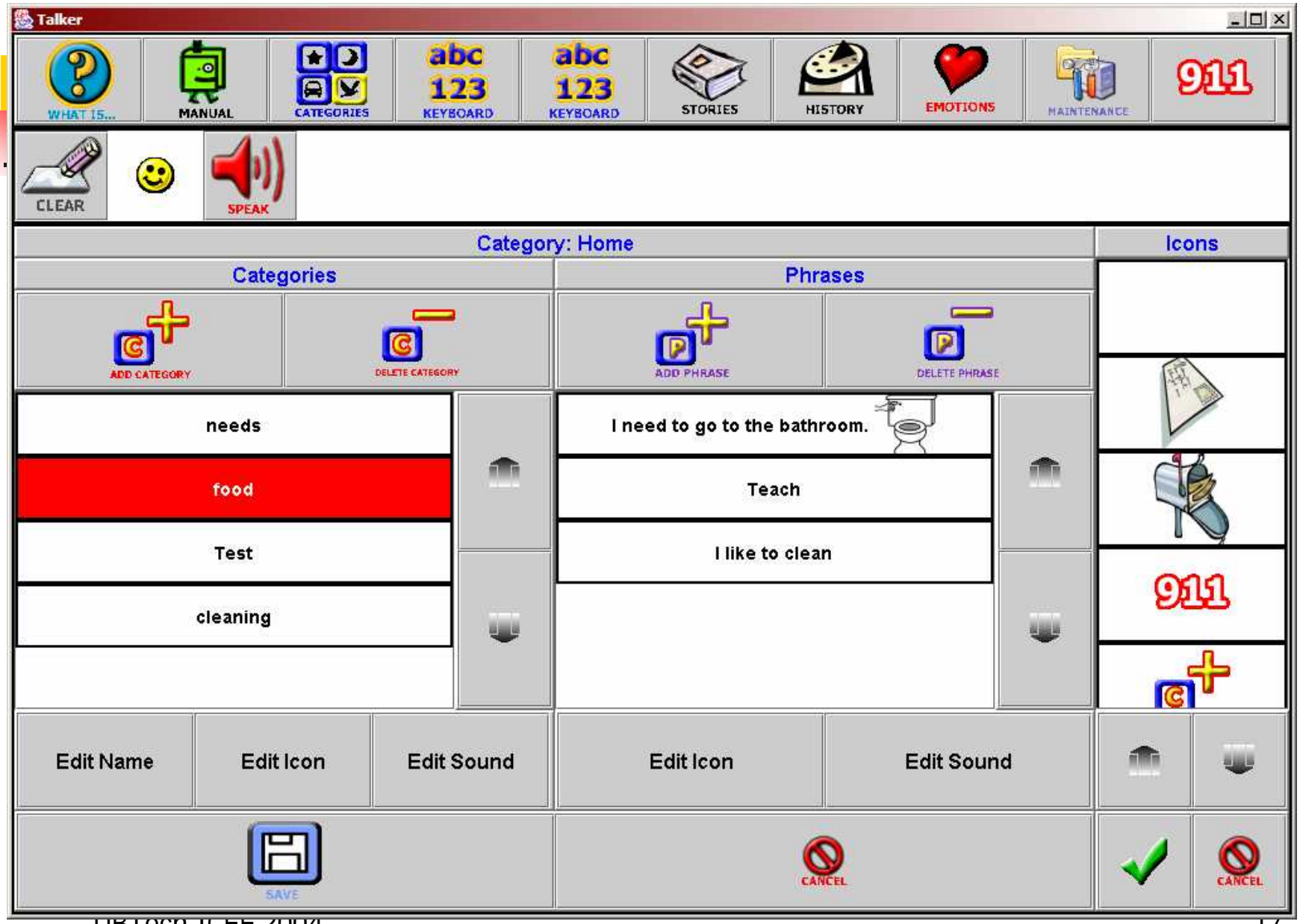
Keyboard (remember, real keyboard not present on touch screen PC)



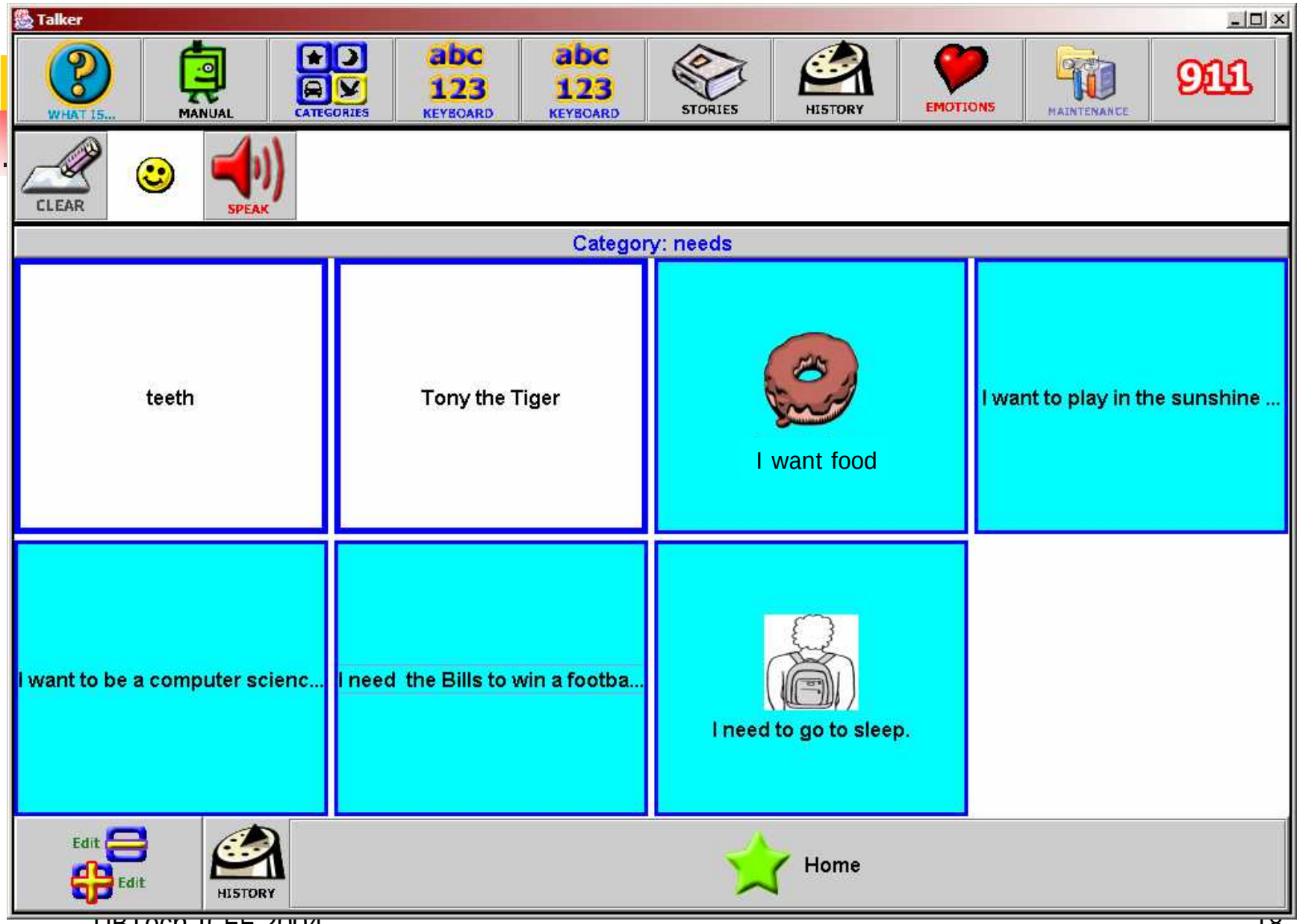
“Story” mode – the ability to pre-enter paragraphs



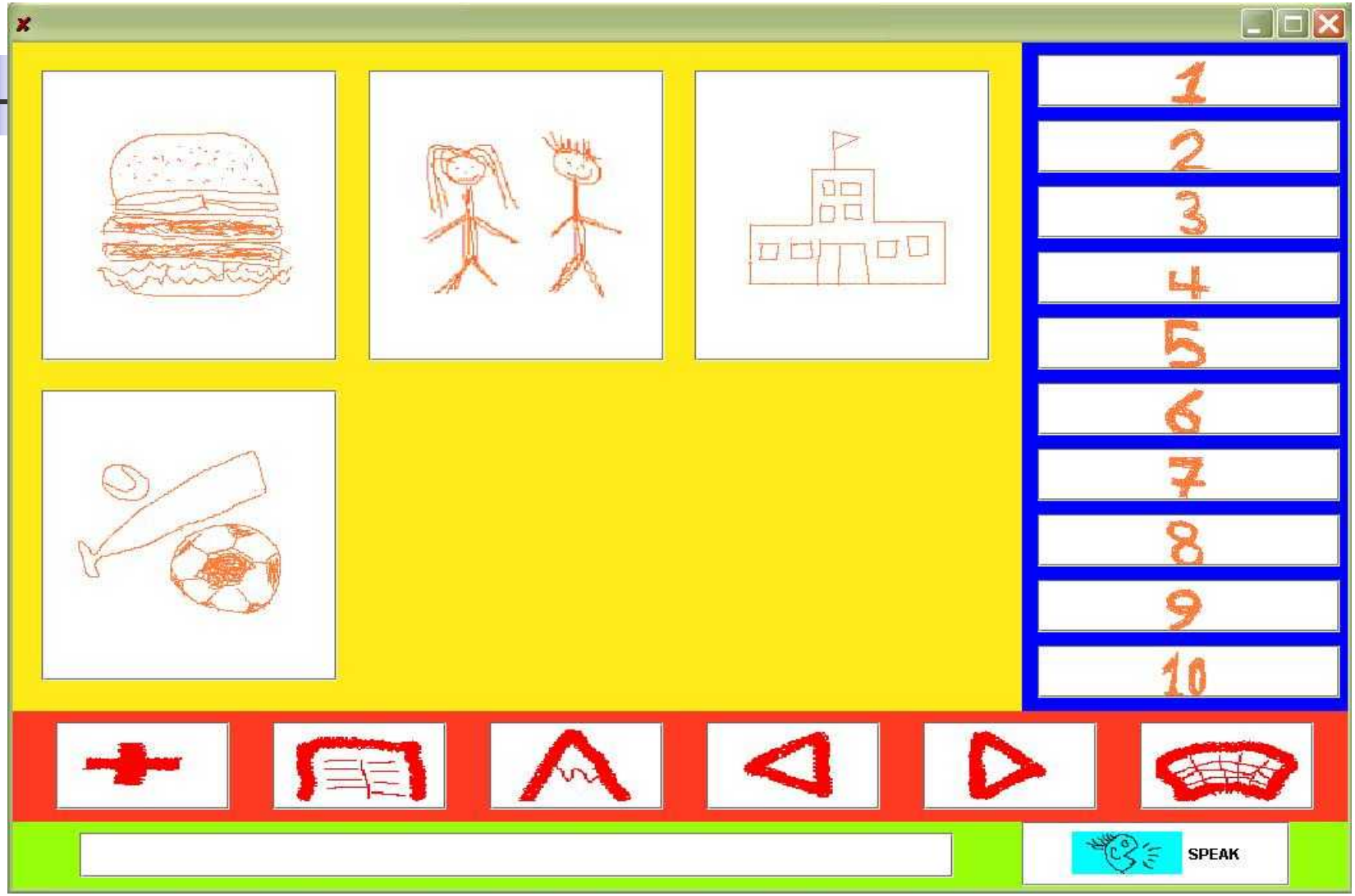
Adding categories and phrases within categories



Main Menu


Talker
WHAT IS...
MANUAL
CATEGORIES
abc 123 KEYBOARD
abc 123 KEYBOARD
STORIES
HISTORY
EMOTIONS
MAINTENANCE
911
CLEAR
SPEAK
Category: needs
teeth
Tony the Tiger
I want food
I want to play in the sunshine ...
I want to be a computer scienc...
I need the Bills to win a footba...
I need to go to sleep.
Edit
Edit
HISTORY
Home

An Alternative Design



UB Talker

- Allows for the creation of sentences, phrases and speeches that can be spoken with the push of a button.
- Phrase & Word Completion - Based on frequency of use, last-used
- Content Prediction - Time and Context - Based on time of day, day of week, season
- Auto-Scan

Our Second Client: Center for Handicapped Children, Amherst NY

The Client

- CHC LEARNING CENTER provides educational and therapeutic programming for pre-school and school age children (infant to 21).

The Problem

- Create a device to facilitate choice-making and cause-and-effect. This is are a central goal of early education for the physically handicapped and developmentally delayed, especially children.
- The relationship between physical action and ultimate effect
- The ability to select between alternatives of increasing number is part of a student's Individual Education Program (IEP) from early-on.

Result

- Build such a choice making teaching station
- UB students named it DISCO

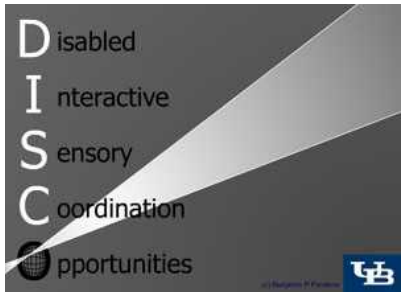
Cause and Effect... How is it taught now?!

The mechanism used usually presents large colored switches which respond with different noises or spoken words:

- first a single switch,
- then two, then four,
- until sufficient cause-and-effect is established to graduate the student to a more powerful augmentative communications device such as a touch-screen talker.

DISCO: What did we build?

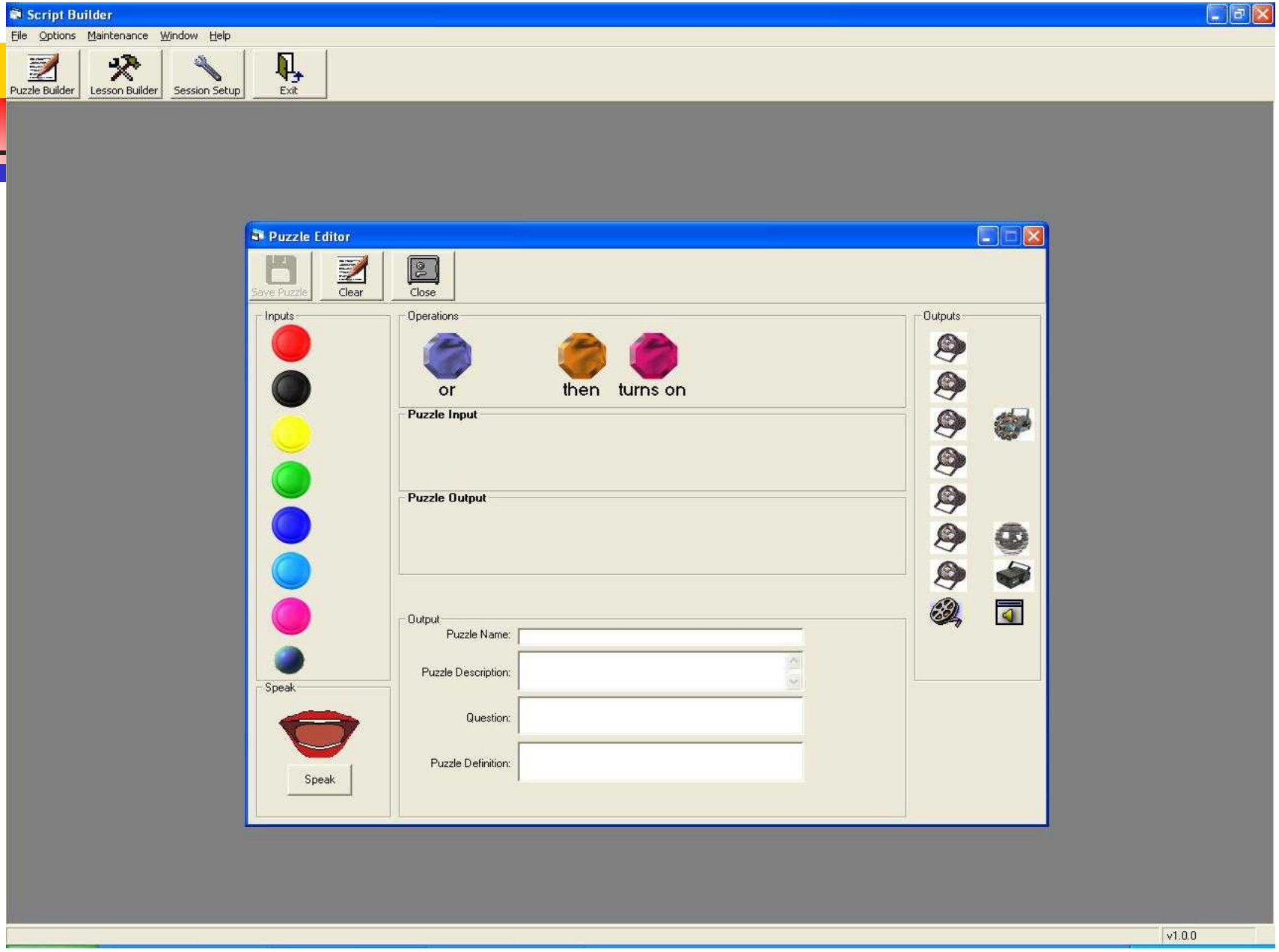
Disabled Interactive Sensory Coordinated Opportunities



- Interface multiple inputs (switches) to yield multiple outputs (lights and sound) through the use of a computer to create an easily adaptable learning tool.
- Easy for therapists and teachers to “program.”
- This tool accommodates a large range of “switches” beyond the hand and eye
- The use of lights, fog, music, video, etc. to create soothing and entertaining stimuli

hardware setup

Program Screen



Benefits: Everyone won!

Benefits to UB and our students.

- Changed student behavior.
- Projects focused incredible creative energy.
- Students saw themselves as individuals with the potential to give something to others.
- Students altered their own career objectives as result of these projects.
- Students who were at risk of dropping out or transferring schools stayed at UB to see these projects to completion.

Benefits: Everyone won!
Benefits to Clients and Agencies

- David tested prototype systems giving critical suggestions to improve the system and changed his view of himself.
- Teachers and therapists at CHC saw themselves in an expanded role:
  - Found themselves assisting UB students in understanding individuals with disabilities.
- A 19 yr. Old CHC student demonstrated a much higher level of functioning and understanding during a field trip to UB than thought possible.
  - Interacted socially appropriately with a male college peer.
  - Was able to notify her caregivers of a potential accident between her wheelchair and a video cart

In the end... Everyone Benefited!

Using the service learning model, but adapting it to the production of new, low-cost technologies for the disabled, improved pedagogy by –

- Providing students with rich design opportunities
- Increased student motivation
- Improved the quality of life of clients
- Raised social and professional awareness for UB students
- Provided an interesting and (we hope) rewarding experience for everyone.... Students, faculty, customers, clients....

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