Using an AAC Device to Program and Control Lego Robots

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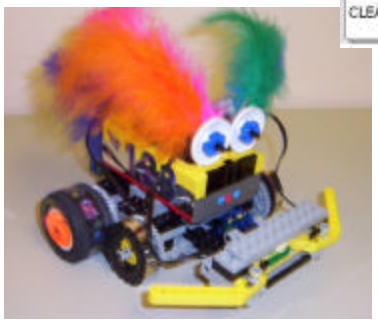
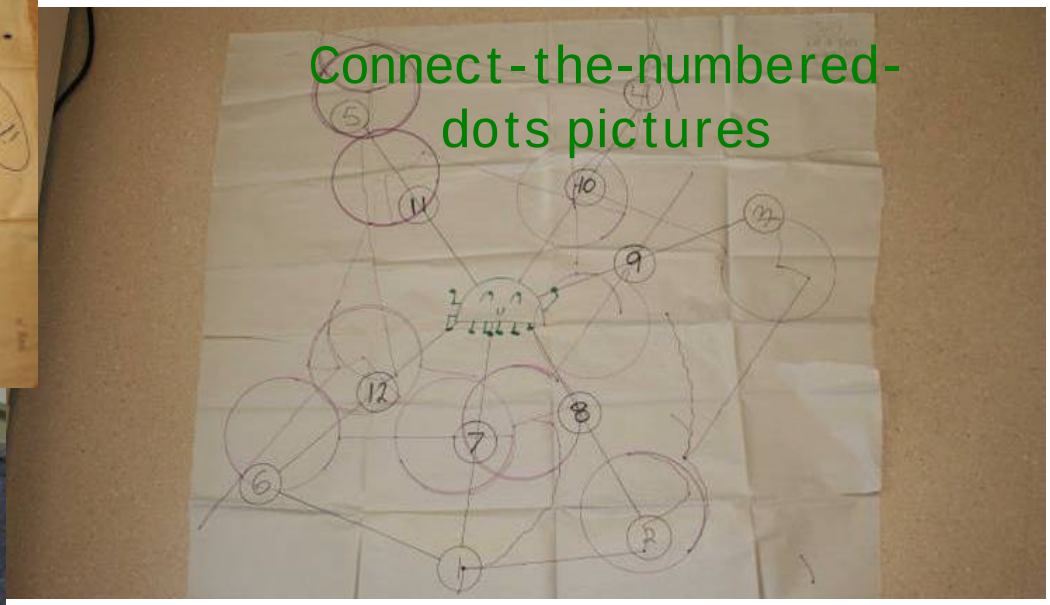
Case study SGD and robot to access educational activities

- 12 y.o. girl who has Cerebral Palsy
- SGD
  - Vanguard, with Unity 45 Full vocabulary set
- Access Method
  - two switch step row-column scanning
  - one switch on each side of head
- Lego Mindstorms roverbot



Activities: Math



Social Studies

Theseus and the Minotaur

Science: Lego Robot Programming in Integrated Classroom

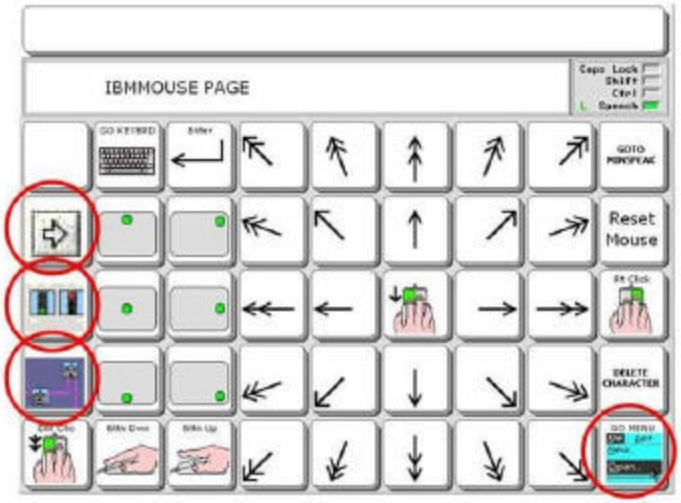
- Test feasibility of the participant using her SGD to write robot programs on computer
- Individualized goal in programming competence
- Measure operational performance
  - time, assistance needed
- Optimize AT system

Individualized Goal: Goal Attainment Scaling (GAS)

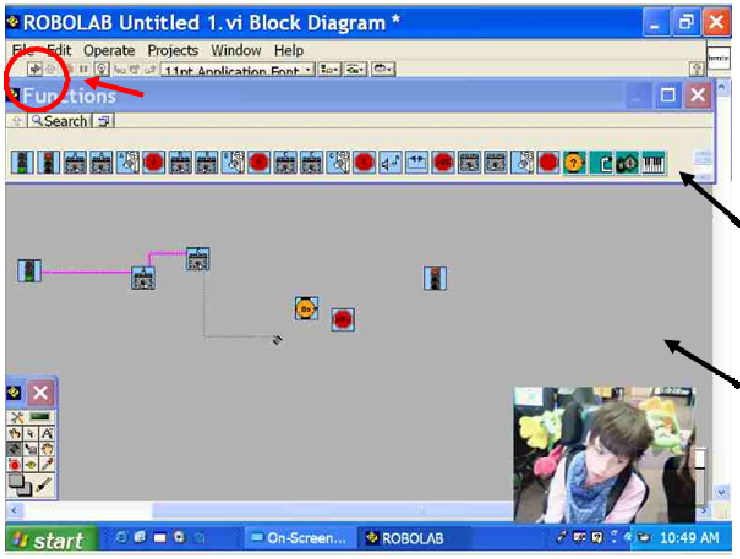
Student increases in complexity of robot programming by:	
-2	**observing other students doing programming**
-1	**testing programs for the other students**
0	**writing a simple program (i.e. 2 steps)**
+1	**writing a longer program (3-4 steps)**
+2	**writing a more complex program (conditional statement or environment sensor)**

Materials

AAC device pages



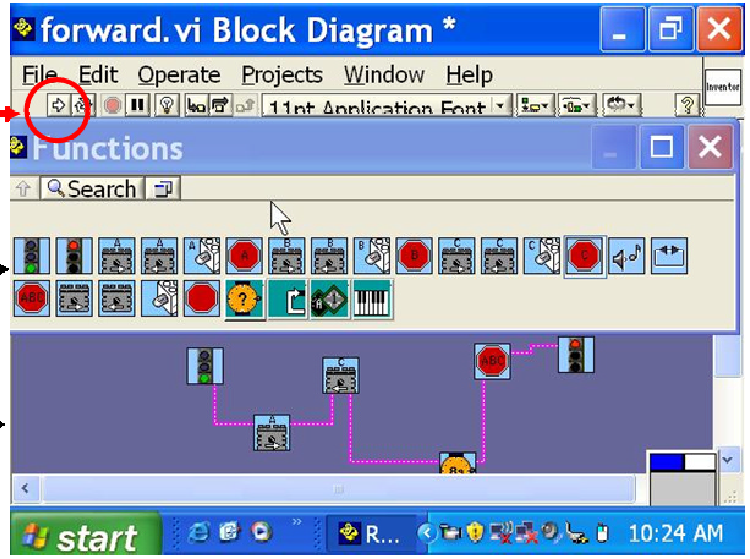
Robolab software



Download to the robot

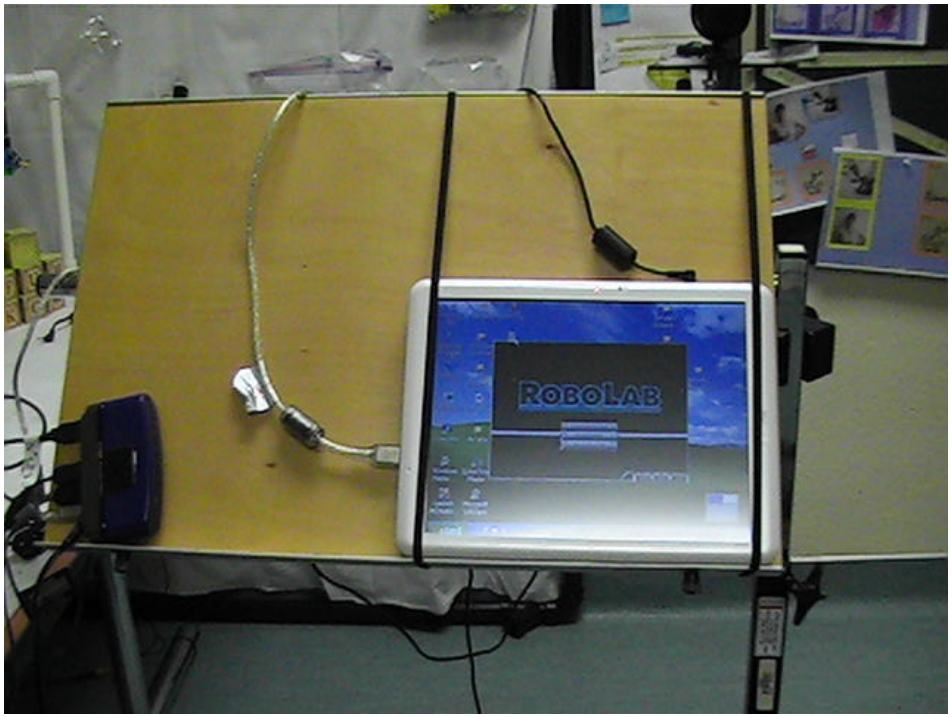
Module Palette

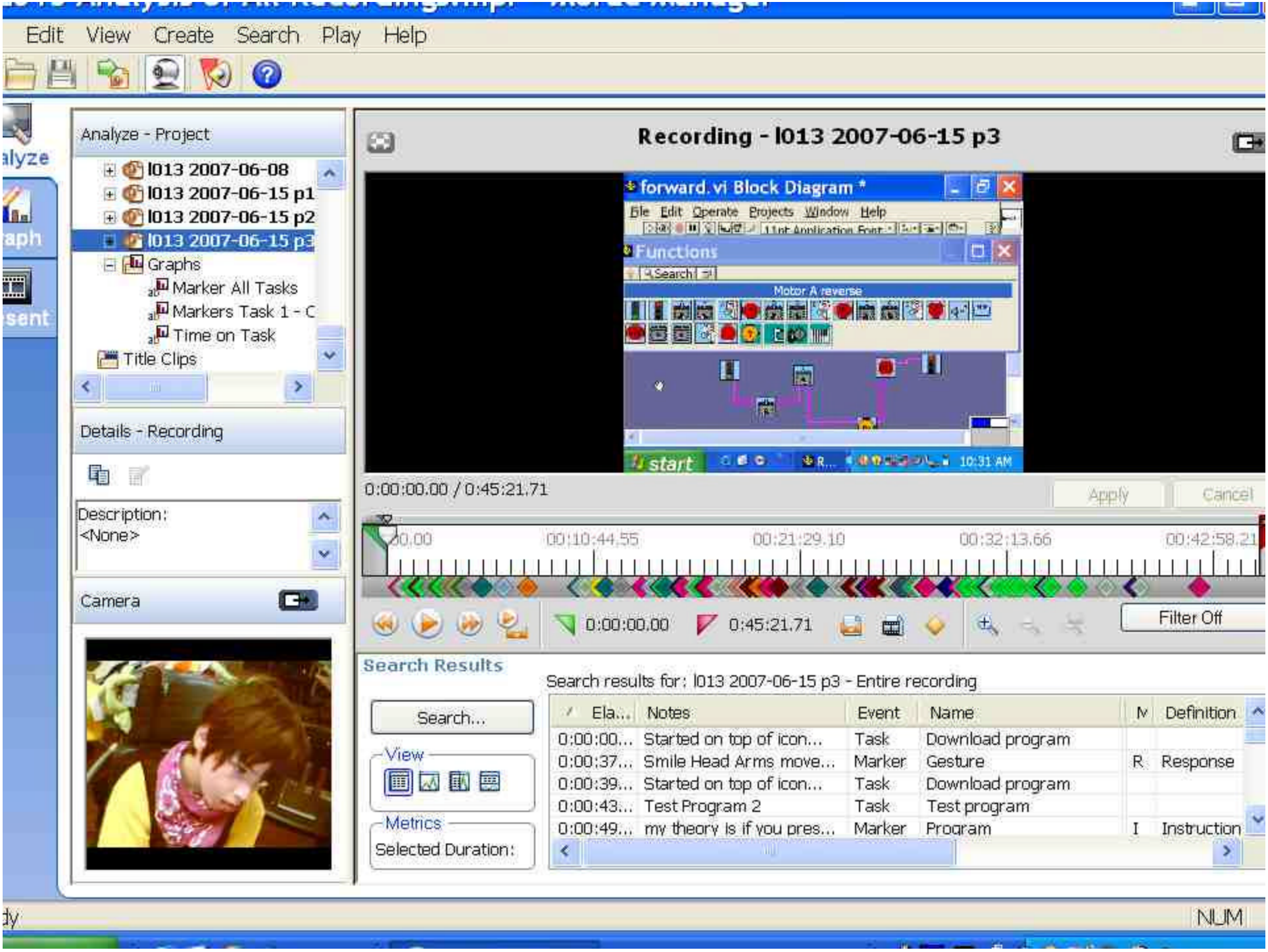
Workspace



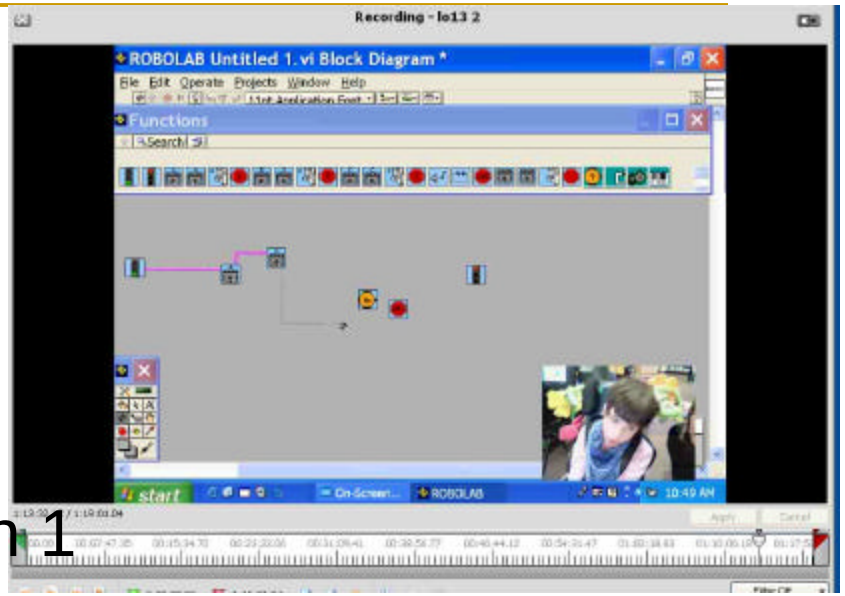
Materials

- Sahara Touch Tablet
- Morae Usability Testing Software
  - Coding Data
    - Mouse clicks
      - jumps
    - Manual, e.g.:
      - Task length
      - Assistance
      - Communication



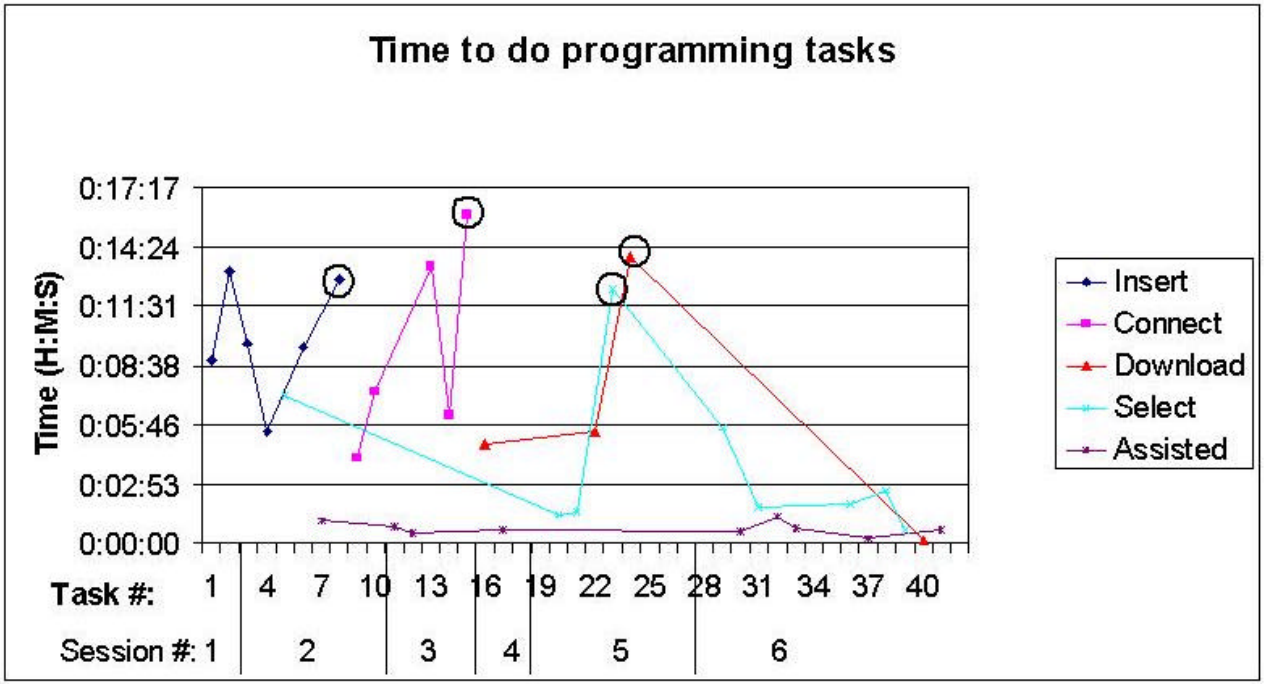

Edit View Create Search Play Help
Analyze - Project
l013 2007-06-08
l013 2007-06-15 p1
l013 2007-06-15 p2
l013 2007-06-15 p3
Graphs
Marker All Tasks
Markers Task 1 - C
Time on Task
Title Clips
Details - Recording
Description:
<None>
Camera
Recording - l013 2007-06-15 p3
forward.vi Block Diagram *
File Edit Operate Projects Window Help
Functions
Search
Motor A reverse
start
10:31 AM
0:00:00.00 / 0:45:21.71
Apply
Cancel
00:10:44.55
00:21:29.10
00:32:13.66
00:42:58.21
0:00:00.00
0:45:21.71
Filter Off
Search Results
Search results for: l013 2007-06-15 p3 - Entire recording
Search...
View
Metrics
Selected Duration:
Ela...
Notes
Event
Name
Definition
0:00:00... Started on top of icon... Task Download program
0:00:37... Smile Head Arms move... Marker Gesture R Response
0:00:39... Started on top of icon... Task Download program
0:00:43... Test Program 2 Task Test program
0:00:49... my theory is if you pres... Marker Program I Instruction
NUM

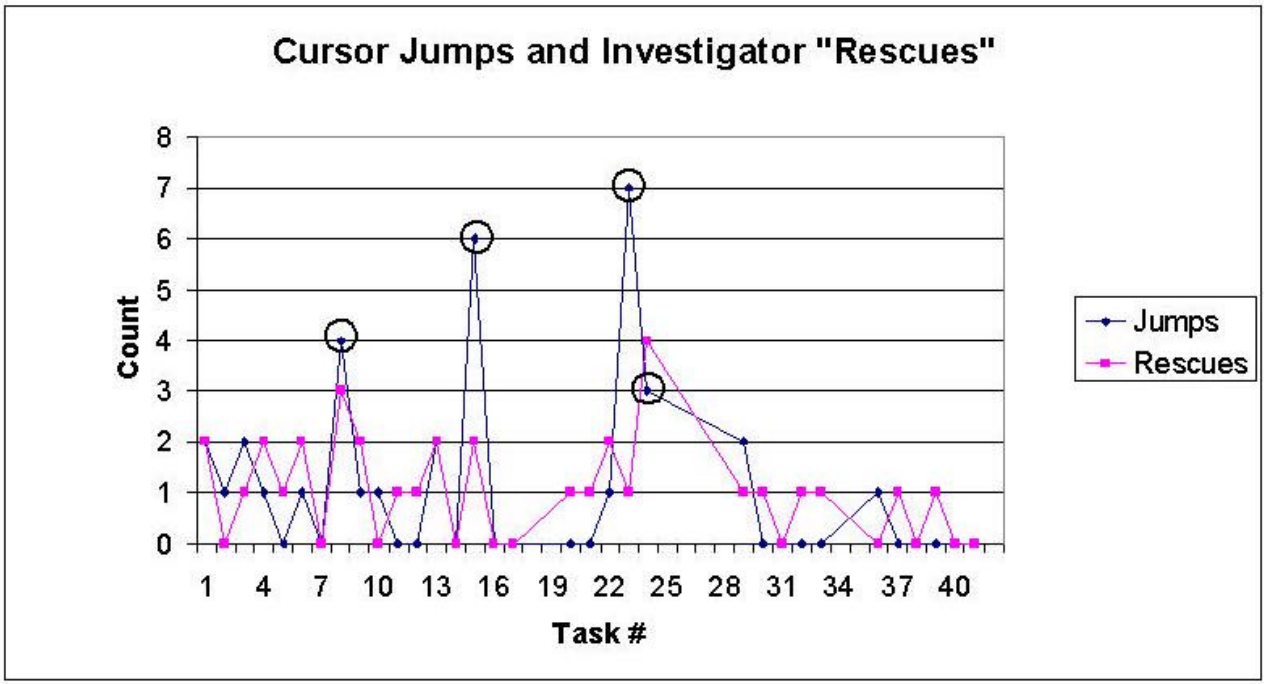
Method



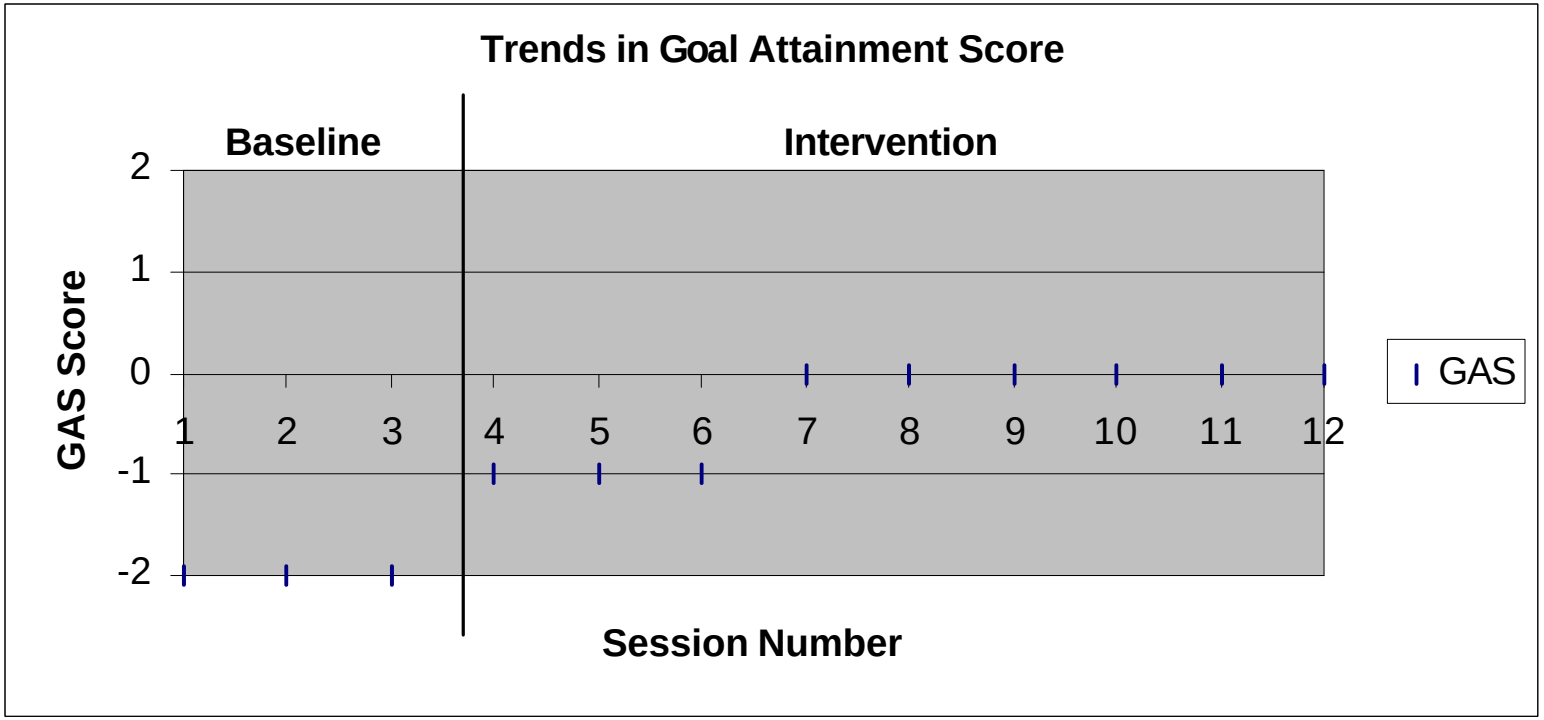
- Sessions:
  - 3 baseline
  - 3 intervention
  - 6 programming sessions, 1 on 1
    - classmates dropped by
- Tasks (similar compressed into categories):
  - insert module
  - connect module
  - download program
  - modify module parameter
    - assisted selection

Results


Time to do programming tasks
Time (H:M:S)
0:17:17
0:14:24
0:11:31
0:08:38
0:05:46
0:02:53
0:00:00
Task #:
1 4 7 10 13 16 19 22 25 28 31 34 37 40
Session #: 1
2
3
4
5
6
Insert
Connect
Download
Select
Assisted


Cursor Jumps and Investigator "Rescues"
Count
8
7
6
5
4
3
2
1
0
1 4 7 10 13 16 19 22 25 28 31 34 37 40
Task #
Jumps
Rescues

Results: Individualized Programming Goal



Teacher comments

"Computers and robots are very motivating and interesting to her peers so it is a way of actively connecting her with the curriculum and the other students in a unique and fun way"

"It gave her opportunities to improve her head switch control needed to work her communication device"

Discussion and conclusions

- Feasibility
  - Active engagement in curriculum
  - Participant, teacher and classmate validation
  - Not independent
- Goal attainment score increased (with prompting)
  - Better understanding of robot function
- Operational Performance
  - Considerable amount of time and assistance needed
    - did not improve over sessions
  - Contributing factors
    - Cursor jumps due to SGD page layout and user habits
    - Programming software

Acknowledgements

Rhino and Lego projects

Commercial AAC project
(device loan)

I Can Centre for
Assistive Technology