Kellar Instructional Handheld data
KIHD System
Research

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George Mason University
The KIHd Concept

• Research
  – Kellar Instructional Handheld Data System (KIHd System) http://kihdsystem.gmu.edu
    “Improving student performance through assessment using performance-centered technology.”

A real time wireless handheld data collection and display system designed to collect and analyze student performance data which can be immediately used to make instructional decisions
The KIHd History

• Why the KIHd System was Needed
• Immersion Program for Design and Development
• Alpha Phase, Testing for Usability
• Beta Phase, GREAT Program
• Pilot Technology Study
• Steppingstones Grant
  – Dissertation
  – Grant Update
Immersion Program

The KIHd project served as a practicum project for the 2004/2005 George Mason University Graduate Immersion Program for Instructional Design and Development.

http://it.gse.gmu.edu/immersion/Immer/
Alpha Phase

Following the integrative learning design instructional process, this usability testing of four teachers and four parents determined performance problems and identified areas in need of revisions for the KIHd prototype.
Beta Phase-GREAT Study

This phase described and offered interpretations of using technology via the KIHd System from the perspective of eight instructors and 12 students at the University level.
Pilot Technology Study

- Examined teacher’s views and usage of technology at the Green School and to determine the likelihood of implementing a systematic and extensive research agenda between the Green School and George Mason University.
Research Questions

• What were teacher perceptions about technology?
• How was technology currently being used?
• What were some perceived barriers to technology adoption?
Stepping Stones

The purpose of this study is to investigate teacher usage of the KIHd System in a metropolitan school where discrete trial teaching (DTT) is employed with students on the Autism spectrum.
Research Team

- Co-PI: Shuangbao Wang, PhD
- Co-PI: Yoosun Chung, PhD
- Senior Researcher: Michael Behrmann, EdD
- Project Coordinator: Heidi Graff, PhD
- Research Assistants: YouRi Shim, Kavita Mittapalli
Areas of Investigation

• **Data driven decisions**
  How teachers are making data driven decision and given different parameters will those decisions remain constant?

• **Teacher planning**
  How do teachers use of planning and will provide insight to other activities that were previously prohibited due to a lack of time?
Dissertation

The purpose of the current study was to explore the influences of technology adoption and usage of the KIHd System, a handheld data collection and analysis tool, in the same setting, where discrete trail teaching (DTT) and Applied Behavior Analysis (ABA) was employed with students on the Autism spectrum.
A qualitative study on adoption and use of the KIHd System was implemented for a twenty week period to ascertain perceptions of teachers during the adoption process in four main areas: data collection, technology usage, training, and the dynamic culture of a school environment.
Statement of Problem

- Data collection and the subsequent visual analysis are paramount to providing the correct intervention to students with Autism.
- Some schools collect the data, yet do not take the time to chart-paper and a pencil are very cumbersome and time consuming.
- Other schools demand their teacher complete this rigorous task of hand charting once a day.
- How can evidence-based decisions be made on a lesson when the evidence of progress, in this case the chart, is not complete until the end of the day?
- With new technology now allows the data to be entered and charted simultaneously, **However, with this new breakthrough, there are new areas of concern that need to be scrutinized.**
Research Questions

• *Training*
  
  What are the attitudes of the teachers about the training received on the KIHd System technology?

  What types of training and support do teachers need to use KIHd System technology in the classroom?

• *Technology Usage*
  
  What are teacher perceptions of the KIHd System technology in regard to the beginning adoption process of this innovation?

  What are the characteristics of a teacher who uses KIHd System technology?
Research Questions

• Data Collection
  • How does the KIHd System technology fit into a classroom servicing students with Autism?
  • How are discrete trial training sessions described using the KIHd System technology?

• School Culture
  • What are the perspectives of administrators and technical support staff in regard to the beginning adoption process of this innovation?
  • What are the dynamic roles of administrators, technical support staff, and teachers in the process of technology adoption?
Literature Review

- Graphic representations assist with this process (Snell & Brown, 2006).
- Visual format promotes communication between parents, teachers, and other school personnel (Deno, 2003).
- Data collection systems need to be simple, efficient, user-friendly (Meyer & Janney, 1989).
- Research has shown that on-going monitoring of student progress generates more appropriate decisions regarding instruction (Farlow & Snell, 1989; Fuchs, Fuchs, & Hamlet, 1993).
- Greater outcomes for students (Todman & Dugard, 2001).
Setting

The Green School Autism Program serves 43 students in 6 classrooms at a 1:1 and 1:2 teacher to student ratio. Individualized education programs with a focus on functional life skills are developed following ABA methodology. Green School provides an 11 month program.
Data Sources

Triangulation of data sources

Observations, meetings, and project meetings

Member Checking

Respondent Validation

E-mails, Likert questionnaires, teacher feedback, demographic questions, field notes, fidelity sheets, site visit notes, meeting notes, and project meeting notes
Data Analysis

• Reread interview transcriptions, reviewed all the observational materials, meeting notes, e-mails, and questionnaires.
• Coded by hand and used the computer software programs NVivo and Inspiration.
• Wrote researcher memos.
• Created concept maps, diagrams, and personas.
## Note Categories

<table>
<thead>
<tr>
<th>Type</th>
<th>Total</th>
<th>Major Topic</th>
<th>Percentage</th>
</tr>
</thead>
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<tr>
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</tr>
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<td>Meeting note</td>
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<td>Procedures</td>
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<td>Field notes</td>
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<td>Data collection</td>
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<td>KIHd System</td>
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<tr>
<td>Site visit notes</td>
<td>5</td>
<td>Glitches</td>
<td>60%</td>
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<tr>
<td>Project meeting notes</td>
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# NVivo Codes

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<tr>
<td></td>
<td>Next steps</td>
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<tr>
<td></td>
<td>Time</td>
<td>6</td>
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<tr>
<td>Technology usage</td>
<td>Glitches</td>
<td>4</td>
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<tr>
<td></td>
<td>Frustration</td>
<td>11</td>
</tr>
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<td></td>
<td>Procedures</td>
<td>21</td>
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<tr>
<td></td>
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<td>10</td>
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<td>Fine tuning</td>
<td>4</td>
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<tr>
<td></td>
<td>KIHd</td>
<td>12</td>
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<tr>
<td></td>
<td>Research to practice</td>
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<td>Staff</td>
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<td></td>
<td>Roles</td>
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<td></td>
<td>Guidelines</td>
<td>6</td>
</tr>
<tr>
<td>Date</td>
<td>Topics</td>
<td></td>
</tr>
<tr>
<td>---------</td>
<td>------------------------------------------------------------------------</td>
<td></td>
</tr>
<tr>
<td>Jan. 12</td>
<td>With pilot has training and technology (AT) concerns</td>
<td></td>
</tr>
<tr>
<td></td>
<td>With new technology have added data collection and school culture</td>
<td></td>
</tr>
<tr>
<td></td>
<td>since policies and who involved have not yet been set</td>
<td></td>
</tr>
<tr>
<td>Jan. 13</td>
<td>Significant issue: Perspective with families, documented collaboration</td>
<td></td>
</tr>
<tr>
<td></td>
<td>with families</td>
<td></td>
</tr>
<tr>
<td></td>
<td>No studies on perspectives of teachers with this population</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Perspective on teachers using new technology and pilot</td>
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<td></td>
<td>No studies on teacher perspective of this population using new tech</td>
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<tr>
<td></td>
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<td></td>
</tr>
<tr>
<td>Jan. 14</td>
<td>Substantive coding Trust</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Merge questing and information into one code</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Time of interviews 11/1, 11/8 etc….</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Substantive code under Training is support?? Not its own category??</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Support Trust</td>
<td></td>
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</table>
Qualitative Findings

Concept map

Training Support

- Reassurance
- Next steps
- Questioning and Information
- Time

Technology Usage Persevere

- Glitches
- Frustration
- Procedure
- Optimum

Data Collection Autism

- Fine Tuning
- KIHd
- Research to Practice

School Culture Trust

- Staff
- Roles
- Guidelines

Perspectives process
Qualitative Findings

- Technology Usage
- School Culture
- Data Collection
- Training

Support: Reassurance, Questioning, and Information Fine Tuning

Perspective Process: Staff, Guidelines

Procedure Roles: Next Steps, Time

Glitches, Frustration

Persevere: Autistic
Administration Personas

I really want to be a part to make sure our visual representation’s problem solving is consistent with what is being done in the classroom for training purposes and not too complicated. So that part I'm invested in, the part that could potentially be long term for the program.

Through out the whole thing I was just worried about the time constraints, we do have so many demands and so many expectations for our instructors and head teachers, so I'm kind of been like a mother hen always trying to watch out for their time and trying to protect them. At times, I felt, I thought it's really going to take up a lot of time but it hasn't. I keep realizing that it hasn't taken up that much time. The end result is that it saves time.

From my end, I want to make sure that the team is well supported but I think it was very well covered. I think that you were very quick to respond to any type of concern. My only concern was to be more involved from the get-go and I have told Anna that you've got it, run with it. Now, that's it started going, I want to know, okay, so show me how to do that.
It’s going well. I mean it has its ups and downs. With technology it has...it has problems. But you should be able to anticipate with that with this kind of data collection.

It’s a great system, we have so much data collection here so it...it negates the paper and pencil. I am very pleased we are participating.

But I am also training right now. Between the clusters of classrooms, we have a teaching assistant that goes back and forth so it’s supposed to help. I take Katie’s rotation and the shared rotation is supposed to take mine. And then Katie is out of the rotation and she does assessments—it frees up some time.
Technical Support Personas

Yes, if it's going to fly, we are going to make the decision. We have to approve the plan within the IT department and then let it go to the business office for approval and budgeting considerations.

The business office acts as a liaison between the Autism administration and the Technical staff.

Evan
IT Specialist

Ward
IT Technician
Conclusions

• *Training*—A factor that influenced the perceptions of technology was training. Support during training was crucial.

• *Technology*—Teacher persistence was the most important characteristic to having success.
Conclusions

• *Data Collection* - In such a busy environment, technology, like the KIHd System, would maximize data collection while requiring a minimum amount of teacher time.

• *School Culture* - Roles were less clear and accountability for who was ultimately “in charge” was a not a sole individual but a group.
KIHd System

KIHd System is a dynamic database-based ubiquitous real-time data collection and analysis system.

Logon to the system:

Database: TUTORIAL
Password: ********

Data Collection
Administration

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KIHd System is a dynamic database-based ubiquitous real-time data collection and analysis system.

Current Database: TUTORIAL

- Define Tasks
- Add A Child
- Add Parameters
- View Graphs, Reports

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Add Other Parameters - DB: TUTORIAL

This is a place where you can add parameters such as teachers, skill areas, objectives and domains etc..

Teacher Name: [eLearning Class]
Login Password: [Blank]
Domain: visual-motor
Skill Area: visual-tracking
Skill Objectives: track changes
Instruction: note-color changes
Target: tally correct number
Material: screen-saver program
Mastery Criteria: [Blank]

Current Teachers: --
Current Domains: --
Current Skill Areas: --
Current Objectives: --
Current Instructions: --
Current Targets: --
Current Materials: --
Current Mastery Criteria: 95% Correct

back to admin main page

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Add New Task - DB: TUTORIAL

Task Name: track color changes Freq
Domain: visual-motor
Skill Area: visual tracking
Skill Objectives: track changes
Distractors: 0
Instructions: notes color changes
Targets: tallies correct number
Material: screen saver program
Mastery Criteria: 96%

Prompts
- full physical
- verbal
- gestural
- modeling
- faded physical
- faded verbal
- independent
- positional

Optional Prompts
track visual changes

Datatype
Frequency

Add Task

back to admin main page
Data Collection - PDA

KIHd System

Select your name:
Heidi

Password:

Login

Admin Home

Device: PDA
Data Collection - PDA

KIHd System

Choose Phase:
- treatment
- Start Session

View Chart:
- End Data Sample

frequent Session

Full Physical: 0
Independent: 12

Secondary Behaviors: frequency
- flap: 0
- jump: 0

Session Data

- Independent
- Physical

Exit System

Teacher: Heidi
Child: Jessica
Domain: Cognitive
Skill Area: Pre-academic colors
Task: Red2
Distractors: 2
Instructions: touch red
Targets: identifies color red
Materials: Color cards
Mastery Criteria: 80%
Datatype: frequency
2nd Datatype: frequency
Phase: treatment
Distractors:

Current Session: 15
Datatype: frequency
2nd Datatype: frequency
Phase: treatment
Distractors:

Teacher: Heidi
Child: Jessica
Domain: Cognitive

Back to data collection
Data Collection - PDA

Session Data

KIHd System

Choose Phase:
- treatment
- Start Session

View Chart
- End Data Session

Exit System
- Teacher: Heidi
- Child: Jessica
- Domain: Cognitive
- Skill Area: Pre-academic colors
- Task: Red2
- Distractors: 2
- Instructions: touch red
- Targets: identifies color red
- Materials: Color cards
- Mastery Criteria: 80%
- Datatype: frequency
- 2nd Datatype: frequency
- Phase: treatment

View primary prompt graph
Back to data collection

Line chart, pie chart, column chart
View secondary behavior graph
Back to data collection
Steppingstones Grant for Spring

- Is there a teacher pattern to viewing the graphs to make data driven decisions?
- How many times do the teachers look at the graph in proximity to the time of data collection and afternoon chart time?
- Does the randomizations test confirm or add to the visual analysis of the semi-logarithmic chart or line graph to make decisions?
- Does the KIHd System enable reliability?
- Will teachers continue to use or add additional students to the KIHd System even after the base study has been completed?
4 Weeks Teachers Training

- Trained teachers how to use KIHd system
- Gathered teacher’s demographic information
- Taught teachers how to input the data in KIHd system
- Showed teachers how to view the interactive graph
How to use KIHd System

1. Go to http://kihdsystem.gmu.edu
2. Click the “Data Collection” tab
3. Find your name, Enter Password, then click “Log In”
4. Select Student
   – For practice, you need to select “Student1”.
   – For real trial, select your student who you are working on.
5. Select Target, then click Continue
6. Make sure you are in the right place.
   – If you find error, click Back button in Internet Explorer.
   If it is ok, click Continue.
How to use KIHd System

7. Choose Phase
   – View Chart – First, you need to initiate the session in order to view chart correctly. In order to initiate the session, click **Start Session**, then click **Cancel**. Then click **View Chart**. You will need to view the chart again after your session is completed. Click “**Back to data collection**”

   – To start to collect data, click “**Start Session**”
     • Y – Correct
     • N – Incorrect
     • When you make a mistake, simply click **Back** button in **Internet Explorer**.
     • When you want to start session all over again, click “**cancel**” button, then click “**Start Session**” again.

   – When finishing data collection, click “**End Session**”

8. **View Chart** again to see what you just collected. Then click “**Back to data collection**”

9. Make sure you end the KIHd system (**End data sample > Log Out > Exit**)  

   **IMPORTANT:** Make sure you connect PDA to the charger after you use
Data from teacher demographic sheets (n=8)

<table>
<thead>
<tr>
<th>All teachers</th>
<th>Average number of years of teaching experience</th>
<th>Average age of teachers</th>
<th>Number of years at School</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean</td>
<td>2.4</td>
<td>24</td>
<td>1.4 (Range 0.5 to 5 years)</td>
</tr>
</tbody>
</table>
Comfort Level

Current Comfort Level in Using Assistive Technology

- **Proficient**: 63%
- **Moderate**: 25%
- **Beginner**: 12%
Comfort Level

Current Comfort Level in Using Educational Technology

<table>
<thead>
<tr>
<th>Comfort Level</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Proficient</td>
<td>63</td>
</tr>
<tr>
<td>Moderate</td>
<td>25</td>
</tr>
<tr>
<td>Beginner</td>
<td>12</td>
</tr>
</tbody>
</table>
Experience Level

Is this your first experience using a PDA?

Yes 62%
No 38%
New Fidelity Checklist

Researcher’s name __________________ Room no. __________ Date _____ Time _____

Instructor/s name/s __________________________ Student/s name/s __________________________

Target ______ Phase ______ Program __________________________

Accuracy ______ Frequency ______ Duration ______ Fluency

Number of correct ______ Number of incorrect ______ Percentage, If known ______

Instructor/s looked at graph ______

Technical help requested ______ Number of times ______ Duration ______

Reason for technical help __________________________

________________________

Any decision/s made during technical help ______

Explain __________________________

Secondary behavior observed/tracked ______

Other comments __________________________
Data from the fidelity sheets

<table>
<thead>
<tr>
<th>Number of times</th>
<th>October</th>
<th>November</th>
<th>December</th>
<th>January</th>
<th>February</th>
<th>March</th>
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</thead>
<tbody>
<tr>
<td>Looked at graph</td>
<td>0</td>
<td>33%</td>
<td>0</td>
<td>25%</td>
<td>50%</td>
<td>50%</td>
</tr>
<tr>
<td>Needed technical help</td>
<td>100%</td>
<td>43%</td>
<td>17%</td>
<td>0</td>
<td>25%</td>
<td>38%</td>
</tr>
</tbody>
</table>
Fidelity Data

Use and Interpretation of Fidelity data

- 100%
- 80%
- 60%
- 40%
- 20%
- 0%

October November December January February March

- Looked at graph
- Needed technical help
Trends

Use and Interpretation of Fidelity data

- Looked at graph
- Needed technical
Reliability of Methodology

Data sessions per month
October 2006-January 2007

Reliability percentage
Reliability of Methodology

Reliability data January-March 2007

Data sessions per month

Reliability Percentage
February 2007

**Number of Visitors**

[Graph showing the number of visitors over the month of February 2007.]

**Average Time On Site**

[Graph showing the average time spent on the site over the month of February 2007.]

**Page Views per Visitor**

[Graph showing the page views per visitor over the month of February 2007.]
March 2007

**Number of Visitors**

**Average Time On Site**

**Page Views per Visitor**

Show details
Paired $t$ test Results of Visits

- **P value and statistical significance:**
  The two-tailed P value equals 0.0936
  This difference is not statistically significant.

- **Confidence interval:**
  The mean of Feb minus March equals -0.778
  95% confidence interval of this difference: From -1.721 to 0.165

- **Intermediate values used in calculations:**
  $t = 1.9023$
  $df = 8$
  standard error of difference = 0.409
Paired $t$ test Results of Time

- **P value and statistical significance:**
  The two-tailed $P$ value is less than 0.0001
  This difference is statistically significant.

- **Confidence interval:**
  The mean of Feb minus March equals -352.789
  95% confidence interval of this difference: From -437.701 to -267.877

- **Intermediate values used in calculations:**
  $t = 9.5809$
  $df = 8$
  standard error of difference = 36.822
Paired $t$ test Results of Pages Viewed

- **P value and statistical significance:**
  The two-tailed P value equals 0.0021
  This difference is statistically significant.

- **Confidence interval:**
  The mean of Feb minus March equals -10.578
  95% confidence interval of this difference: From -16.025 to -5.131

- **Intermediate values used in calculations:**
  $t = 4.4783$
  $df = 8$
  standard error of difference = 2.362
### Review

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<thead>
<tr>
<th></th>
<th>Feb</th>
<th>March</th>
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<tbody>
<tr>
<td><strong>Visits</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Group</td>
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</tr>
<tr>
<td>Mean</td>
<td>2.433</td>
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<tr>
<td>SD</td>
<td>1.074</td>
<td>0.848</td>
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<tr>
<td>Group</td>
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<td></td>
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<tr>
<td>Mean</td>
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<td>373.111</td>
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<tr>
<td>SD</td>
<td>16.196</td>
<td>114.326</td>
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<td>SD</td>
<td>6.699</td>
<td>5.430</td>
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</table>

- Increase in traffic as expected in March (more participants)
- Time on site increased from 20 seconds to 6 minutes
- Pages viewed per visitor increased from 8 pages to 18 pages
Print Evidence in Progress

Student's Name: Conner
Program: Describing Pictures and Events-pictures
Mastery Criteria: 30% accuracy over 2 sessions

Target: T5 agent/object+is/are+descrit
Date: 3/13/2007 - 4/12/2007
Anecdotal Evidence

- T6
- Variability in performance shown on graph with one teacher
- Brought up on Wednesday meeting
- Not all teachers had the same operant definition
- Needed both parts of the response to be correct (e.g., The boys face is dirty. The girls face is clean)

Reached consensus on what was correct
T6 Anecdotal Evidence of Making Data-Driven Decisions
Sites and Contacts

- KIHd System Project Website
  http://kihdsystem.gmu.edu/stepstone/index.html
- KIHd System
  http://kihdsystem.gmu.edu

Helen A. Kellar Institute for Human disAbilities

- (703) 993-3670 (voice/TTY)
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Questions