Tablet-Based Activity Schedule for Children with Autism in Mainstream Environment

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School Inclusion of Children with ASD

- Proven benefits (*Hunt & McDonnell, 2007*)

- Autonomy impeded by difficulties in classroom activities (*Cramer et al., 2011*)
  
  - Managing daily routines
  
  - Making transitions between activities
  
  - Engaging in social interactions

Activity Schedules to support classroom activities
Activity Schedules in School Context

- Goal-directed activities
- Decomposing an activity into successive steps
- Each step represented by a text and/or a picture
- Paper-based supports

Their usage promotes autonomy (Koyama et al., 2011; Lequia et al., 2012; McClannahan & Krantz, 1999)

Examples of paper-based activity schedules (Hayes et al., 2010)
Limitations of Paper-Based Activity Schedules in School Context

- Time-consuming to create for stakeholders
- Not flexible
- Cumbersome to use for children
- Stigmatizing

Examples of paper-based activity schedules (Hayes et al., 2010)
Activity Schedules on Technological Support in School Context

vSked (Hirano et al., 2010)

Effective in protected environments
Requirements for Designing Interactive Technologies for Children with ASD

(Hirano et al., 2010; Hayes et al., 2010; Hourcade et al., 2013)

Protected environments

Specific and individualized tasks for special education classrooms
- Special education teacher
- School aids
- Therapists

- Clear-mapping between actions
- Rely on visual supports
- Flexible
- Simplicity
- Mistake-free
- Predictability
- Avoid distracting stimuli
Requirements for Designing Interactive Technologies for Children with ASD

(Hirano et al., 2010; Hayes et al., 2010; Hourcade et al., 2013)

- Simplicity
- Predictability
- Clear-mapping between actions
- Rely on visual supports
- Flexible
- Mistake-free
- Simplicity
- Predictability
- Avoid distractive stimuli

Mainstreamed environments

Tasks ?

Stakeholders ?
Technological Support for Mainstreamed Classrooms: Stakeholders’ Concerns

Therapists
- School psychologists
- Speech therapists
- Occupational therapists

Rehabilitation

School staff
- Teachers
- Special education teachers
- School aids

Education

Human Factors & Ergonomics

Successful inclusion in mainstreamed classrooms

- Maintain instructional flow
- Avoid academic classes
- Avoid chats between students

Promote oral communication
- Individualized interventions
- Avoid distracting stimuli
- Focus on one function at a time

HCI Designers Support

Navigation
Interaction
Visual design
Interface

Support
Our approach for Designing Interactive Technologies for Mainstreamed Environments

Mainstreamed environments

Participatory Design

Activities to be supported

Design Principles

- Teachers
- Special education teachers
- School aids
- Therapists
Outcome of Participatory Design: Design Principles

27 classroom activities

General listing

Categorization

Activities to be supported

Activity models
Neuropsychological models

Classroom routines

Verbal communication

Participatory Design

specific activities

specific activities
### Outcome of Participatory Design: Activities to be Supported

<table>
<thead>
<tr>
<th>CLASSROOM ROUTINES</th>
<th>VERBAL COMMUNICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Going to classroom</td>
<td>Answering the teacher</td>
</tr>
<tr>
<td>Taking out school supplies</td>
<td>Answering a classmate</td>
</tr>
<tr>
<td>Listening and taking notes</td>
<td>Talking to teacher</td>
</tr>
<tr>
<td>Using calendar</td>
<td>Talking to classmate</td>
</tr>
<tr>
<td>Leaving the classroom</td>
<td></td>
</tr>
</tbody>
</table>
Outcome of Participatory Design: Design Principles

School staff education

Therapists rehabilitation

Designers support

- promote reading skills
- idiosyncratic contents
- show progress status
- short sequences
- avoid auditory channel
Classroom Schedule+: An Example of Implementation

Classroom routines

- Going into the classroom
- Leaving the classroom
- Listening and taking notes
- Taking out school supplies
- Using calendars

Verbal communication

- Answering a classmate
- Answering the teacher
- Talking to classmate
- Talking to teacher

Making a comment.
Classroom Schedule+:
An Example of Implementation
Assessment:
General Procedure

- Can Classroom Schedule+ be used in mainstreamed classrooms?
- Is Classroom Schedule+ effective to support for activities in mainstreamed classrooms?
Assessment: School Aid Questionnaire

<table>
<thead>
<tr>
<th>TAKING OUT SCHOOL SUPPLIES</th>
<th>UNOBSERVABLE / NOT DONE</th>
<th>DONE WHEN REQUESTED / WITH HELP / BADLY</th>
<th>DONE AUTONOMOUSLY</th>
</tr>
</thead>
<tbody>
<tr>
<td>OPEN YOUR BAG</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>GET YOUR PENCIL CASE, NOTEBOOK AND WORKBOOK</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>OPEN YOUR PENCIL CASE AND NOTEBOOK</td>
<td></td>
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</tbody>
</table>


## Assessment: Participants

<table>
<thead>
<tr>
<th></th>
<th>EQUIPPED CHILDREN WITH ASD (N = 5)</th>
<th>NON-EQUIPPED CHILDREN WITH ASD (N = 5)</th>
<th>MANN &amp; WHITNEY U-TEST P VALUE</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Age</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>M (SD)</td>
<td>15.00 (1.22)</td>
<td>14.60 (1.14)</td>
<td>&gt; .700</td>
</tr>
<tr>
<td><strong>IQ</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>M (SD)</td>
<td>74.00 (29.83)</td>
<td>66.50 (26.72)</td>
<td>&gt; .600</td>
</tr>
<tr>
<td><strong>SRS</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>M (SD)</td>
<td>79.80 (37.42)</td>
<td>86.80 (30.51)</td>
<td>&gt; .700</td>
</tr>
</tbody>
</table>
Results: Classroom Routines

Classroom routines are improved and seem to be acquired.
Results: Verbal Communication

Verbal communication is improved but still requires assistance
Discussion

- Autonomous and efficient use of Classroom Schedule+ in mainstreamed environment
- Participatory Design allowed app infusion in mainstreamed environment
- Relevance of flexible visual supports for AS in school settings
Conclusion

• Classroom Schedule+: a tablet app supporting task-management

• Increased socio-adaptive behaviors in mainstreamed classrooms

• Insights on design of AS in mainstreamed classrooms
Perspectives

• Larger study:

  • 18 students with autism equipped with Classroom Schedule+
  • 18 students with intellectual disabilities equipped with Classroom Schedule +
  • 18 students with autism non-equipped with Classroom Schedule+

• Generalization of the approach to other tasks (emotion regulation, etc.)

• Funding for a longitudinal follow-up of equipped students