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Cultural issues in implementing an integrated augmentative manipulation and communication assistive technology for academic activities





Project UARPIE



Research team:

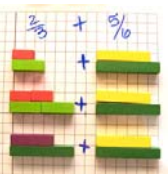
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Funding:  Fundação para a Ciência e a Tecnologia


Support: 

Background

- Multimodal activities enhance the learning experience

Cuisenaire rods  mathfour.com

 www.learning4kids.net

Tangram  aliexpress.com

Background

- Current pedagogy advises providing students with opportunities for seeing, hearing, doing and telling

Geoplan



petticoisee.canalblog.com

<http://www.peacefulpathwaysmontessori.com>

Background

- Children with speech and motor impairment might experience difficulties in accessing curriculum content



"Cuerdas", Pedro Solís García

Project UARPIE

- Aims at developing a new integrated augmentative manipulation and communication assistive technology (IAMCAT) to enable children with disabilities to manipulate educational items while communicating about their experiences



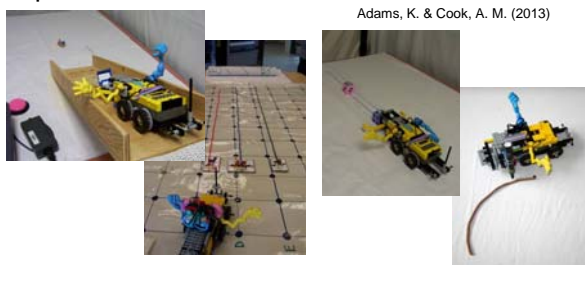
Previous work

- Case study
 - Math
 - Social studies
 - Science



Previous work

- Integrated augmentative manipulation and communication assistive technology to perform math activities



Adams, K. & Cook, A. M. (2013)

Previous work

- Participants

	M01	M02	M03
Sex	Female	Male	Female
Age (years)	14	10	12
Grade	8	4	6
Educational setting	Self contained classroom, life skills program	Integrated classroom	Integrated classroom
Scanning method	Row-Column	Row-Column	Quarter-Row-Column
Language system and grid size	Unity™ 45 Full	Unity™ 45 Full	Unity™ 84 Sequenced

Adams, K. & Cook, A. M. (2013)

Previous work

- Augmentative communication

Adams, K. & Cook, A. M. (2013)

- Vanguard™ II SGD (PRC)



- Participants were involved in the design of their own SGD interface

Previous work

- Augmentative manipulation

Adams, K. & Cook, A. M. (2013)

- Lego® Mindstorms® car-like robot



- Controlled via infrared commands
- Characteristics: low robot body with a flat surface, a location to attach objects, a gripper, a mechanism for moving a pen up and down, and a spool to hold string

Previous work

- Revealed some gaps in student knowledge
- Students chose robot over observing or directing
 - More rigorously compared the differences between robot, observing and directing
 - Teacher guided
 - » Issue of who did what (e.g., teacher "leading")
 - » Efficient
 - Directing Teacher
 - » Effective
 - » But only for the participants who had good linguistic skill
 - Robot
 - » The most effective to "show what *they* know"
 - » The highest participant satisfaction

UARPIE's IAMCAT

- Integrated augmentative manipulation and communication assistive technology to perform academic activities (language, math, and science & social studies)



UARPIE's IAMCAT

- Participants: system developed for
 - 5-6 year olds
 - Pre-school and first grade students
 - Students integrated in regular classes
 - Users with different access methods (direct / scanning; mouse / eye tracking / switches)



UARPIE's IAMCAT

- Augmentative communication
 - Laptop running The Grid 2 AAC software



- Communication grids integrating task dependant vocabulary and robot control commands were developed

UARPIE's IAMCAT

- Augmentative manipulation
 - Lego® Mindstorms® NXT car-like robot



- Controlled via BlueTooth® commands
- Characteristics: low robot body with a flat surface, a location to attach objects, a gripper, a mechanism for moving a pen up and down

UARPIE's IAMCAT

- Augmentative manipulation
 - Robot commands implemented:
 - Forward
 - Backward
 - Turn left 90 degrees
 - Turn right 90 degrees
 - Pen up / down
 - Open / close gripper



UARPIE's IAMCAT pilot test

- Participant
 - 9 years old, male
 - bilateral spastic (tetraparetic) cerebral palsy
 - no independent mobility
 - The Grid competent user
 - row-column scanning controlled by a single switch located at his head
 - attends the third grade and, as reported by his mother, already acquired the necessary math skills to complete the purposed tasks

UARPIE's IAMCAT pilot test

- Training
 - one training session took place approximately two weeks before the pilot test to train the child on system use
- Activities
 - 1st: draw a line equal to the one that was drawn on the floor
 - 2nd: choosing the solid with only curved surfaces among three solids (sphere, cylinder and cube) and taking it to a goal
 - 3rd: "buy" different objects marked with different prizes (juice – 2€, ball – 3€, book – 9€, pen – 1€, and T-shirt – 5€), having 5€ available

UARPIE's IAMCAT pilot test



Unedited video



44s video edited from a 3,5min video



1min15s video edited from a 7min video

UARPIE's IAMCAT pilot test

- Pilot test main conclusions
 - Participant was able to perform the activities using the IAMCAT
 - The position of the most commonly used robot controls within the communication grid should be optimized for scanning users
 - New robot control modes should be implemented in order to facilitate driving the robot for long distances (e.g., long / short distance, "press and hold" mode, "hit to run, hit to stop" mode)
- Participant's comment
 - "Can I take the robot home?"

Cultural issues

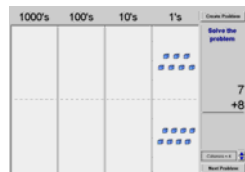
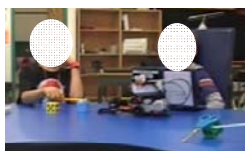
	Canada	Portugal
Technological	Dedicated SGD <ul style="list-style-type: none"> Useful control modes (e.g., press and hold) are already implemented AAC running on mainstream technology is becoming widespread in Canada too	AAC software running on a standard PC <ul style="list-style-type: none"> Different programs running on the computer can be triggered from the AAC software
Language set	Children used standard communication grids with a standard language system	Children used communication grids with user specific vocabulary
School curriculum	Different regions within the country follow different curricular guidelines, but educational activities are standardized within each region	Curricular goals are set for the entire country, but teachers have the freedom of choosing the educational activities they find most appropriate

Project UARPIE – next steps

- System will be used by children with neuromotor impairments in regular classes in Portugal
- Experimental objectives:
 - to evaluate academic achievement when using the AT compared to without it
 - to assess teachers' perceptions of the use of the AT and its impact on the student and in the classroom (e.g., student's engagement with activities, sensitivity to distractions and social inclusion factors).

Parallel work – next steps

- Present:
 - comparing participation (manipulation and communication) between that used by a child who uses AAC and a peer in pairs activity
- Future:
 - comparing robot and commercially available virtual manipulatives



More info

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