Using assistive robots to promote inclusive education

Type of Project

Finished research project

Summary

Both a physical and a virtual Lego robot were developed to support children's with neuromotor disabilities participation in academic activities requiring the manipulation of objects. Children controlled the robot through their Augmentative and Alternative Communication device thus allowing them to simultaneously perform the activities and communicate about them.
Nine children with neuromotor disabilities, aged from 3 to 6 years old, used the Integrated Augmentative Manipulation and Comunication Assistive Technology (IAMCAT) at their classes to perform academic activities in the curricular areas of Mathematics, Language, and Science & Social Studies along with their peers. Nine regular teachers and nine special education teachers also participated in the study. Teachers considered the IAMCAT a valuable resource that can be integrated in regular classes and that is compatible with the teachers' curricular planning and management. However they pointed out the need for proper training and for the presence of another teacher / teaching assistant in class.

Low-tech, high-tech products, services and contexts for play

A Lego Mindstorms robot was built with a gripper to manipulate objects and a pen attached to allow for drawing on the robot's traveling surface. Robot command cells were incorporated into communication boards of the Augmentative and Alternative Communication software The Grid 2. Communication between the computer running The Grid 2 and the robot was done through BlueTooth.
A virtual version of the system was also devised, children using the robot control cells integrated into The Grid 2 communication boards to control a virtual robot on a computer screen.
The goal of the Integrated Augmentative Manipulation and Communication Assistive Technologies developed is to support children's with neuromotor disabilities participation in academic activities that require the manipulation of objects.

The context of use

Children used the Integrated Augmentative Manipulation and Communication Assistive Technology to participate in academic activities in their classrooms, along with their typically developing peers. The academic activities in the curricular areas of Mathematics, Language, and Science & Social Studies were prepared by the participants' teachers, taking into consideration their curricular planning and management.

Type of play in this play system

Cognitive

Practice
Symbolic

Social

Solitary

Objectives related to play according to ICF-CY

Play-like activities: Therapeutic and educational objectives

d1 Learning and applying knowledge (learning through symbolic play, learning through pretend play)

Number of participants

5-10

Chronological Age

3-6 years

Development Age

3-6 years

LUDI Categories of disabilities

Physical impairments:
Moderate
Severe

Explanation on the use of low-tech, high-tech devices, services or contexts

Explanation

Verbal instruction, language and communication fitting to chronological age

Involvement

Adult: therapist/educator/researcher

Role

Providing instruction

Evaluation of objectives and outcome measures

Description of outcome measure(s)

Observation by professional/researcher providing the play experience
Feedback from client/parents/professionals

Information about availability of outcome measure: publisher, website, contact person

Participants' teachers were interviewed before and after the intervention. A content analysis of the interviews was conducted.

Summary of achieved effects

Teachers considered the IAMCAT a valuable resource that can be integrated in regular classes and that is compatible with the teachers' curricular planning and management. However they pointed out the need for proper training and for the presence of another teacher / teaching assistant in class. Teachers considered that the project continuity would be more ensured with the virtual IAMCAT. Teachers referred more to the children's participation in the activities with the virtual robot and referred more to the impact on the group dynamics of the physical robot.

References to the intervention or research project

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Publication

Using assistive robots to promote inclusive education - first user trials
P. Encarnação, K. Adams, A. Cook, M. Nunes da Ponte, A. Caiado, T. Leite, C. Nunes, J. Pereira, G. Piedade, M. Ribeiro, A. Martins, and M. Silva
Proceedings of the RESNA 2015 Conference, Denver, US, June 10-14, 2015

Keywords

Assistive robots, inclusive education