Advances in Consumer Research
https://acr-journal.com/
Volume-3 | Issue-1 | Jan 2026
Original Researcher Article

Exploring the Role of Educational Robotics in Supporting Learners with Special Needs: A Qualitative Study

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ABSTRACT
Integration of robotics into special education is a revolutionary opportunity to meet various needs of learners with disabilities. Robotics of various types can provide the interactive, adjustable, and entertaining tools for the development of skills concerning cognitive, social, emotional and physical aspects of a person's self. Here we address the role of robotics to improve learning experience for students with special educational needs as well as address inclusive education. NAO, Kaspar and QT Robot, are examples of social robots, which demonstrated promising results in teaching children with an autism spectrum disorder (ASD) to improve the ability to communicate socially, which includes eye contact, turn-taking, and recognition of emotions. These robots offer regular, calm, and non-judgmental interactions in a controlled space which alleviates anxiety and sensory over-stimulation. For students with speech and language problems, robots that is able to recognize speech, i.e. "listen" and synthesize that speech, i.e. 'speak', provide immediate feedback and a safe environment to practice language without worrying about making mistakes.
Programmable kits, which include the LEGO Mind storms, Bee-Bot and Topobo, demonstrate problem solving, sequencing and logical thinking and stimulate the brain development in a simpler, tactile way. Also, assistive robotic devices improve mobility and independence for students with physical disability and helps providing physical therapy and daily movements. Detection of emotional recognition components in certain robots allows them to carry out interaction with children's emotions, provide companionship and regulate negative emotions - critical for students with behavioral or emotional issues. Robotics can be adapted to follow each child's individual learning profiles, and AI changing content and pace to every student according to his or her abilities and requirements. This personalized learning strategy encourages academic advancement and encourages higher engagement. In addition, child early learning environments have utilized robotics to enable the identification of undetected learning problems whose intervention may begin early. Spite of its potential, there exist challenges in large scale implementation of the robotics in special education like high cost, inadequate teacher training and ethical issues. However, studies demonstrate that robot interventions can increase social, cognitive, and functional powers of students by several orders of magnitude. Finally, robotics has great promise in transforming special education by eliminating barriers to learning and creating individualized, inclusive, empowering learning experiences. Technology is likely to further develop and so incisive integration and evidence-based practices will become vital in maximizing the benefits of technology for learners with special needs..
Keywords: Robotics; Special Education; ICT

1. INTRODUCTION:

Lately, the education field has adopted robotics in practical ways to help students with special needs. Previously, robots served only industrial and academic fields; now, teachers use them to encourage new forms of teaching that are inclusive, appealing and fit every student. Children and students with autism, ADHD or learning disabilities are particularly affected by this new way of teaching.

Using old teaching strategies usually fails to completely address the many needs of students from diverse groups. With robotics, learners can enjoy assistance that is always there, talks with them and grows with them individually. With robots, students can work on communication, improve their social skills and handle lessons with less strain. For lots of individuals, robots help with education and at the same time serve as friendly companions.

Robots may be simple or very advanced and can communicate, move, demonstrate emotions and help students complete assignments in the classroom. Such pets are valuable for children that find people's behavior hard to understand or accept. Robotics is helping to improve education for students who traditionally struggled with school. By developing spaces that fit each person's needs, robotics is assisting in minimizing gaps in learning and helping more individuals feel included.

As technology improves, robots will likely participate more in education by bringing new ways for all students, especially students with special needs, to achieve better results. Combining robotics with special education, truthfully, results in better learning for all students.

Understanding What Must Be Done for Special Education Students

Learning and developmental problems are common for students with special needs, including speech problems, difficulties moving, inattention, social issues and conditions known as autism, ADHD or dyslexia. Many learners from this background aim for extra help and do best with personalized instruction.

Classroom teaching methods cannot always address the needs of these learners, who do best with lessons that are structured, repeated and include activities. Special education tries to meet the needs of students with cognitive, physical, sensory and emotional learning differences.

Supporting these students is best when teaching strategies are easily adaptable and chosen according to their needs. Robotics allows students to receive instruction that repeats, stays consistent and is tailored to each student. The help of robots contributes to communication, motor skills and social growth, so that students with special needs can learn more easily.

Robotics helps special education in many new ways.

1. Improving Learning through Interaction

A major benefit of using robots is that they keep people's attention better than other things. Many autistic children are more interested in working with a robot than they are with a human educator. Being around robots makes students feel more secure and approaches learning without fear of criticism.

Using interactive humanoid or animal robots, students can follow lessons, get extra instructions repeated and have the robot act according to their facial or verbal expressions, all of which adds excitement to the learning process.

2. Having more opportunities to connect and share with others

Robots are able to act as social models and allow students to learn better ways to communicate in an environment where they feel protected. Social robots can aid children with language delays or autism by helping them build confidence in interacting before they join in fully with others.

Several robots are designed with emotions in mind. They can look at the user, notice gestures and change the tone of their voice during a conversation. Milo and NAO are social robots created to help students with ASD build communication skills by demonstrating the correct interactions and always giving feedback.

3. Using Regular Habits and Manner

Consistent and predictable routines usually help children with developmental disabilities do well. They do particularly well at teaching in a predictable and regular way. Because the schedule is always the same, students may behave and learn much better.

Robotic systems can present visual schedules and give directions through sound to help a person change tasks and continue good habits. With programming, robots work with students who have physical disabilities on motor skills, helping them to improve function and coordination. Group explorations with robotics help students interact, interact with each other and improve their social interactions. In addition, using robots allows students to solve problems and make decisions in a safe way which supports their self-directed learning.

How Robots Can Make Learning Better

1. Encouraging Students to Learn in an Engaging Way

Robots can walk, communicate, make expressions and participate in games too. This may hold students' attention and stimulate their interest in education. A lot of kids like to use technology and robots often seem entertaining and amusing to them. Playful learning usually results in students paying close attention.

2. Being Part of Communication

Some children struggle with talking to others or understanding what someone is saying. They can demonstrate easy methods for speaking, posing questions and giving responses. Since robots are reliable and don't rush students, students can practice interacting with less concern.

3. Providing clear instructions to everyone time and again

It often takes some students listening to an idea a number of times before they understand it. Robots perform the same action the exact same way every single time. This helps the student because they can repeat what they did when it suits them.

4. Teaching Independence

Robots give students help in everyday areas such as getting set for lessons, arranging their belongings and completing simple tasks. It allows students to work by themselves and gain confidence and useful skills.

5. Supporting Kids' Feelings and Actions

Certain students struggle to understand feelings inside and outside of themselves. Robots can display facial gestures and discuss emotions in terms that are straightforward. With this, students come to understand different feelings and what to do when frustrated, sad or happy. Different robots are also developed to respond to emotions or help students learn how to control their feelings. Using these systems, children who struggle to control their emotions benefit from hearing feedback that is both calm and supportive. Robotics, introduced into therapy or education, provides opportunities for students to learn how to regulate themselves and cope (Scassellati et al., 2012).

Robotics Helps Special Needs Learners in Many Ways

1. Greater motivation and increased interest

The novel and attractive way robots interact can hold students' interest throughout a lesson. For people who are sensitive to variations in human behavior, robots provide security and a routine experience. An ASD diagnosis often means a learner responds in a positive way to robots thanks to their regular and clear actions.

2. Support for helping children develop their speaking skills

Those students with difficulties speaking or understanding language can use special communication support tools. With speech synthesis, robots can show correct language skills and interact with students using speech. According to Husijnen et al. (2016), social robots help children with developmental disabilities learn how to talk and interact with others more.

3. Taking lessons in a certain order and repeating them

A major advantage of robotic systems is that they can repeat jobs or practices with no decrease in quality or monotony. It is important for those who depend on lots of practice to really grasp different concepts. A robot can teach students consistently and increase or decrease the difficulty as necessary, matching what differentiated instruction calls for (Cabibihan et al., 2013).

4. Supporting People in Becoming Autonomous

Robotics offers a way for students to work step by step, learning how to improve their daily habits and skills. So, for instance, a robot can help a student stick with their morning habits, join a group activity or finish their tasks. Children can develop their executive function skills such as planning, sequence and time management, when adults engage in these interactive activities.

Challenges and Considerations

So many benefits come with robotics in special education, but there are hurdles in using them.

Prices and Availability: Top educational robots are not cheap and some schools simply do not have enough funding to purchase or maintain them. Cost and the ability to grow remain important problems.

Teachers should be given enough support and training in order to work with robots in classroom lessons. If there is no proper guidance, we may not take full advantage of what robotic tools can do.

Not every student will react the same to using robotics. We should assess whether robotic interaction fits each case individually.

Schools have to face issues about protecting students' data and privacy as robots begin to collect information about their learning process.

Robotics May Play an Important Role in Special Education

Robotics is opening up many promising possibilities in the world of special education. New advancements in technology means robots can learn more cost less and be easier for people to use. As a result, robots will provide new and helpful advantages to students who require special assistance at school.

The areas always changing the fastest are those using artificial intelligence (AI). Going forward, robots could detect what feelings a student has, for instance, if they are happy, sad, confused or frustrated. As a result, robots might be able to react to students in a way that addresses what suits their learning and emotions best. Using personalized learning, students are more likely to keep focused and believe in their abilities.

When prices are lowered and technology advances, more schools will be able to use classroom robots. Experts in education, therapy, engineering and research will cooperate to bring about robots that work both effectively and in real schools.

Even with these advances, robots will not replace teachers. Instead, they will work alongside educators to support learning, guiding routines, or helping students practice communication and social skills.

In the future, robotics will play a key role in creating more inclusive classrooms. They will help ensure that students with disabilities get the tools and support they need to thrive. With the right planning and teamwork, robots can make learning better for everyone—especially those who need it most.

2. CONCLUSION

Robotics could help make a big difference in special education by offering new and customized ways for students with disabilities to learn. Because technology is getting better, robots are now useful in schools, helping children who have certain physical, emotional or cognitive challenges. Various robotic systems are very reliable, patient and flexible which is sometimes tricky for many teaching techniques.

Robots play a big role in making learning in special education more fun and engaging. Informational robotics allows young people to learn in games, through storytelling and with the use of visual tools. Humanoid robots' facial expressions and voices allow kids with autism to learn social skills in a comfortable, controlled environment. Because these robots act the same way every time and are open to all, many students feel more comfortable and inclined to take part.

Robotics is also improving communication. Many students with disabilities have difficulty communicating which can result in both frustration and feelings of isolation. Robots designed with either speech-generators or touchscreens can function as support for children in letting others know what they are thinking. With more confidence, children can be supported better by their teachers and caregivers.

Each student can use a robot that has been programmed to their individual learning needs and schedule. Artificial intelligence and analyzing data allow these systems to see how a student is progressing and immediately modify lessons to give helpful and personalized advice. Custom fit commitments guarantee that no student is left out and all can work toward their learning goals in a comfortable way.

In conclusion, the future of robotics in special education is full of exciting possibilities. By enhancing communication, supporting personalized learning, and promoting independence, robots can help create a more inclusive and equitable educational environment. With thoughtful implementation, robotics can empower students with disabilities to reach their full potential and enjoy a richer, more meaningful learning experience.

REFERENCES

1. Botev, J., & Rodríguez Lera, F. J. (2020). Immersive telepresence framework for remote educational scenarios. In Learning and Collaboration Technologies. Human and Technology Ecosystems: 7th International Conference, LCT 2020, Held as Part of the 22nd HCI International Conference, HCII 2020, Copenhagen, Denmark, July 19–24, 2020, Proceedings, Part II 22 (pp. 373-390). Springer International Publishing.
2. Pakkar, R., Clabaugh, C., Lee, R., Deng, E., & Matarić, M. J. (2019, October). Designing a socially assistive robot for long-term in-home use for children with autism spectrum disorders. In 2019 28th IEEE international conference on robot and human interactive communication (RO-MAN) (pp. 1-7). IEEE.
3. Van Den Heuvel, R., Jansens, R., Littler, B., Huijnen, C., Di Nuovo, A., Bonarini, A., ... & De Witte, L. (2022). The potential of robotics for the development and wellbeing of children with disabilities as we see it. Technology and Disability, 34(1), 25-33.
4. Cabibihan, J. J., Javed, H., Ang, M., & Aljunied, S. M. (2013). Why robots? A survey on the roles and benefits of social robots in the therapy of children with autism. International journal of social robotics, 5, 593-618.
5. Diehl, J. J., Schmitt, L. M., Villano, M., & Crowell, C. R. (2012). The clinical use of robots for individuals with autism spectrum disorders: A critical review. Research in autism spectrum disorders, 6(1), 249-262.
6. Huijnen, C. A., Lexis, M. A., Jansens, R., & de Witte, L. P. (2017). How to implement robots in interventions for children with autism? A co-creation study involving people with autism, parents and professionals. Journal of autism and developmental disorders, 47, 3079-3096.
7. Scassellati, B., Admoni, H., & Matarić, M. (2012). Robots for use in autism research. Annual review of biomedical engineering, 14(1), 275-294.
8. Di Battista, S., Pivetti, M., & Moro, M. (2022). Learning support teachers' intention to use educational robotics: The role of perception of usefulness and adaptability. Robotics, 11(134).
9. Di Lieto, M. C., Castro, E., Pecini, C., Inguaggiato, E., Cecchi, F., Dario, P., Cioni, G., & Sgandurra, G. (2020). Improving executive functions at school in children with special needs by educational robotics. Frontiers in Psychology, 10, 2813.
10. Fachantidis, N., Syriopoulou-Delli, C. K., Vezyrtzis, I., & Zygopoulou, M. (2020). Beneficial effects of robot-mediated class activities on a child with ASD and his typical classmates. International Journal of Developmental Disabilities, 66(3), 245–253.
11. Galvez Trigo, M. J., Standen, P. J., & Cobb, S. V. G. (2019). Robots in special education: Reasons for low uptake. Journal of Enabling Technologies, 13(2), 59–69.
12. Papakostas, G. A., Sidiropoulos, G. K., Papadopoulou, C. I., Vrochidou, E., Kaburlasos, V. G., Papadopoulou, M. T., Holeva, V., Nikopoulou, V. A., & Dalivigkas, N. (2021). Social robots in special education: A systematic review. Electronics, 10(12), 1398.
13. Pivetti, M., Di Battista, S., Agatolio, F., Simaku, B., Moro, M., & Menegatti, E. (2020). Educational robotics for children with neurodevelopmental disorders: A systematic review. Heliyon, 6(e05160).
14. Tlili, A., Lin, V., Chen, N.-S., & Huang, R. (2020). A systematic review on robot-assisted special education from the activity theory perspective. Educational Technology & Society, 23(3), 95–109.
15. Zheng, Z., Zhang, J., & Li, Y. (2015). Robot-mediated imitation skill training for children with autism. IEEE Transactions on Neural Systems and Rehabilitation Engineering, 24(6), 682–691.
16. Yang, Q., Lu, H., Liang, D., Gong, S., & Feng, H. (2024). Surprising performances of students with autism in classroom with NAO robot. arXiv preprint arXiv:2407.12014.
17. Wu, X. (2022). Interaction design for socially assistive robots for people with developmental disabilities. arXiv preprint arXiv:2301.00840.
18. Lee, U., Kim, H., Eom, J., Jeong, H., Lee, S., Byun, G., Lee, Y., Kang, M., Kim, G., Na, J., Moon, J., & Kim, H. (2025). Echo-Teddy: Preliminary design and development of large language model-based social robot for autistic students. arXiv preprint arXiv:2502.04029.
19. Ismail, S., Ismail, M., & Ismail, R. (2019). Social robots in special education: A systematic review. Electronics, 8(12), 1398.
20. Pliasa, S., Fachantidis, N., & Maragkou, P. (2020). Can children of typical development benefit from inclusion intervention with Daisy Robot—a socially assistive robot? In Proceedings of the 2020 ACM/IEEE International Conference on Human-Robot Interaction (pp. 235–240). Association for Computing Machinery.
21. Lindsay, S., Kolne, K., Oh, A., & Cagliostro, E. (2019). Children with disabilities engaging in STEM: Exploring how a group-based robotics program influences STEM activation. Canadian Journal of Science, Mathematics and Technology Education, 19(4), 387–397.