



Utilising Robotics Social Clubs to Support the Needs of Students on the Autism Spectrum Within Inclusive School Settings

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Terminology and abbreviations

Because many people on the spectrum reject the use of the term 'disorder' to describe their experience of autism, the authors of this report have chosen to use the terminology 'the autism spectrum', 'students on the autism spectrum' and 'students on the spectrum' when referring to the conditions described in the Diagnostic and Statistical Manual of Mental Disorders (DSM-5) as 'autism spectrum disorder'. However, the terminology used by the survey participants around autism spectrum disorder has not been altered in the qualitative data sections and is their chosen wording.

The Cooperative Research Centre for Living with Autism (Autism CRC)

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Executive Summary

PURPOSE OF THIS STUDY

This pilot study further expanded and evaluated a robotics social club intervention to support the inclusion of young people on the autism spectrum within inclusive school contexts. The project addressed the often perceived barriers to successful intervention in the mainstream school environment through the development of supporting documents and resources in the form of an intervention manual/resource kit that is accessible to help support teachers wanting to establish and implement a robotics social club in their schools or classrooms. In addition, these resources assist in capturing and generalising the learnings and strategies acquired within the club more broadly to the classroom and whole school context and to support the personal and social capabilities of the Australian Curriculum.

AIM OF THE STUDY

The study sought to build on the resources and experiences which Brisbane Catholic Education (BCE) had acquired previously in relation to the use of the robotics social clubs by utilising a participatory action research methodology to address the following research objectives:

1. Evaluate how the robotics social club intervention promotes:
 - a. learning of the personal and social capabilities within the Australian Curriculum; and,
 - b. peer relationships and academic engagement for students on the autism spectrum within the context of the inclusive school-classroom environment.
2. Identify effective robotics social club strategies that support the generalisation of students' academic engagement and peer relationships to the classroom setting. This would in turn build the confidence and competence of classroom teachers to embed the personal and social capabilities of the Australian Curriculum into their teaching practice.
3. Develop a robotics social club resource kit/manual for dissemination through the Autism CRC that could be a reference and supporting document for

schools and individual teachers planning to establish and implement a robotics social club within their school context.

STUDY DESCRIPTION

Given the exploratory nature of this pilot study, a participatory action research design was used based on Timperley and Alton-Lee's (2008) inquiry cycle for developing teacher knowledge and effectiveness. Using these action research cycles of inquiry through a case study design, the study investigated the implementation of robotics social clubs to support the needs of students on the autism spectrum within inclusive school settings.

SUMMARY OF KEY FINDINGS

Key findings of this pilot study utilising robotics social clubs to support the needs of students on the autism spectrum within inclusive school settings are as follows:

1. Social Networks and Friendships

- Rather than forming *more* connections with peers, it appears the club encouraged students to establish *stronger* friendships in more clearly defined groups. Both students on the spectrum and their same aged peers appeared to show a similar trend.
- Overall, students on the autism spectrum:
 - Demonstrated an increased awareness of peer social networks.
 - Experienced greater benefit in terms of their integration and acceptance into the social network of the club, compared to their same aged peers.
 - Experienced greater benefits than their peers, in terms of an increase in the number of students they liked to hang out with, and a decrease in the number of times they were 'rejected' by peers.
- In terms of friendships, both students on the autism spectrum and their same aged peers showed a comparable increase over time in the number of nominations as 'friends' by peers. However, same aged peers showed a greater increase in their awareness of friendships and social networks compared to students on the spectrum.

2. Motivation and Engagement

- Initial findings suggest that the club may have had a positive effect on students' motivation and engagement by buffering against some of the expected drops in 'booster' factors over time as students get older.
- The club seemed to have a positive effect on engagement by buffering against the expected drop in engagement over time, and perhaps even helping to increase levels of engagement in the most vulnerable students.

3. Perceptions of the Club

3.1 *Expectations Coming into the Club*

There were a range of teacher, parent and student perceived expectations of the club prior to it commencing. These expectations centred around how involvement would support the students involved and the skills teachers would require.

3.1.1 Perceptions of how the club would help the students involved

Perceptions of how the club would help the students involved included:

1. **Enhancing personal and social capabilities** including:
 - a. Developing skills needed for teamwork,
 - b. Increasing confidence, having a sense of success and developing leadership skills,
 - c. Enhancing resilience and dealing with frustrations,
 - d. Increasing self-awareness and independence, and
 - e. Getting to know others and making friends.
2. **Increasing engagement** including:
 - a. Enhancing student-student relationships (e.g., getting to know others and making new friends),
 - b. Having relevance to job and career interests and developing life skills,

- c. Having fun,
- d. Increasing co-curricular involvement, and
- e. Encouraging generalisation to classroom and playground.

3. Tasks and technology including:

- a. Increasing building, programming and technological skills, and
- b. Enhancing creativity and problem solving skills.

3.1.2 Perceptions of expectations on teachers involved in the club

These expectations centred around things teachers would need to run the clubs or skills they would require and included:

1. Pedagogical knowledge including a focus on teachers running the club:

- a. Using explicit instruction and breaking down tasks,
- b. Providing structure and routine,
- c. Utilising:
 - i. Visual supports,
 - ii. Prompting, coaching, reflection,
 - iii. Modelling,
 - iv. Positive reinforcement and feedback,
 - v. Practice and repetition,
- d. Providing a safe environment,
- e. Teaching confidence and encouraging self-efficacy, and
- f. Having a desire to learn new pedagogical practices.

2. Content knowledge focussed on an expectation that some existing knowledge of the personal and social capabilities existed and would be utilised.

3. **Technological knowledge expectations** highlighted the need for teachers to be supported in their technological and content knowledge to help the club be successful.
4. **Generalisation** expectations highlighted the importance of generalising the student learning from the club to both the classroom and playground. Expectations of generalisation to other teachers' practice included that this could be through:
 - a. staff meetings,
 - b. the sharing of case studies of students,
 - c. peer observation and mentoring, and
 - d. informal conversations.

3.2 Perceptions of the Outcomes of the Club

Perceptions of the outcomes of the club fell into three main categories:

1. Student outcomes,
2. Teacher outcomes, and
3. Challenges and suggestions for improvement.

3.2.1 Student Outcomes

The perceived benefits of the club for the students involved included improvements in:

1. **Personal and social capabilities** including:
 - a. Improved skills in teamwork skills (e.g., being cooperative, helpful, patient, sharing, communicating, listening, caring, compromising/making decisions, including others),
 - b. Increased confidence, having a sense of success and improved leadership skills,
 - c. Enhanced resilience and better skills in dealing with frustrations,
 - d. Improved self-awareness of strengths and difficulties, and

e. Increased knowledge of others and development of friendships.

2. **Increased engagement** including:

- a. Improved student-student relationships (e.g., got to know others, made new friends),
- b. Enjoyment of robotics tasks,
- c. Relevance to job and career interests was obvious and life skills were learned,
- d. It was fun, and
- e. There was generalisation to classroom and playground.

3. **Task/technology** including:

- a. Building, programming and technological skills were learned,
- b. Creativity and problem solving skills improved, and
- c. Student-teacher relationships were improved.

3.2.2 Teacher Outcomes

The perceived benefits of the club for the teachers involved included improvements in:

1. **Content knowledge**, including increased knowledge in:

- a. Personal and social capabilities,
- b. Pedagogical knowledge, and
- c. Robotics and programming.

2. **Generalisation** including:

- a. To the classroom and playground,
- b. Increased knowledge of individual students' needs, and
- c. Improved teacher-student relationships.

3.2.3 Challenges and Suggestions for Improvement

There was also a lot of feedback about the challenges experienced and suggestions for improvement to the club and resources. These included improvements to the:

1. **Social aspects of the club and the content** including:
 - a. Teamwork difficulties and improving team configuration,
 - b. Encouraging consistent teams and attendance,
 - c. Having student-led team formation,
 - d. Reinforcing that the robot belongs to a team,
 - e. Having more students, and
 - f. Revising the learning intentions and success criteria.
2. **Strategies and pedagogy** including the importance of having:
 - a. Clear rules and expectations,
 - b. Fair instructions and ownership of equipment,
 - c. Development of positive attitudes,
 - d. Structure and scaffolding,
 - e. Scheduling and built-in flexibility,
 - f. Enthusiastic teachers, and
 - g. More positive reinforcement and celebration of success.
3. **Tasks and technology** including:
 - a. Support for technical difficulties,
 - b. More effective computers/wifi,
 - c. Consideration given to:
 - i. The nature of challenges,
 - ii. The variety of challenges from the start,

- iii. More creative building challenges (and less programming),
 - iv. More robot battles and races,
 - v. New challenges, and
 - vi. Opportunity to use different robots,
- d. More teaching of programming,
 - e. Providing more time for the club, and
 - f. Improving teacher competence/confidence with robotics, more support.
4. **Generalisation of the skills learned** including providing:
- a. Information for parents,
 - b. Information provided to families to help generate at-home discussion (including through a website, newsletter, email, flyer),
 - c. The opportunity to attend a session/s,
 - d. Feedback from teachers,
 - e. Hope that the club continues, and
 - f. Links to classroom and broader applications.

4. Teaching Actions

Specific teaching actions that were perceived as important to the running of the club and were important to be integrated into the delivery of the club included:

1. **Pedagogy and effective strategies** including the use of:
- a. Explicit instruction, breaking tasks down,
 - b. Structure and routine, time management,
 - c. Visual supports,
 - d. A learning focus with the use of:

- i. Prompting, coaching, reflection,
- ii. Modelling, joint construction,
- iii. Positive reinforcement and feedback,
- iv. Practice and repetition,
- v. The provision of a safe environment,
- vi. Student-led group formation and different roles in the group,
- vii. A focus on the hidden learning, and
- viii. Allowing for differentiation and allowing students ownership.

2. **Professional learning processes** including:

- a. Completing reflections, planning,
- b. Sharing in staff meeting,
- c. Peer observation and mentoring, and
- d. Teacher-student relationships.

IMPLICATIONS FOR FUTURE PRACTICE

Implications for future practice include:

- Considering using robotics clubs as part of the continuum of support offered through a positive behaviour framework. The club framework would fit in well at both a Tier 1 or 2 level intervention.
- Though resources have been developed with the intention of being detailed enough and with enough links to external resources for teachers to pick up and run the robotics social club program, consideration should be given to the need to provide a day of training before implementing the program. This training could:
 - Provide an overview of the program;
 - Develop content knowledge (personal and social capabilities);
 - Develop technological knowledge (robotics); and,

- Develop pedagogical knowledge (re: effective practices for teaching students on the spectrum).
- Provide examples of how application/integration of the club within existing school systems and policies could be applied (e.g., within a school's Student Behaviour Support Plan as a Tier 1 or Tier 2 targeted social skills intervention, and within the Australian Curriculum requirements). This could demonstrate how establishing a robotics social club within a school can meet multiple goals – it is relevant not only to inclusive education and supporting students on the autism spectrum, but also to supporting broader student wellbeing and supporting all students to meet achievement standards across multiple areas of the Australian Curriculum.

KEY RECOMMENDATIONS

1. Robotics social clubs can serve multiple goals in school environments including to support:
 - a. Social emotional wellbeing,
 - b. Behaviour support,
 - c. Academic engagement and motivation, and
 - d. The demands of the Australian curriculum.
2. Professional development for teachers implementing robotics social clubs in schools would be useful and could be offered in a range of ways (e.g., face-to-face, through website or social networking community).
3. Resources need to be constantly updated and improved to reflect learnings from school communities implementing them.
4. Robotics social clubs have application with a range of age groups, student needs and school contexts.
5. Robotics social clubs are effective to implement within inclusive school communities and help to support an inclusive school culture.

REFERENCES

- Timperley, H., & Alton-Lee, A. (2008). Reframing teacher professional learning: An alternative policy approach to strengthening valued outcomes for diverse learners. *Review of Research in Education*, 32(1), 328-369.