



ABA + Robotics Pilot and Summer Program 2021

Goal for HWCDSB ABA + Robotics Pilot Program

The goal of the Hamilton-Wentworth Catholic District School Board (HWCDSB) ABA + Robotics Pilot program is to provide a learning opportunity to students with special education needs who have an interest in LEGO® and/or robotics. This pilot program will support students with special education needs who present with significant behavioural concerns that may interfere with collaborative participation in a group setting. While capitalizing on the student's interest in LEGO® and Robotics, the focus is to embed Applied Behaviour Analysis (ABA) strategies to strengthen skills and support their academic and behavioural development using differentiated instruction.

Examples of Targeted Skills and Behavioural Goals

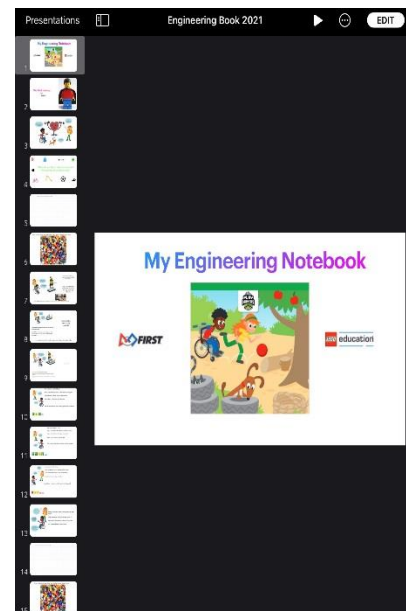
- Decreasing and replacing problem behaviours (e.g., physical or verbal aggression, property destruction, elopement, non-compliance and/or verbal refusals)
- Compliance to instructions and work demands
- Tolerating denied access (e.g., not getting their way, item not available, item not working in the way they want it to work, people doing things differently from what they want)
- Problem solving (e.g., when item is not working or when an item is not fitting properly)
- Self-advocacy (e.g., asking for what they need or want, asking for help)
- Tolerating interruptions and transitions off preferred to comply with a LEGO® challenge or work task demand
- Accepting suggestions and trying things in a different way
- Turn-taking, sharing materials with peers, engaging in collaborative play and building with peers
- Initiating conversations, making comments, engaging in reciprocal conversations on-topic

Development and Customization to the HWCDSB ABA + Robotics Pilot Program

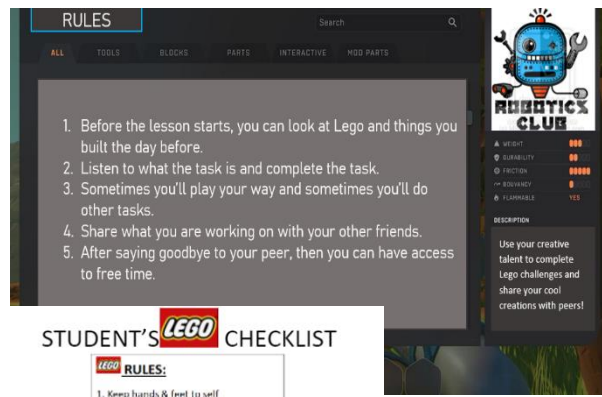
The HWCDSB ABA + Robotics Pilot Program ran in June 2021 during the school year for 2 weeks (10 days), for 1 hour daily and as a summer program at the end of August 2021 for 1 week (5 days) for 2 hours daily. The initial pilot program ran with two students, one at each school and met virtually through Microsoft Teams. The summer program ran with 3-4 students at each school site (2 school sites participated). The purpose of a small group with a maximum of 4 students is to build up the student's tolerance to working and sharing materials with 1 peer partner. Each pair was given a large LEGO® building plate (15"x15") to build on together and shared one *FIRST* LEGO® League Explore kit and one WeDo kit.



The schedule of the program included: free play, LEGO® Challenge for the session, completing Keynote presentation tasks based on LEGO® challenge, free play + embedding interruptions to preferred play, share LEGO® build with peer (virtually at the other school site), share joke of the day (virtually), and clean-up. For 2-hour sessions, following the second free play, the students would have snack time, followed by a second LEGO® challenge. This pilot program customized the "Engineering Notebook" and developed a Keynote presentation on each student's iPad with similar components. Each LEGO® build challenge was paired with options in the Keynote presentation for students to electronically document their work (e.g., drawing on the iPad, inserting a picture, video or audio).



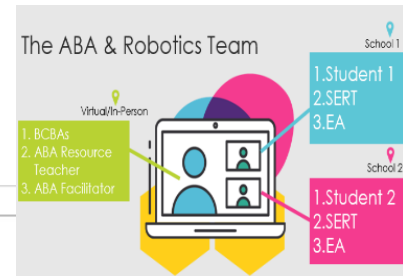
Each student received individualized behavioural assessments and programming for skill development that was embedded throughout the pilot program while they completed LEGO® challenges and the associated work tasks in their Keynote presentation file. Staff facilitating the program used function-based ABA strategies based on the function of the student’s behaviour (i.e., tangible, escape, attention, and/or automatic reinforcement). Antecedent strategies and environmental arrangements helped minimize occurrences of problem behaviour. Alternative replacement behaviours and desired behaviours were taught using ABA strategies such as behaviour skills training (BST), functional communication training (FCT), most-to-least prompting, shaping, and positive or negative reinforcement. Additional antecedent strategies included the development and implementation of session rules or a student checklist of tasks before getting access to reinforcement.



STUDENT'S LEGO CHECKLIST



1. Sit down
2. Mrs. Fazzari's Challenge
3. LEGO Challenge
4. Take Picture of Lego
5. Show peer Lego
6. 10 minutes iPad in ABA Room only
7. Leave iPad in ABA Room
8. Walk



The pilot program and the summer program were facilitated by a special education resource teacher with support from an educational assistant. One site also had a classroom teacher to support session lessons. Both school site programs were overseen by Board Certified Behaviour Analysts (BCBAs) and other members of the ABA Team, including the Special Assignment ABA Resource Teacher and ABA Facilitators.

Data Collection and Progress Monitoring

At baseline, HWCDSD staff collected individual student data on five targeted goals (tolerates interruption and complies with brief demand, tolerates denied access, complies with LEGO® challenges and task demands, transitions off preferred play to comply with task demands, and tolerates sharing/peer play with materials). Additional targets may be included during baseline data collection based on student profiles and background information from previous assessments or observations. Following baseline data collection, the Board Certified Behaviour Analyst (BCBA) and the special education resource teacher decided on 1-2 individualized behavioural goals for the program. The educational assistant at each school site was responsible for collecting data on the goals selected for each student. Trial-by-trial data was collected daily on individualized goals and converted into percentage of opportunities data per session. Frequency data was also collected on certain behaviours (e.g., number of times the student independently asked for help, the number of students the student said inappropriate words).

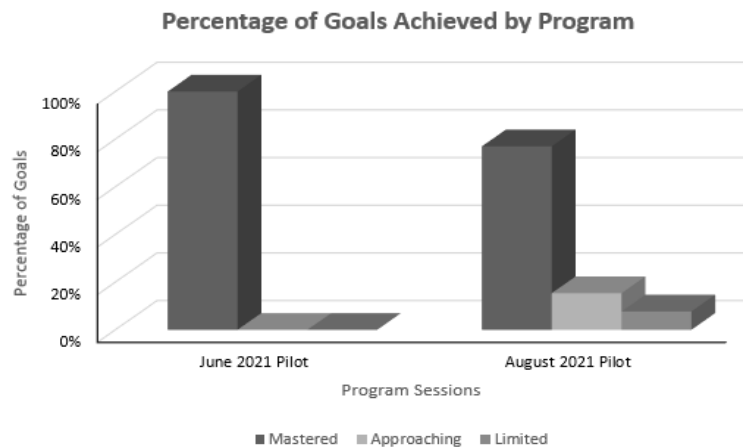
HWCDSD ABA + Robotics Pilot Program and Summer Program Results

Overall, both pilot programs demonstrated a decrease in problem behaviour and an increase in skill development based on the individualized targeted goals.

Figure 1.

This graph represents the total percentage of goals achieved by program. In the June 2021 pilot program, across two students, 100% of the individualized goals were mastered. In the August 2021 pilot program, across seven students, 77% of the individualized goals were mastered, 15% were approaching mastery criteria, and 8% of goals had limited progress.

- *Note: Mastered** (measurable goal achieved)
- Approaching** (student performing towards goal at 50-75% level of achievement)
- Limited** (student performing below 50% level of achievement)



Please see examples of measurement and progress of individualized goals below.

Student 1 – Sample Data

This student participated in the first pilot program with one other student from another school site. This student’s crisis behaviour included screaming, physical aggression, property destruction (e.g., throwing items like chairs, knocking over desks, ripping items) and elopement (walking or running out of a room, program space, or out of the school). The baseline duration of crisis behaviour was up to 180 minutes a day, 1-5 times per day, in March 2021. The function of this student’s behaviour was access to tangible (i.e., getting access to what he wants and getting people to do what he wants. While the ABA intervention in the school was successful in reducing the crisis behaviour to zero occurrences prior to participation in this pilot, it was often challenging to interrupt the student engaging in a preferred to comply with any activities or instructions. Therefore, compliance was very limited and crisis behaviour would begin to emerge if an interruption or work demand was placed.

Figure 2.

This graph represents the duration of crisis problem behaviour in minutes on one axis, and the frequency of precursor behaviour (behaviours presented before escalation) on the other axis. At baseline in the pilot program (day one), the student engaged in nine occurrences of precursor behaviour and crisis behaviour with a total duration of 15 minutes. By the end of the program (last three data points), the student engaged in an average of two occurrences of precursor behaviour (78% reduction), with an average duration of three minutes for crisis behaviour (80% reduction).

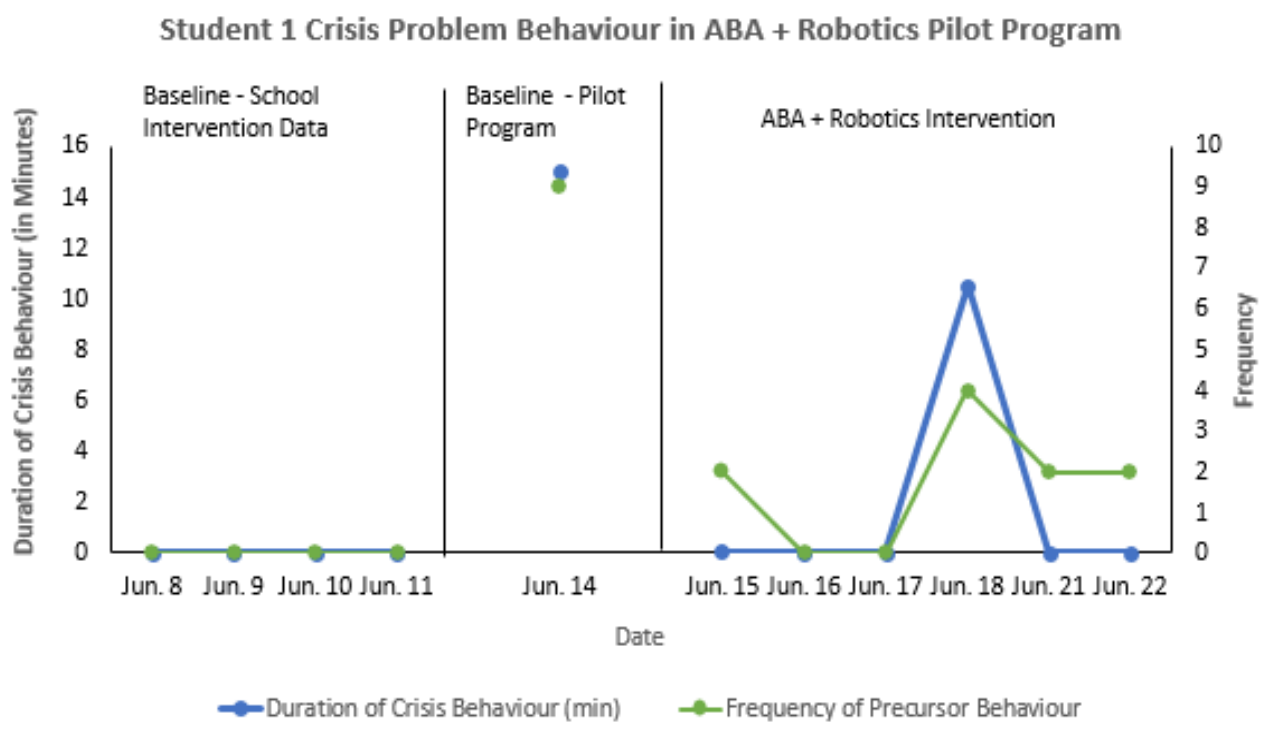
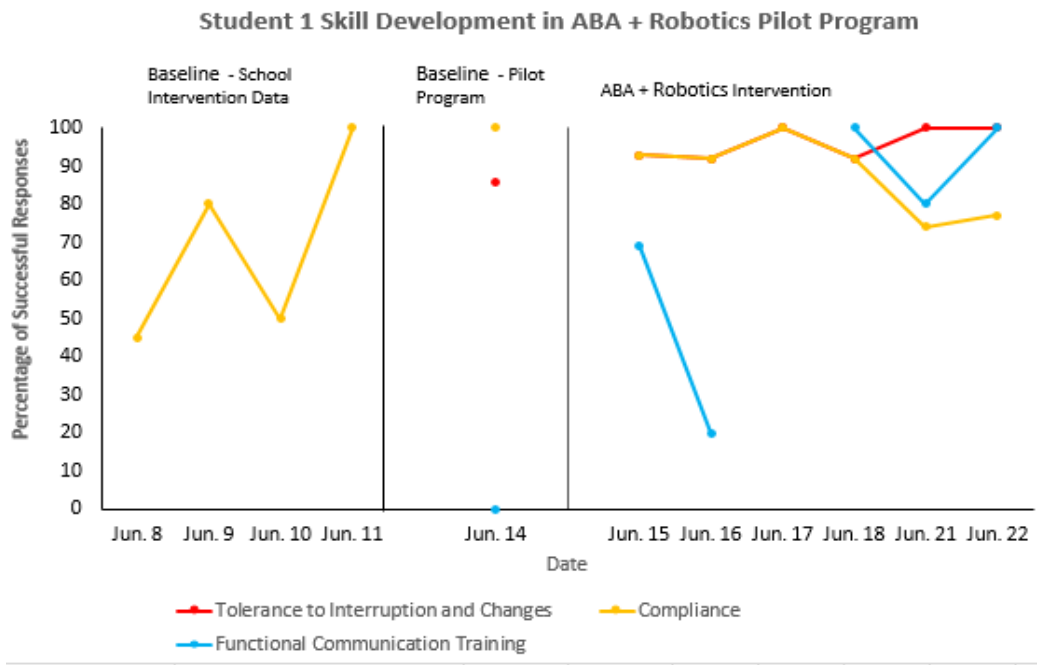


Figure 3.

This graph represents the percentage of successful responses across the targeted skill building goals of tolerating interruption to a preferred and having other people make changes, compliance to instructions and work demands, as well as using a functional communication response (e.g., “my choice”) to get what he wants instead of engaging in crisis problem behaviour. At baseline in the pilot program, the student’s overall compliance remained at a high level (100%) with the ability to tolerate interruptions and changes at 86%, both generalized from the school-based ABA intervention. By the end of the pilot program (last three data points), the student was tolerating interruption and changes for an average of 97% of

opportunities, he complied with an average of 81% of all work demands and instructions, and he used his words to functionally replace the crisis problem behaviour for an average of 93% of opportunities.

The significant change in intervention during the ABA + Robotics Pilot Program was the implementation of increased work demands and task difficulty presented which the staff had difficulty with prior to the pilot program. Crisis problem behaviour remained low as the expectations increased because the student was highly motivated by engagement with LEGO® and robotics. The student demonstrated more willingness to comply with an increased number and difficulty of tasks and tolerating people interrupting and not doing what he wants because of the motivating reinforcer. Through the ABA + Robotics Pilot Program, this student demonstrated an increase in tolerating interruptions and doing things in a different way as well as overall compliance, with a significantly increased amount of academic work output, while levels of problem behaviour continued to remain low.



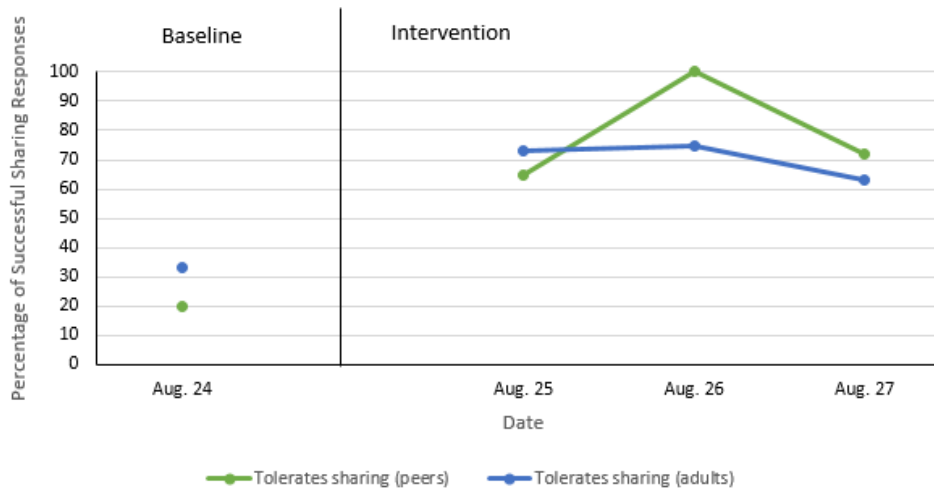
Student 2 – Sample Data

This student participated in the Summer ABA + Robotics Pilot Program with a small group of two other students. This student exhibited behaviours of yelling out (loud vocalizations of protest and refusal statements), physical occurrences of grabbing for pieces, hitting hands out of the way, throwing LEGO® pieces on the ground, and non-compliance (not following teacher instructions or directions). The function of this student’s behaviour was access to tangible (i.e., getting access to LEGO® pieces, building his way). The targeted goal for this student was to tolerate sharing of materials and turn-taking with peers and adults.

Figure 4.

This graph represents the percentage of successful responses for sharing materials and taking turns with a peer and with an adult staff member, across baseline and three intervention days. At baseline, the student engaged in problem behaviours when prompted to share and take turns building with a peer or adult. Baseline results show the student’s tolerance level to share with peers was 20% and 33% with adults. Following three days of function-based ABA intervention and shaping steps in combination with the student’s motivation and interest in LEGO® and robotics, by the end of the program, the student demonstrated the ability to tolerate sharing with peers on average for 79% of opportunities and 70% of opportunities with adults.

Student 2 Skill Development (Sharing) in Summer ABA + Robotics Pilot Program



Future Planning for HWCDSB ABA + Robotics Pilot Program

The combination of intensive ABA interventions, capitalizing on the student's interest and motivation to build with LEGO® and explore robotics has shown preliminary results of successfully generalizing behaviour support plans with function-based strategies to maintain low levels of problem behaviour and teach new behavioural skills to support self-management of behaviour in group situations.

The HWCDSB ABA Team and two pilot elementary schools have plans to continue this pilot project into the 2021-2022 school year, expanding the program to current and new students with similar profiles and targeted learning expectations which will be part of the student's individualized education plan (IEP).

The HWCDSB hope to continue pairing with *FIRST* Canada to provide this opportunity to students with special education needs whose problem behaviour may otherwise prevent them from fully participating in a group setting with their peers.

Supporting Pictures of the HWCDSB ABA + Robotics Pilot Program June 2021 and Summer Program 2021

Please note that the parent/guardian(s) of the students represented in these photos have provided informed consent for sharing for training, presentations or workshops for persons or organizations OUTSIDE of Hamilton-Wentworth Catholic District School Board, and for HWCDSB and *FIRST* Canada to use videos and/or photo recordings for reporting and information sharing outside of the Hamilton-Wentworth Catholic District School Board (e.g., Ministry of Education, community presentations or reports, *FIRST* Canada website or affiliations).







