Summary of Research Findings

Impact of IDEAS Maker Club on Socializing

- **ALL students (both autistic and non-autistic) showed increased rates of social responsiveness to peers throughout their time participating in Maker Club.**
- Teachers report that their autistic students were more socially engaged in Maker Club compared to in the traditional classroom.
- Sharing interests with peers while participating in a flexible and creative social environment encouraged these exciting social findings.
    - Citation: Chen, Y. L., Martin, W., Vidiksis, R., & Patten, K. (2021). "A different environment for success": A mixed-methods exploration of social participation outcomes among adolescents on the autism spectrum in an inclusive, interest-based school club. *International Journal of Developmental Disabilities*, 1–10.

Impact of IDEAS Maker Club on STEM Career Interest

- **All Maker Club students increased their interest in pursuing a STEM-related career.**
- Autistic students entered Maker Club with a heightened interest in STEM careers and higher science appreciation scores compared to non-autistic peers.
    - Citation: Martin, W. B., Yu, J., Wei, X., Vidiksis, R., Patten, K. K., & Riccio, A. (2020, June). Promoting science, technology, and engineering self-efficacy and knowledge for all with an autism inclusion maker program. In *Frontiers in Education* (Vol. 5, p. 75). Frontiers Media SA.

Impact of IDEAS Maker Club on Understanding the Engineering Design Process

- **Students who participated in Maker Club showed improved technology and engineering self-efficacy, science appreciation, and understanding of the EDP compared to students who did not enroll in Maker Club.**
    - Citation: Martin, W. B., Yu, J., Wei, X., Vidiksis, R., Patten, K. K., & Riccio, A. (2020, June). Promoting science, technology, and engineering self-efficacy and knowledge for all with an autism inclusion maker program. In *Frontiers in Education* (Vol. 5, p. 75). Frontiers Media SA.

Impact of IDEAS Maker Club on Executive Functioning

- **Maker Club students developed perseverance in the face of challenges, flexibly and resourcefully solved design problems, and accepted failure or mistakes as a normal part of the engineering process.**
  - Citation: Murthi, K., Chen, Y. L., Patten, K., Martin, W., Vidiksis, R., & Riccio, A. (2022). "What do we do after we fail? We try again": Autistic students' experiences of project failures in an interest-based afterschool maker program. INSAR (International Society for Autism Research) Annual Meeting 2002.

Peer-Reviewed Publications

Citation	Topic Areas	Results/Conclusions
Chen, Y. L., Martin, W., Vidiksis, R., & Patten, K. (2021). "A different environment for success": A mixed-methods exploration of social participation outcomes among adolescents on the autism spectrum in an inclusive, interest-based school club. *International Journal of Developmental Disabilities*, 1–10. https://doi.org/10.1080/20473869.2021.2001729	Benefits of interest-driven clubs, group activities, and flexible social and project-based learning environments	Both students on the spectrum and non-autistic peers without any group differences demonstrated increased social response rates and social reciprocity over time. Teachers reported that students on the spectrum engaged more socially than in general classrooms and attributed the positive outcomes to activities encouraging shared interests and the flexible social environment.

Peer-Reviewed Publications		
Citation	**Topic Areas**	**Results/Conclusions**
Chen, Y. L., Murthi, K., Martin, W., Vidiksis, R., Riccio, A., & Patten, K. (2022). Experiences of students, teachers, and parents participating in an inclusive, school-based informal engineering education program. *Journal of Autism and Developmental Disorders*, *52*(8), 3574–3585. https://doi.org/10.1007/s10803-021-05230-2	Students, teachers, and parents' experiences and perceived outcomes of the IDEAS Maker program	Students shared their experiences in five thematic areas: their engagement in the clubs, the skills they acquired from the Maker program, their experiences about developing career interests in STEM, their experiences of building a community and feeling a sense of belonging, and developing self-determination skills. Teachers and parents shared similar experiences of seeing students engaged in the clubs and developing social relationships along with following their curiosities and using their interests to develop projects.
Martin, W. B., Yu, J., Wei, X., Vidiksis, R., Patten, K. K., & Riccio, A. (2020, June). Promoting science, technology, and engineering self-efficacy and knowledge for all with an autism inclusion maker program. In *Frontiers in Education* (Vol. 5, p. 75). Frontiers Media SA. https://doi.org/10.3389/feduc.2020.00075	Impact of IDEAS Maker Club on STEM career interest	All Maker Club students increased their interest in pursuing a STEM-related career. Autistic students entered Maker Club with a heightened interest in STEM careers and higher science appreciation scores compared to non-autistic peers.

Peer-Reviewed Publications		
Citation	**Topic Areas**	**Results/Conclusions**
Murthi, K., & Patten, K. (2023, March/April). Improving executive functions using the Engineering Design Process: A peer-mediated problem-solving approach for autistic adolescents. American Journal of Occupational Therapy, *77*(2). https://doi.org/10.5014/ajot.2023.050166	› Making a case for Occupational therapists to use the Engineering Design Process (EDP) as a strategy to develop executive functions › Describing the unique features of EDP including systems thinking (ability to see patterns and relationships between concepts), collaboration (working with different members in the group), communication (talking about projects and results) and creativity (by thinking through problems in different ways). › Highlighting the executive functions (cognitive flexibility, working memory and regulation) skills that are developed through the EDP.	The EDP positively improved cognitive flexibility, working memory and self-regulation skills. EDP democratized the problem-solving journey for autistic adolescents as they engage in more peer-related, context-specific social and communicative skills through collaborative learning processes. The EDP helped students build authentic partnerships with other peers in areas of interest and use their curiosities to solve problems.

Conference Presentations		
Citation	**Topic Areas**	**Results/Conclusions**
Murthi, K., Chen, Y. L., Patten, K., Martin, W., Vidiksis, R., & Riccio, A. (2022). "What do we do after we fail? We try again": Autistic students' experiences of project failures in an interest-based afterschool maker program. INSAR (International Society for Autism Research) Annual Meeting 2002.	Using a strength-focused approach to document student experiences of failing in the Maker Clubs	Students in the Maker Clubs used the Engineering Design Process to design and develop their independent projects. Students developed perseverance in the face of challenges in their projects, flexibly and resourcefully solved design problems, and accepted failing or making mistakes as a normalized part of the design process.
Murthi, K., Chen, Y. L., Patten, K., Martin, W., Vidiksis, R., & Riccio, A. (2022). "We're always testing our prototypes:" Using Maker Curriculum to Build Problem-Solving Skills and STEM Interests in an Inclusive Club Context. CEC (Council for Exceptional Children) Convention and Expo 2022.	Students' experiences of using their STEM learning to solve design challenges and problem-solve in the Maker Clubs	The Makers program facilitated students' capacities to organize and manipulate information while developing their projects. Students exercised self-regulation and co-regulation to problem-solve and finish their projects. Since activities were highly interest-driven, students found value in these projects, which enabled them to persist through challenges and finish their projects.

Conference Presentations		
Citation	**Topic Areas**	**Results/Conclusions**
Murthi, K., Chen, Y. L., Patten, K., Martin, W., Vidiksis, R., & Riccio, A. (2021). Teacher Experiences of Implementing the IDEAS Maker Program, a Research-Based Inclusive STEM Curriculum in Public Middle Schools. INSAR (International Society for Autism Research) Annual Meeting 2002.	Teachers' experiences of participating and running the clubs and their roles in facilitating designing in these clubs	Teachers valued their role as facilitator of the Maker Club and agreed that the clubs were a space for students who experienced challenges in class to socialize with and learn from their peers. Teachers reported that the clubs were a great space to flexibly tailor their students' learning needs, building on their strengths and interests. Teachers believed that the clubs were a positive space for students to express and manage their feelings. Teachers valued the support they received from peers while running the clubs. Teachers reported that challenges of running the clubs included logistics and organization (e.g., busing, timing, and space).