MPOWERME, LLC (Pediatric OT & SLP Services) Play To Do™ (Education Consulting • Toy/STEAM Design • Research) OT-Informed Project-Based Learning for Inclusive K–5 Classrooms

Coding Adventure Pilot: Full Quantitative Report

Executive Summary

The Coding Adventure Pilot examined how OT-informed, story-based early coding experiences strengthen executive function (EF), social-emotional learning (SEL), communication, problem-solving, and early computational thinking skills in K–2 learners. Over four sessions, students engaged with large-format coding blocks, collaborative debugging routines, and whole-body code-running challenges tied to narrative problem-solving. Data revealed meaningful growth across EF, SEL, motor planning, coding fluency, and debugging behaviors, demonstrating the effectiveness of multisensory, movement-rich PBL in early childhood settings.

Study Design & Methods

Participants included diverse early learners from K–1 grade range. Students represented typical development as well as neurodivergent profiles, including autism, ADHD, and sensory processing disorder. Each 45–60 minute session incorporated a structured warm-up, story-based challenge, hands-on coding block sequencing, collaborative debugging routines, whole-body code-running, and reflective discussion.

Learning Environment Photos (Insert as Needed)

Warm-up exploration of coding tiles.

Students build sequences to move characters through obstacles.

Coding Adventures Pilot utilized modified Codie Blocks™ modular coding materials – visit https://codieblocks.com/
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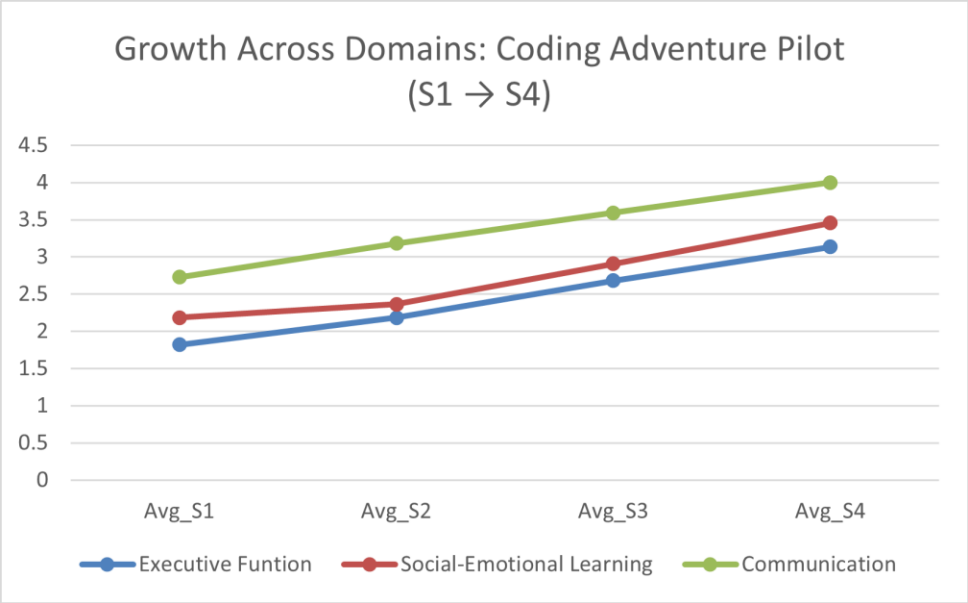
Whole-body code-running path constructed and tested.

Quantitative Findings Across EF, SEL, Coding, and Motor Domains

Students demonstrated measurable growth across all assessed domains. The strongest gains were observed in planning, working memory, cognitive flexibility, collaboration, communication, whole-body code execution, and debugging behaviors.



Overall Domain Growth (Session 4 vs. Session 1).

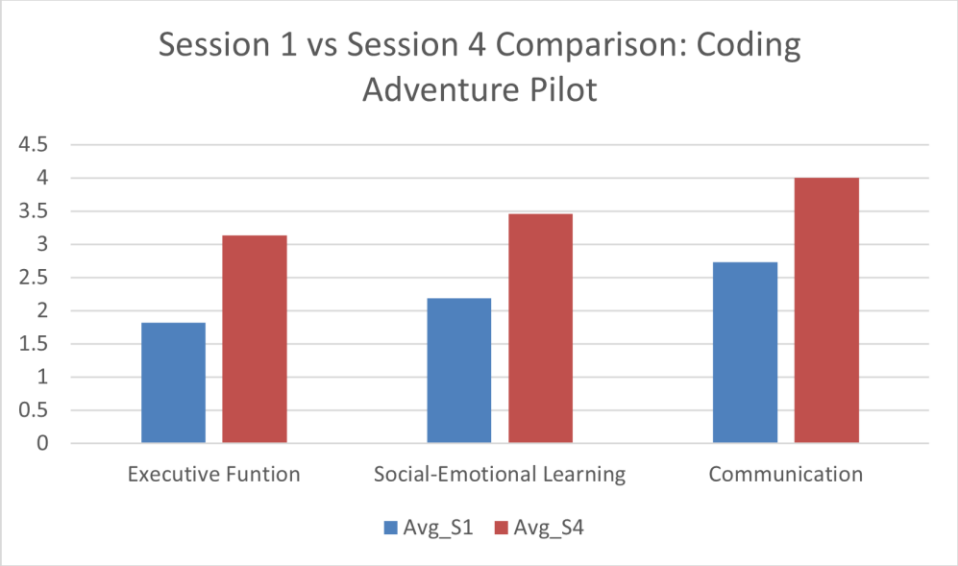
Executive Function Growth Across Four Sessions

Early coding tasks naturally activated EF through planning sequences, holding multi-step directions in working memory, shifting strategies when sequences failed, and initiating action during whole-body navigation. Students displayed increased independence, stronger sequencing accuracy, better anticipation of consequences, and more resilient responses to coding errors.

SEL Growth Across Coding Challenges

Story-based coding challenges required turn-taking, negotiation, communication, and shared problem-solving. Students strengthened their abilities to collaborate, explain reasoning, listen to peers, and adjust movement or coding paths based on team insights. SEL growth was evident in

teamwork, emotional regulation during debugging, and increasing confidence in presenting solutions.



Coding Fluency & Debugging Behavior Trends

Students showed rapid growth in their ability to identify coding blocks, interpret directional commands, and build accurate sequences that aligned to the story's problem. Debugging behaviors increased significantly as students recognized errors, verbalized them, and collaboratively improved code sequences.

Whole-Body Code-Running & Motor Planning

Whole-body navigation tasks required students to translate symbolic code into movement. This supported motor planning, sequencing, directionality, spatial awareness, and bilateral coordination. Students became more accurate and more confident with each session, showing smoother transitions, fewer hesitations, and stronger integration of visual, verbal, and motor inputs.

Warm-Up vs. Main Task: Readiness Trends

Warm-ups played a critical role in preparing students for coding challenges. Short, structured practice with tiles, symbol matching, pattern sequencing, and obstacle previews helped reduce cognitive load and increased fluency before tackling multi-step story challenges.

Skill Domain	Warm-Up Trends	Main Task Trends	Interpretation
Coding Fluency	Increased recognition of tile symbols and patterns.	More efficient sequence building and fewer errors.	Warm-ups strengthened symbol–action understanding.

Motor Planning	Students rehearsed direction concepts in low-stakes tasks.	Greater accuracy and smoother navigation on full paths.	Warm-up primed gross motor EF integration.
Working Memory	Short sequences practiced and repeated.	Students held longer sequences during code-running.	Warm-ups built sequencing and recall capacity.
Cognitive Flexibility	Students experimented with alternative tile combinations.	Adapted more quickly when mistakes were found.	Warm-ups supported flexible problem-solving.
Collaboration Readiness	Peer communication routines strengthened.	Teams coordinated debugging and navigation roles.	Warm-ups prepared SEL pathways for teamwork.

Interpretation Through an OT Lens

Coding in early childhood requires the integration of sensory processing, motor planning, sequencing, language, and self-regulation -- all areas aligned with occupational therapy expertise. Story-based PBL provides natural entry points for diverse learners, offering multiple modalities (visual, tactile, movement, narrative) for engagement and expression.

Whole-body code-running uniquely supports early EF development by demanding real-time integration of working memory, inhibition, cognitive flexibility, and emotional regulation. Debugging provides a safe space to practice frustration tolerance, persistence, and reflective thinking.

Recommendations for Early Elementary Classrooms

- Include 5-minute coding warm-ups to reduce cognitive load and increase fluency.
- Use story-based prompts to anchor meaning and increase motivation.
- Integrate whole-body navigation tasks to support motor planning and EF.
- Create predictable routines for debugging that normalize error and iteration.
- Provide visual supports and gestures to scaffold early coding concepts.
- Use peer roles (navigator, builder, debugger) to strengthen SEL and communication.

Conclusion

The Coding Adventure Pilot demonstrates that OT-informed coding instruction is a powerful, developmentally aligned approach for early learners. Students showed measurable gains in executive functioning, SEL, coding fluency, debugging, and motor planning. With its emphasis on hands-on exploration, storytelling, movement, and reflection, this model offers a scalable pathway for meaningful early STEM engagement.