



Science/STEM and Robotics Update

To: Program and School Services Committee

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Report No.: 04-12-4508

Strategic Directions

- Transform Student Learning
- Provide Equity of Access to Learning Opportunities for All Students
- Allocate Human and Financial Resources Strategically to Support Student Needs

Recommendation

It is recommended that the Science/STEM and Robotics Update for 2022-23 be received..

Context

The Toronto District School Board (TDSB) Science, STEM and Robotics Department supports teachers and schools in developing key skills outlined in the new Ontario Science curriculum (2022), including scientific research, experiment design, engineering, and critical thinking. The department provides professional learning, STEM support, safety training sessions, and robotics programs using culturally relevant and responsive pedagogical principles. Additionally, the department's Science Resource Centres provide enriching learning opportunities to the entire Board.

Action Plan and Associated Timeline

The TDSB's Multi-Year Strategic Plan (MYSP) guides the system's work towards identified goals and actions. The TDSB offers various professional learning opportunities in Science, STEM, and Robotics education, such as the revised 2022 Science and Technology Curriculum for Grades 1-8, the new 2022 de-streamed Grade 9 Science course (e.g., coding, engineering design process), safety courses (e.g., Secondary Science, Power Tools), robotics, STEM conferences (e.g., Eureka) and Skills Ontario Challenges. The Science/STEM and Robotics department partners with

other departments on projects such as Your Voice is Power (e.g., Indigenous music and coding), assistive technology and science (e.g., Mindomo), Outdoor Education and Science, Coding (e.g., Unity, Minecraft), Indigenous STEAMMD (with the UIEC), and Beginning Teachers and robotics, and supporting Math Science Technology (MST) student interest programs. TDSB also has access to resources through the Space Resource Centre (e.g., Star Lab) and the Science and Technology Resource Centre (e.g., Science Kits).

Bringing STEM to Life

Overview: The Science/STEM department partnered with Kindergarten to Industry (k2i) Institute at Lassonde School of Engineering (York University) on *Bringing STEM to Life*. The *In-School program* loans participating schools equipment kits (e.g. micro:bits, breadboard, motors, sensors) to enhance student learning. In the *Bringing STEM to Life: Work-Integrated Learning Experience/Helen Carswell program* offers students the chance to work in a research laboratory and focuses on encouraging girls, Indigenous youth, and Black youth to pursue STEM careers.

Participation and Timeline: Six to eight schools in underserved areas of the city are selected annually to participate in the project (3-8 teachers per school teaching 5-18 class sections per school). The first-semester cohort for 2022-2023 completed professional learning, while cohort two began in March 2023. The program includes professional learning for grade 9 and 10 Science classes, focusing on coding and using the loaned technology resources. In addition, 94 students from 29 schools participated in the *Work-integrated Learning Experience* in summer 2022.

Next Steps: The 2022-2023 *Bringing STEM to Life: In-School program* runs until May 2023. Students can apply for the *Bringing STEM to Life: Work-integrated Learning Experience* for summer 2023 to obtain secondary school credits (e.g., grade 11 university prep and physics).

Evidence of Impact: The *Bringing STEM to Life: In School program* has positively impacted teachers' STEM skills, resulting in engaging and hands-on learning experiences for students (e.g., coding and Micro:bits). Many schools have continued their learning by purchasing technology after the program. The summer *Work-Integrated Learning and Helen Carswell Program* has also been successful, with a 99% completion rate with a course average of 86% (e.g., grade 11 physics credit while working on a project with a professor as lab assistants). Students expressed

gratitude for the new skills and work experience in a post-secondary setting. One TDSB student even described the opportunity as “life-changing.”

Robotics Subsidies

Overview: The TDSB Science, STEM, and Robotics department provides \$2,500 subsidies to elementary and secondary schools to integrate robotics into the classroom. This subsidy supports competitive robotics (e.g., including social and environmental justice challenges), but the more significant focus is on offering hands-on experience in STEM and coding, particularly in underserved communities (e.g., new robotics users, marginalized students).

Participation and Timeline: The TDSB Science, STEM, and Robotics department prioritizes subsidies for schools new to robotics and LOI. Each year, the department supports 75 schools with robotics subsidies, and schools that receive the subsidy create a two-year plan and submit annual reports (e.g., May).

Next Steps: Professional learning opportunities to support the implementation of robotics are also available in spring 2023.

Evidence of Impact: Evidence shows that the robotics subsidies have positively impacted teachers' familiarity and comfort with coding, collaboration, and student engagement. Schools appreciated offering students hands-on coding experiences, such as building robots, circuits, and games. Students new to these technologies expressed interest in coding. Social learning was also evident from group work (e.g., group work to debug code). One elementary school engaged all homeroom classrooms by creating sharable in-school robotics kits, and one secondary school engaged over half its student population in coding across Life Skills and Academic pathways.

New Science Curricula

Overview: The Science, STEM, and Robotics department organized a professional learning series introducing teachers to the new elementary Science and Technology curriculum. In 2022, the Ministry of Education released a revised Science and

Technology curriculum for grades 1 to 8, as well as a new de-streamed Grade 9 Science course. The department provided webinars to support educators in understanding these changes and to offer guidance on implementing new areas of focus, such as coding, Engineering, and Design.

Participation and Timeline: The webinars were designed to cover different curriculum strands, such as Life Systems, Matter and Energy, Structures and Mechanisms, and Earth and Space Systems. About 48 teachers and administrators from 24 elementary and secondary schools participated in the six-week series from October to November 2022. Central staff, including K-12 Learning Coaches, were also provided STEM learning experiences. In addition, teachers participated in the *"Get your Hands ON" the NEW Science & Technology Curriculum* professional learning session during the January PA Day.

Next Steps: The Science, STEM, and Robotics department will continue to provide ongoing professional learning opportunities to support the implementation of the Revised Science and Technology Curriculum for Grades 1 to 8 (2022) and the new de-streamed Grade 9 Science course (2022). The next series of sessions will focus on unpacking each strand of the new curriculum. Additionally, Grade 9 teachers have requested support in coding and engineering design, and the department will continue to share resources and plan to provide sessions to meet their needs.

Evidence of Impact: Participating teachers implemented the revised curriculum in their classrooms in 2022-2023, and reported increased understanding of the focus of the revisions. In addition, the hands-on professional learning gave teachers greater comfort with hand tools for hands-on "makers" experiences.

TDSB Science Resource Centres

Overview: The TDSB Science, STEM, and Robotics department supports schools through Science resource centers such as the Canadian Space Resource Center (CSRC), which provides space education resources like space images and videos, as well as 25 unique and grade-specific space presentations including a portable planetarium called the Digital Star Lab (DSL) to explore concepts like orbits, rotation, day and night, galaxies, and nebulae. Additionally, the department operates a Science and Technology Resource Center that loans hands-on STEM curriculum resource kits (K-10), including building materials, robotics for coding, hands-on materials, French resources, microscopes, and hand tools.

Participation and Timeline: By March 2023, the Canadian Space Resource Centre (CSRC) had conducted 116 virtual presentations for TDSB students and staff. The Digital Star Lab (DSL) presentations resumed in-person at the TDSB Eureka Conference. Before the pandemic, approximately 300 in-person DSL presentations were given each school year. In addition, as of March 2023, the Science and Technology Resource Centre had loaned out 3551 STEM resources to 3191 classrooms.

Next Steps: The TDSB Science, STEM, and Robotics department continues to accept bookings at the Canadian Space Resource Centre (CSRC) and Science and Technology Resource Centre by schools throughout the system. The department also collaborates with other departments to explore knowledge systems (e.g., UIEC regarding Indigenous constellation systems). In addition, the department will launch a summer writing project to update the Science resource kits to address the new Science curriculum.

Evidence of Impact: Participants reported positive impacts from the Canadian Space Resource Centre's interactive and educational space presentations, which covered curriculum expectations, facilitated growth in teaching astronomy, and provided enrichment in current space topics. In addition, the Science and Technology Resource Kits received excellent ratings from most teachers, with many indicating they would recommend them to colleagues. Teachers particularly appreciated the hands-on activities and consumables included in the kits.

Resource Implications

The TDSB provided funding for the initiatives mentioned above to support the implementation of the new 2022 science curriculum and Grade 9 destreamed science course, as well as to strengthen educators' content knowledge in Science, STEM, and robotics (e.g., coding) and provide them with the necessary tools and resources to improve student learning and confidence in these areas.

Project and Staffing	Source of Funding
Bringing STEM for Life	TDSB Science/STEM Funds
Robotics Subsidies	TDSB Robotics Funds
New Science Curricula	TDSB Science/STEM Funds

Communications Considerations

The Science, STEM, and Robotics department is developing a new communications plan to establish formal processes for internal reporting, system and public engagement. The plan includes social media platforms such as Twitter, Instagram, and Brightspace, Direct Line, websites, newsletters (e.g., STEM Files) and STEM educator networks (e.g., ACLs, CLs, Lead Educators).

Board Policy and Procedure Reference(s)

Procedure PR601 - Safe Use of Power Tools

Policy P088 - Acceptable Use of Information Technology Resources.

Appendices

NIL

From

Audley Salmon, Associate Director, Learning Transformation and Equity at audley.salmon@tdsb.on.ca or at 416-397-3187

Mervi Salo, Centrally Assigned Principal, Learning Transformation and Equity at mervi.salo@tdsb.on.ca or at 416-394-7281

Mahfuza Rahman, Acting Coordinator, Mathematics, Science, STEM & Robotics at mahfuza.rahman@tdsb.on.ca or at 416-396-9167

Stephen Gilbert, Classroom Safety & STEM Lead Teacher at stephen.gilbert@tdsb.on.ca or at 416-396-4947